The productive use of free time: The utilisation of deterministic maintenance opportunity windows due to excess capacity in large coupled production lines with finite buffers

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Abstract

Engineering design rules for large serial coupled production processes result in excess capacity and redundancy being built into production lines. The V-profile engineering design rule is applied to protect machines before and after the slowest machine from starving and blocking. As a result, machines that are feeding and drawing from the constraint machine, have locked-in free time, also called maintenance opportunity windows (MOWs), which eventually causes idle time if not used timeously.

During a typical production run, the point of constraint moves randomly around the serial production process due to stochastic (due to the unpredictability of breakdowns) and deterministic (due to stoppages resulting from known replenishment rates for raw material and refuelling) behaviour and requirements of production machines. Operators are typically not able to assess a large production process as a whole. An operator might be the current bottleneck and not be aware of this. Similarly, an operator might be unaware that he has free time at his disposal. Free time can become useful knowledge if the operator knows of its presence and magnitude. The purpose of this study was to calculate, in real time, the size of the non-constraint so that this time can be used productively to improve overall performance of the production process.

The Theory of Constraints, Just in Time and Kanban do not address conveyor travel times and the issue of excess capacity in modern coupled manufacturing. Being made aware of free time allows the operator real-time control to perform opportunistic preventative maintenance activities while the production process is running. It also indicates to an operator that he is the current bottleneck and that he/she should make every effort to keep his/her machine going to the benefit of the complete production process. Downtime at the bottleneck can be communicated and added to free time at other production stations in real time; this additional free time can then also be used to perform opportunity-based preventative maintenance. Recent advancements in high-speed wireless communication methods make it possible to keep a real-time status of all production material in the process and of the throughput rates of machines. Knowing the status of accumulation quantities, throughput rates and levels are the building blocks of the relevant algorithms that calculate free time on the production line in real time.

Three test criteria were defined to solve the problem defined in this research. The tests are: (i) a test for free-time accuracy; (ii) a start-up test; and (iii) a judicious use test. These tests proved that free time can be calculated accurately; operators can improve the start-up performance and judiciously use free time during the normal running state.

The outcome of an experiment at the Valpré bottling facility in Heidelberg also suggested an overall improvement in operational efficiency and labour productivity. The free-time concept was presented and debated at eight international and numerous local conferences and meetings where the concept was shaped into the practical tool it has proven to be.

Key words: real-time control, V-profile, excess capacity, finite buffer, serial production process, stochastic, deterministic, free time, critical downtime, maintenance opportunity windows, Theory of Constraints, blocking, starvation, coupled manufacturing, productive use of free time, idle time, opportunistic or opportunity-based preventative maintenance, constraint, accumulation, throughput rate.

Opsomming

Ingenieursontwerpsreëls vir groot serie-gekoppelde produksieprosesse het tot gevolg dat oortollige kapasiteit ingebou word. Die V-profiel ingenieursontwerpsreël word toegepas om masjiene voor en na die middelste masjiene te beskerm teen materiaaltekorte of stroom-af ophoping. As gevolg hiervan, het produksiemasjiene stroom-af en stroom-op ingeboude ‘vrye tyd’ (ook bekend as kritiese aftyd of onderhoudsgeleendheidsvensters), wat verander in ledige tyd indien dit nie betyds aangewend word nie.

Tydens produksie beweeg die punt van die beperking lukraak rond as gevolg van stogastiese en deterministiese gedrag en die behoeftes van die produksiemasjiene – stogasties as gevolg van die onvoorspelbare masjienstoppe en deterministies as gevolg van bekende aanvullingstempo’s vir rou materiaal en brandstof. Operateurs is tipies nie in staat om die produksieproses as ’n geheel te evalueer nie. ’n Operateur kan die huidige bottelnek wees en onbewus wees daarvan. Net so kan ’n operateur vrye tyd tot sy beskikking hê, maar eweneens nie bewus wees daarvan nie. Hierdie ingeboude vrye tyd is bruikbare kennis indien die operateur bewus is daarvan.

Die uitdaging in hierdie studie was om die grootte van die nie-beperking in reële tyd te bereken, sodat hierdie tyd produktief gebruik kan word om die algehele prestasie te verbeter.

Die Teorie van Beperkings, Knapbetyds en Kanban spreek nie die vervoerbandreistye en die kwessie van oortollige kapasiteit in ‘n moderne gekoppelde vervaardigingslyn aan nie. Kennis van die hoeveelheid vrye tyd gee die operateur reële tydbeheer om opportunistiese voorkomende onderhoudsaktiwiteite uit te voer, terwyl die produksieproses ononderbroke loop. Dit wys ook vir ’n operateur wanneer hy die huidige bottelnek is en dat hy dan alles in sy vermoë moet doen om sy produksiemasjien tot voordeel van die hele produksieproses aan die werk te hou.

Onlangse vooruitgang in hoë-spoed kommunikasie-metodes maak hierdie geleentheid nou 'n werklikheid. Dit is moontlik om 'n huidige status van alle produksiemateriaal in die proses en die huidige deurvloeikoers van masjiene te hou. Die kennis van die status van die hoeveelhede en deurvloeikoerse van materiaal in die proses is die boustene van die betrokke algoritmes wat vrye tyd op die produksieproses bereken in huidige tyd. Drie toetskriteria is in die studie gedefinieer om die probleem op te los.

Die toetse is: (i) 'n toets vir vrye tyd akkuraatheid; (ii) 'n aanvang-van-produksie toets; en (iii) 'n oordeelkundige gebruikstoets. Hierdie toetse het getoon dat vrye tyd akkuraat bereken kan word, dat operateurs die aanvang-van-produksie prestasie kan verbeter en dat vrye tyd gedurende normale produksie oordeelkundig gebruik kan word.

Die uitkoms van 'n eksperiment by die Valpré botteleringsfasiliteit in Heidelberg het gedui op 'n algehele verbetering in operasionele doeltreffendheid en produktiwiteit van arbeid. Die vrye-tyd konsep is aangebied en bespreek by agt internasionale en verskeie plaaslike konferensies en vergaderings waartydens die konsep gevorm is tot die praktiese instrument wat dit vandag is.

Sleutelwoorde: Reële tyd beheer, V-profile, oorbodige kapasiteit, beperkte buffer, reeks produksieproses, stogasties, deterministies, vrye tyd, kritiese aftyd, onderhoudsgeleentheidsvenster Teorie van Beperkings, opeenhoping, produktekort, gekoppelde vervaardiging, produktiewe gebruik van vrye tyd, ledige tyd, opportunistiese of voorkomende geleendheidsonderhoud, beperking, akkumulasie, deurvloeikoers.

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A	distribution function for the inter-arrival times (Kendall's notation)
AC	accumulator capacity
AL	accumulator level
β	breakdown free time confidence
B	distribution of the service times (Kendall's notation)
BDFT	breakdown free time
bph	bottles per hour
CBM	current bottleneck machine
CCM	current constraint machine
CD	countdown
CM	coupled manufacturing
CPU	central processing unit
CQ	clear quantity
CTR	current throughput rate
D	service discipline (Kendall's notation)
DFT	dynamic free time
DS	downstream
EBI	empty bottler inspector
EMS	enterprise management systems
FIFO	first in first out;
FTSC	The Free-Time Solutions Company
GHz	Gigahertz
H	enthalpic certainty
HDD	hard-disk drive
HTML	HyperText Markup Language
HTR	historic throughput rate
IP	Internet protocol
IPAV	Intelligent Production Analysis and Visualisation
JIT	Just in Time
K	capacity of the system (Kendall's notation)
LEED	Leadership in Environmental Design
LIFO	last in first out;
m	number of servers (Kendall's notation)
MATT	minimum accumulator travel time
MOW	maintenance opportunity window
MTBF	mean time between failures

MTTM	mean time to maintain
n	number of sources of customers (Kendall’s notation)
PCB	printed circuit board
PDT	prime delay time
PET	Polyethylene Terephthalate
PQ	prime quantity
PUFT	productive use of free time
RAM	random-access memory
RS	randomly selected
RTR	relevant throughput rate
S	entropic uncertainty
SAP	Systems Applications and Products in Data Processing
SCADA	Supervisory Control and Data Acquisition
SFT	static free time
SSD	solid-state drive
TOC	Theory of Constraints
TQM	Total Quality Management
US	upstream
USB	Universal Serial Bus (must be identified in context)
USB	University of Stellenbosch Business School (must be identified in context)
USGBC	United States Green Building Council
WCM	World Class Manufacturing

CHAPTER 1
ORIENTATION

1.1 INTRODUCTION

A manufacturing system is a set of machines, transportation elements, computers, storage buffers (accumulators) and other items that are used together for manufacturing (Gershwin, 1994). Useful concepts such as 'Kaizen' (Imai, 1986), 'Kaikaku' (Bodek, 2004), 'Autonomous and opportunistic Maintenance' (McKone & Wiess, 1998), 'Poke Yoke' (Shingo, 1986) and many more techniques are used in manufacturing to improve plant operations. Finding time to do these improvements in the modern production environment is challenging. Excess capacity and stochastic failures of production machines create idleness: "This is because machines are unreliable and therefore, material flow may be disrupted by machine failures. Such failures can cause neighbouring machines to be idle and they, in turn, can create idleness to their neighbours" (Shi, 2012).

High-speed production processes are complex and integrate many raw material streams in real time. During a typical production run, the bottleneck moves up and down the production process due to stochastic failures and stoppages for change-over, maintenance, cleaning and inspection at the various points of interruption. Operators are typically not able to assess the production process as a whole; as a result, an operator might be at the current bottleneck and not be aware of this fact. Similarly, an operator might have free time at his disposal, but not be aware of this. This 'designed-in' free time could become useful knowledge if the operator could be informed timeously of its presence and magnitude. Typical production support systems for large production processes focus on the drum/key machine. Analysis of the reasons for performance deficiency is typically done by analysing the history of a particular production period. Many tools designed to improve future performance come from analysing past performance. The challenge is to determine, in real time, the size of the non-constraint and propose that this time ('free time') be used to do opportunistic maintenance and ultimately improve overall performance.

This research investigated the possibility of making free time known to operators so that they could perform opportunity-based preventative maintenance and change-over functions during free time, also known as a maintenance opportunity window (MOW).

1.2 BACKGROUND

In 1996, at the Prospecton Brewery in Kwazulu Natal, a project was initiated to innovate the workspace and improve information systems in Human Resources, Finance and Administration, Logistics, Engineering and Production. Task teams were formed for each of the identified business areas. The production improvement task team had a combination of six production and information technology associates and met on a weekly basis to evaluate potential projects that were identified by the team. It was agreed that the various team members would do some initial independent work, observing potential productivity opportunities and report back to the team. It was during one of these observations that production operators were observed being idle, due to conditions elsewhere on the coupled production line. The question arose: ‘How can these operators be productive during this idle period?’ In addition: ‘How can information technology be used in an innovative way to present time information to the operator during this idle period?’ It was further observed that production lines, with line-of-sight challenges between the conveyor-coupled production processes, could benefit from a real-time process information system between workstations, which would bind the production process into a cohesive unit. It follows that the more complex the manufacturing production process and the more machines involved, the greater the opportunity.

In the next team meeting the term, ‘free time’ was used for the first time to describe the potential of the idle time operators have during production.

At that time, the members of the task team did not yet understand the hidden potential benefit created by the ‘bowl phenomenon’. The bowl phenomenon is a design rule for coupled production processes, where one key process is protected from starvation and against blocking. Hillier and So (1996a) proved that the bowl phenomenon is relatively robust. Fairly large errors (even 50%) in the amount of unbalance still provides an improvement in throughput over a perfectly balanced line. As a result, machines feeding the key machine and drawing from the key machine have excess capacity and thus idle time. The line is therefore deliberately unbalanced in favour of the key machine. This idle time, used correctly, can become productive downtime.

The free-time concept was first defined and presented in public by the writer at the SABMiller production conference in Warmbaths, South Africa in April 1998. However, it was quickly realised that substantial conceptual work was going to be necessary to fully explore this idea and to demonstrate its potential in a practical setting.

Funding for the project was not approved as the concept was not well understood and financial justification of the concept was difficult. The project was abandoned. Significant funding was needed to make any meaningful progress, as the concept needed a new way of measuring the production line independently from the existing control systems.

A second attempt in setting up an experiment to prove that idle time can be used productively was made in 2004. Funds were secured as part of Coca-Cola’s innovation drive at their business unit in South Africa. A company named Blue ESP was approached after they sucessfully presented their information technology skills and knowledge to the business unit. The first real attempt at designing a hardware solution for the free-time concept was made during this attempt. A returnable glass Coca-Cola bottling production line in Nigel, South Africa was selected for this experiment. After a full year of development, the company abandoned the attempt and sited reasons such as hardware limitations, no existing theory on how to calculate free time, lack of funding, and knowledge constraints as reasons why the experiment failed. An important lesson from this failed attempt was that a wired (networked) solution presented too many challenges to be sustainable, as changes to the production machines needed the free-time system's wiring to change too, i.e. a wireless (networked) solution was required. During this time the interaction between Blue ESP and the research was limited to once a week. This in later experiments proved to be insufficient. Three hundred and fifty thousand Rand (R350 000) was spent on this project.

The first wireless installation was developed in 2006 for a non-returnable Polyethylene Terephthalate (PET) Coca-Cola bottling production line in Parow Industrial in Cape Town. In 2007 a company named PUFT (Pty) Ltd was registered to commercialise the concept of 'productive use of free time'. The wireless technology developed during this experiment solved some problems, but ongoing issues with communication accuracy caused conflicting events on the production line. For example, the system would present two current bottlenecks, and this confused the operational staff. The free-time concept was also not fully developed and the free-time calculations were not correct for all production line states. Free-time calculations did not deal correctly with prime quantities and clear quantities and theoretical accumulator levels in the model continued to be inaccurate. The installation only served the purpose of counting containers and therefore, its use was limited to line monitoring. A new company was registered called IPAV systems (Intelligent Production Analysis and Visualisation). The concept was not well understood by the software programmer and the interaction with the researcher was not sufficient to deal with the ongoing research challenges. The importance of the correct blend of multidisciplinary skills to work on the project was a key lesson during this attempt. Approximately four hundred and twenty thousand Rand (R420 000) was spent on this project.

It was clear that more substantial conceptual work was necessary to explore this idea fully and to demonstrate its potential in a practical setting. In 2008, the University of Stellenbosch Business School (USB) was approached to guide the work necessary for the concept in a PhD study topic, which was proposed and accepted in December 2009.

As the study progressed, and the concept gained shape, a second attempt by the researcher, Leon Coetzee and Dale Whitfield was made at the Green Field Valpré bottling facility in Heidelberg, South Africa. Most of the wireless communication issues were solved with the next generation of wireless hardware. However, the software developed could not deal with the variability and unpredictability of human interface during the production process. The free-time project was abandoned due to a lack of available accurate readings from the production process. Re-work, quality testing, pack changes and unexplained operator behaviour resulted in inaccurate product counts that needed to be reset continuously. The system continued to be unstable and needed significant continuous intervention from the programming staff. The acid test, especially designed to test the accuracy of free-time calculations failed almost every time. The developer, IPAV systems, explained that the 'noise' and interference by operators and their behaviour made it impossible to keep accurate record of the status of the production process. They coined the term ‘productive downtime’ and continued to develop their wireless solution with no accurate measurement of free time.

After two years of development, the project was scaled down to a conventional line monitoring system. This left the company with a sellable product, but it did not demonstrate the free-time concept. The project still needed solutions to deal with inaccuracies and lacked the correct combination of disciplines to work together to solve the problem. The total cost of this project was estimated at eight hundred and sixty thousand Rand (R860 000).

A fourth and final attempt started in early 2013. A new company was formed to attempt proving the free-time concept. A company called The Free-Time Solutions Company (FTSC) was formed. They are based in Heidelberg with a satellite office in Cape Town. A new wireless solution was developed from scratch as IPAV would not release their solution to FTSC. Building on the concept developed by the researcher in the previous attempts, they proceeded to provide for the uncertainties that existed in the production process. Entropic uncertainty and enthalpic certainty were defined which resulted in a more conservative view of free time. Accumulator resets and process-specific free-time calculations were developed. A successful installation of this experiment was done at the Valpré spring water bottling plant. The total cost of this experiment is estimated at eight hundred thousand Rand (R800 000).

1.3 OBJECTIVE

The objective is not to predict, but to accurately calculate and display to each production operator the free time available or MOW to do opportunistic preventative maintenance, cleaning, adjustment or setup/changeover on the production machine, without interfering with the steady flow of materials through the production process. For a production process, free time is also generated at a machine when there are no parts available on a cross-flow assembly to the serial production process, for example, if the motorcar assembly line is waiting for seats that have not been delivered in time. This knowledge is normally only available at the specific workstation and not shared along production processes.

Unlocking this information and making it visible for all line operators will allow operators to do opportunistic preventative maintenance, cleaning, adjustment or setup/changeover during the normal running of the production process.

Free time applies well to high-speed coupled manufacturing (CM) production processes, with three or more points of interruption and with ‘line of sight’ challenges between the coupled machines. The larger the manufacturing production process and the greater the number of machines in succession, the more beneficial its application could be. Free time is productive idle time and is defined as the time available at a point of interest or at a production machine due to installed excess capacity and stoppages elsewhere in the production process. The definition of MOW covers some of what free time defines, but it excludes installed excess capacity and the effect that prolonged stoppages on the production bottleneck machine has on a particular machine which is being observed. The main objective is to accurately display to each production operator the free time available to him to do opportunistic preventative maintenance, cleaning, adjustments or setup and changeover on the production machine without interfering with the steady flow of materials and the subsequent production of finished goods.

The Theory of Constraints (TOC) aims to identify the constraints of a system and exploit these constraints. The free-time concept, however, describes the free time available at all the non-constraints in real time for a coupled manufacturing system and allows operators to do opportunistic maintenance, cleaning, adjustments, setup and changeover, at the right time.

A more comprehensive description of the TOC in comparison to Queueing Theory and the free-time concept is presented in Chapter 3.

Figure 1.1 illustrates a time scale for some well-known production improvement techniques. Most common are the techniques using history to analyse performance and to prevent past events from reoccurring. Most modern production machines also display real-time efficiency. This, in a sense, is already history as it is merely a current indication of the recent past.

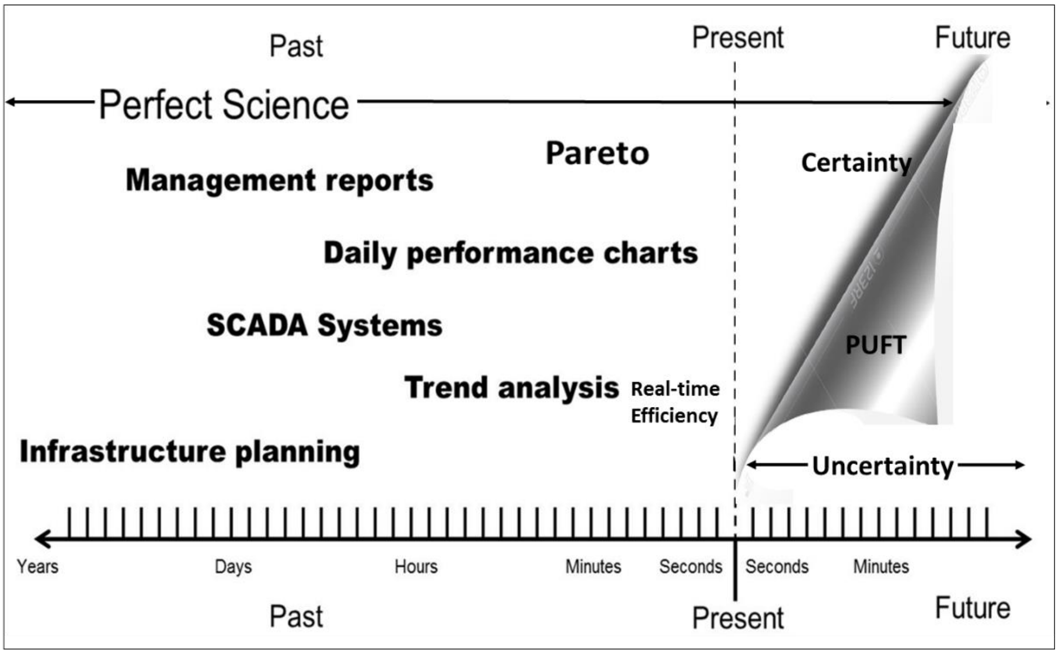


Figure 1.1: Proven production improvement techniques in relation to time

Source: Researcher's own illustration.

Production managers are presented with daily operating charts to analyse the past few hours of production. This information is used to plan corrective action to ensure production reliability and prevent stock-outs. Performance trends are analysed to interject initiatives that will stop negative trends. Pareto analysis is performed to focus resources and effort where the maximum benefit can be derived. Longer horizon production improvement techniques rely on Supervisory Control and Data Acquisition (SCADA) techniques, management reporting and infrastructure planning, to name but a few. The one factor that all these techniques have in common is that they use historical data to drive problem-solving and decision-making. The productive use of free-time concept (PUFT) uses conditions and constraints to calculate live free time at each production station. This free time can be used productively in the present moment, or become idle time in the future. PUFT is therefore positioned to give operators a window into the near future resulting from excess capacity.

In Figure 1.2, three typical levels of an organisation are illustrated. The top layer of the pyramid is Level 3 and represents senior management. Information systems typically used at this level of production include, ‘enterprise management systems’ such as Systems Applications and Products in Data Processing (SAP) and JD Edwards. The second level, Level 2, represents the supervisory level of the organisation. Supervisors typically look at short-term trends in production performance. Typical information system tools at this level include various types of ‘Supervisory Control and Data Acquisition’ (SCADA) software such as In-Touch and Monitrol. Information systems for the bottom-level operator are almost non-existent. The Level-1 operator is typically the lowest skill on the production line and has manual job activities, such as moving product and material onto and from the production line. The Level-1 operator works in real time and therefore, a real-time production support system such as the free-time concept is ideal for this level.

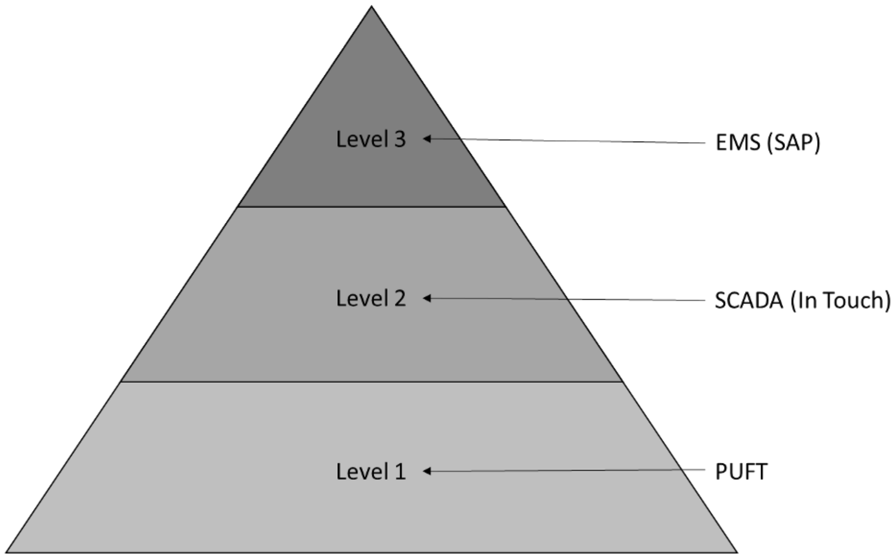


Figure 1.2: Various levels of the organisation requires different solutions

Source: Researcher’s own illustration.

1.4 PROBLEM STATEMENT

The first attempt at formally formulating the problem statement was in 2009. Two more iterations were done before the current problem statement was formulated. For completeness, all three these problem statements are listed below. Formulating the problem statement is an iterative process. The many iterations of the problem statement represent the evolution of the problem, as it became better understood during the process of exploration in the research conducted.

1.4.1 First iteration

Just in Time (JIT) and Kanban methods fall short in assisting modern coupled manufacturing production lines, because fixed accumulation and inventory cannot be optimised by manipulating arrival times of product. Inefficiency and excess capacity are locked into the design of large production lines to ensure a continuous flow through the production line. Describing, in real time, the size of excess capacity and the resulting free time at production stations in coupled manufacturing production lines, have not been possible to date, mainly due to technology limitations in real-time communication. The problem the researcher intended to solve, is one for which the theory, he believed, did not exist.

1.4.2 Second iteration

Traditional improvement methods fail to apply to modern coupled, serial manufacturing processes with finite buffers. Fixed accumulation with serial processes cannot be optimised by manipulating arrival times of product or by reducing inventory. Excess capacity is locked into the design of large production processes, resulting in excess capacity at production stations.

Although the idea of free time could be conceptualised, testing the potential of gaining productivity through practical implementation had proven to be difficult. The absence of existing algorithms, technology limitations in real-time communication, inaccurate sensing and human error left previous attempts of the researcher to implement the concept in practice unsuccessful.

However, current advancements in wireless high-speed communication technologies have potentially made this concept a real possibility. It is now possible to accurately monitor the real-time status of all production material in the production process and the relevant real-time throughput rates of all machines. Knowing the status of accumulation quantities and the throughput rate of each machine, form the building blocks of the algorithms used to calculate free time in the production process in real time.

1.4.3 Third iteration

Coupled production lines with finite buffers are prone to machines being idle due to blocking or starvation. Excess capacity is designed into these closed systems due to over-engineering and make-fit solutions. Improving overall efficiency using lean manufacturing techniques like Kanban or Just in Time are limited in their application when it comes to modern coupled processes with finite inter-stage buffers. The efficient use of idle time during the normal course of production, to do minor opportunistic preventative maintenance tasks, could improve overall efficiency. However, proving the existence of useful free time available on a coupled production line and calculating the free time in a transient state of production could be difficult. Measuring and using the free time judiciously could result in improving the overall efficiency of the production process.

1.5 RESEARCH QUESTIONS

The core research question focused on how to calculate useful free time, i.e. the size of the non-constraint at each point of interest, in a coupled production process and make this information available to machine operators in real time.

In order to explore this question, the following four sub-questions were also posed:

- How can the calculated free time be verified as accurate?
- Is the calculated free time useful in the context of the production setup?
- How is free time utilisation measured?
- What are the financial and other benefits of implementing the solution?

1.6 RESEARCH DESIGN AND METHODOLOGY

Research was not done using a single methodological framework, but rather by using multiple approaches. Methods in turn, are sub elements of a methodology. Methods used in this research included the engineering method, qualitative, quantitative, deductive, inductive, simulation, empirical, analytical and mathematical methods.

1.6.1 The research onion

The researcher used the metaphor of the 'research onion' in Figure 1.3 to illustrate how the final elements (the core of the research onion) needed to be considered in relation to other design elements (the outer layers of the research onion) (Saunders, Lewis and Thornhill, 2012). It was the researcher's understandings and associated decisions in relation to these outer layers that provided the context and boundaries within which data collection techniques and analysis procedures have been selected.

The research started at the outermost layer of the illustration, offering the option of exploratory research versus non-exploratory research and then an overview of different research philosophies and their implications for research design. The researcher then peeled back each of the subsequent layers considering the implications of methodological choice, strategies and the time horizon for design used in the development of the free-time concept.

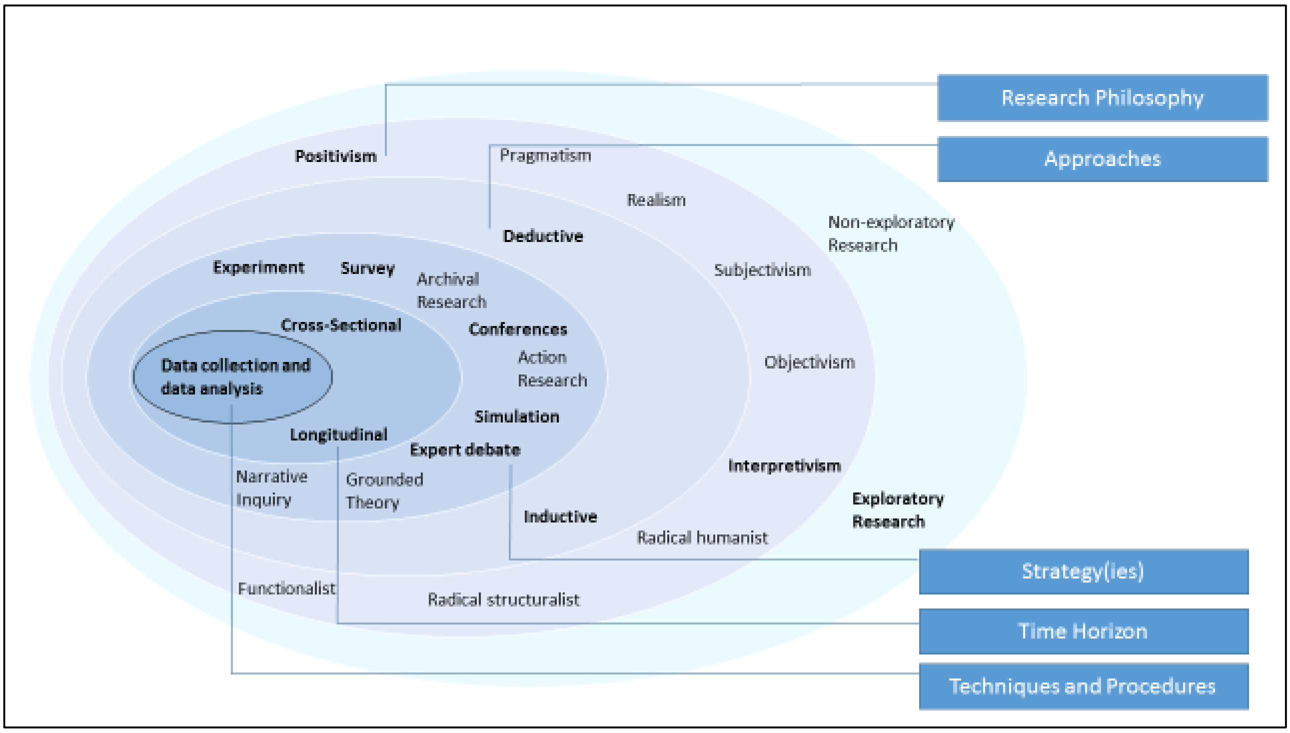


Figure 1.3: The research onion

Source: Adapted from Saunders, et al, 2012.

1.6.2 Exploratory research

Exploratory research is research conducted for a problem that has not been clearly defined. It often occurs before we know enough to make conceptual distinctions or posit an explanatory relationship. Exploratory research helps determine the best research design, data collection method and selection of subjects. It should draw definitive conclusions only with extreme caution. Given its fundamental nature, exploratory research often concludes that a perceived problem does not actually exist. The very outer layer in the depiction of the research onion, therefore, influences the choice of options right to the core of the onion.

Limited literature, presented in the next chapter, was available on the topic of free time in a coupled manufacturing process. This situation, therefore, forced a deviation from the typical research methodology.

Exploratory research was conducted using the following methods and strategies in this research study:

- Participating in expert debate;
- Presenting progress findings at conferences and meetings;
- Attending innovation exhibits and shows by equipment suppliers;
- Experimenting by building prototypes;
- Conducting a qualitative survey to gauge the suitability of the selected plant and operators selected for the field experiment; and
- Using simulation spreadsheets to test formulae only.

1.6.3 Research philosophy

This study partly adopted a positivist philosophy as credible data could only be derived from quantitative analysis obtained during the experiment and partly an interpretivistic philosophy when qualitative data derived from the operator survey conducted was interpreted.

The research questions were also formulated very pragmatically, i.e. ‘Can I measure the free time and can I measure the improvement in start-up behaviour and the judicious use of free time?’

1.6.4 Research approach

Due to the positivist nature of the research, this study mainly adopted a deductive approach (Saunders *et al*., 2012). This approach represents the most common view of the relationship between theory and research and results gained from this approach are developed through logical reasoning. The data was analysed and tested to ascertain whether it proved the existence of free time.

However, an inductive-based argument rather than a hypothesis-directed argument was lead, in order to generalise the concept of free time in the last chapter. The mixed-method research approach was therefore adopted to study the free-time concept.

1.6.5 Research strategies

1.6.5.1 Stochastic simulation

Stochastic simulation seemed the obvious choice research strategy for coupled processes to study the free-time concept. Simulation is often used to assist with the design and optimising of a system, but is not as popular when the problem relates to the management of a particular existing system. The free-time concept was all about the measurement of stuff. There was no uncertainty in the system; the only uncertainty was that we had not measured free time. Firstly, we needed to developed hardware to do the measuring. This development was done using the engineering method, as there were many iterations before a suitable hardware solution was designed.

1.6.5.2 The experiment

An experiment was needed as a research strategy because there was no other option. The change in human behaviour could only be tested on a real-life production line. During the design of the Valpré production line in Germany, stochastic simulation and other methods were used to optimise the buffer allocation for this turn-key line, based on the ‘mean time between failures’ (MTBF) and the ‘mean time to maintain’ (MTTM) of the seven machines coupled with finite buffers. Once the design and optimisation phase was complete, an expert panel reviewed the throughput speeds and buffers allocated. Changes were then made to the designed size of machines and buffers by applying some rules of thumb. One example was the expert panel recommending that the peak labelling throughput should be 28 per cent more than that of the filling machine. The supplier of the production line was confident that the labeller would perform to standard with only 20 per cent excess capacity. This and other changes added to the level of confidence that the production line would run efficiently but created a great deal of idle time. Stochastic simulation was not the best potential strategy here because the capacity decisions made by the expert panel used experience rather than analytical methods to determine the final chosen capacity. They had a ‘rather safe than sorry’ approach.

The experiment also presented the research with another advantage and yet again another deviation from the conventional way of solving a research problem. In the case of the Valpré experiment, a sample was not taken to represent the population of information, but the whole population was measured and used to calculate the results. It was therefore not necessary to state a hypothesis and accept or reject the same. An experiment was used, as it was a likely strategy to assess the change in human behaviour. Stochastic simulation could potentially not provide all the answers to the research questions associated with the change in human behaviour. The experiment was designed using the engineering method. The engineering design process is a methodical series of steps that engineers use in creating functional products and processes. The steps tend to be articulated, subdivided and/or illustrated in a variety of different ways, but regardless, they generally reflect certain core principles regarding the underlying concepts and their respective sequence and interrelationship. In addition, the process is iterative. Parts of the process often needed to be repeated many times before production of a product could begin. Khandani (2005) listed a most basic list of only five steps describing the engineering design process:

i) Define the problem;

ii) Gather pertinent information;

iii) Generate multiple solutions;

iv) Analyse and select a solution; and

v) Test and implement the solution.

A comparison between the scientific method and the engineering process is presented in Table 1.1.

Table 1.1: Comparison between the Scientific method and the Engineering design process

Scientific method	Engineering design process
Ask a question The scientific method aims to quantify nature.	**Define a problem** The engineering process aims to solve a problem or design a system.
Do Background Research	
Construct a hypothesis and test it with an experiment A hypothesis predicts the outcome of the experiment before the experiment is conducted.	**Specify requirements and choose a solution** The requirements for solving an engineering problem should be met by the solution. A list of solutions are brainstormed before one is chosen as a prototype.
Check to see if the experimental procedure is working Observations are made as the experiment is carried out to make sure that the result can be obtained. If the intermediate results are not relevant to the hypothesis, another experimental procedure needs to be designed and carried out.	**Develop a prototype solution** A prototype is developed to solve the problem. Once a solution is chosen, it needs to be built or implemented.
Analyse data and draw conclusions Graphs are drawn and analysed to find correlations between the gathered data and the hypothesis.	**Test solution** The prototype is implemented as a solution. If it does not solve the problem, another solution is invented and prototyped.
Results align with hypothesis, partially or not at all Either the results align with the hypothesis or the results only align partially or not at all.	**Solution meets requirement, partially or not at all** Either the prototype solves the problem or the prototype only solves the problem partially or not at all.
Communicate results	
The scientific and engineering community must communicate results. Scientists can do further research on a topic and engineers can research which solutions solve which problems.	

1.6.5.3 Expert debate

A useful strategy in exploratory research is expert debate. This especially was the case in researching the free-time concept. There was little to no literature available on the topic. Fortunately, the field of designing an optimising coupled manufacturing, with unreliable machines connected with finite buffers, has many experts. Large international companies with their own internal research and development departments were interviewed, presented to and the issues were debated. These included Krones, Hartness and Lineview. See Appendix B for the complete list of eight international presentations and fourteen local presentations.

Presentations were also made to maintenance professionals, PhD students, plant management, production managers and technical directors and the concept was debated. During these discussions the concept was shaped and affected. For the past sixteen years, the free-time concept could never be disproved and almost in all cases, the experts agreed that the concept had significant potential to improve the production efficiency. However, without an experiment to answer the research question, the question remained unanswered and the concept unproven.

1.6.5.4 Conferences and shows

In March 2010, the free-time concept was first presented internationally at the International Lean & Six Sigma Conference in Orlando, Florida. During this session, delegates from many different backgrounds interested in improving production performance attended. In this session, the suggestion that the concept could potentially work for de-coupled manufacturing was debated for the first time. It has since been proven that the concept only applies in processes with finite coupled inter-stage buffers.

Drinktec in Germany is the leading international trade show for coupled production lines in high-speed bottling. The show is held every four years. The researcher has attended the show every four years since 1993. The most recent show was in 2013. During these shows, equipment and production line suppliers display the most recent advancements in technology.

New handling machinery minimising the use of buffers and new production line monitoring and control systems are on display. These shows were an excellent opportunity to do exploratory research. The suppliers are very open to part with their knowledge during this time. During these shows, other line monitoring systems were studied to establish if anyone else had a system that could sense free time on a coupled manufacturing line. Only IPAV (refer Section 1.2) had an unproven prototype on display in 2013 from the third failed experiment done in the Valpré plant under the researcher’s direction.

1.6.5.5 The survey

A questionnaire was developed to test the suitability, readiness and views of the operators involved in the free-time concept experiment. The study went further and measured the experience had by the operators. This exploratory research method assisted in confirming the Valpré site as a suitable environment for the experiment to be performed. The study’s findings are presented in Chapter 12 and the questionnaire is included in Appendix F.

1.6.6 The research time horizon

There are two time horizon choices: (i) cross-sectional, which is a short-term study; and (ii) longitudinal which is research carried out over a longer period. In this research study, both these options were once again taken up. During the experiment, a status/information snapshot of the complete production line was taken every five seconds. This information represented a cross-sectional set of information. These readings were repeated every five seconds and the data used in the experiment represented eight weeks of continuous information. Therefore, the data could also be described as longitudinal. See Appendix D for an extract of the data showing both cross-sectional and longitudinal options.

For the qualitative research, the cross-sectional choice was made to measure the suitability, readiness and views of the operators at a specific point in time. The qualitative data collection was done before the empirical experiment started, in case the results showed an unsuitable environment.

1.6.7 Data collection and data analysis

The final layer of the onion moved the research design further into the practicalities of data collection and analysis. Two data sets were generated during the research. The first was a large quantitative research empirical data set and the next was a qualitative research survey done with all the operators involved with the free-time experiment.

The first decision was to select the best location for the experiment. The Valpré plant was selected for the following reasons:

- It has a coupled production line with a potential to carry up to 28 000 bottles of inventory on the line in accumulation;
- The plant has state-of-the-art technology;
- The workforce is relatively well educated (minimum matric);
- The workforce generally had a positive response to the free-time concept;
- Management had bought into the free-time concept; and
- The plant is in close proximity to the system installation staff.

Next, the duration of the experiment had to be determined. The plant runs either sixteen or twenty-four hours in the day, five days in the week, depending on the seasonal demand. One month’s data was found to be sufficient to determine current practice. The operators were trained on the job while supervisors were trained in the training centre. The experiment was continued for another four weeks to allow sufficient time to observe a sustained change in operator behaviour. The experiment data set represented the period 5 May tot 29 June 2014, eight weeks and 11 520 observations, one every five seconds. The results were analysed by trending the results and calculating the relevant statistical numbers.

The qualitative questionnaire is presented in Appendix F. All the operators completed the questionnaire and therefore, represented the population and not a sample. The questionnaire was drawn up to measure the demographics of the respondents, the views of the operators on whether the tool is useful, unique and being used regularly. These insights re-enforced the notion that the Valpré plant was a good location for the experiment.

1.7 DISSERTATION OUTLINE

The remainder of this dissertation is organised in the following sequence:

Chapter 2 discusses the literature available on production improvement techniques, *inter alia*. It shows that algorithms developed for coupled manufacturing are exclusively developed for the design of new systems, rather than improving or optimising already built production lines. Significant research has been done on optimising buffer allocations, sizes and positions. An introduction to the ‘V-profile’ and methods of improving ‘JIT’ and ‘Kanban’ in the latest research are described in the literature review.

Chapter 3 discusses Queueing Theory and the Theory of Constraints and how the free-time concept differs from these two established fields of research.

In Chapter 4 the development of the free-time theory model is discussed. Five different machine types are defined. Dynamic and static free times are defined and accumulator states are shown. Finally, the four production states are discussed.

In Chapter 5 matrix mathematics are used to define the machine and accumulator matrices for the generic five-machine production line. Free-time calculations are developed from first principles for the sleep (stationary), start-up and normal running (transient) states. The general solution for any number of machines is developed and discussed. An example showing the special solution for blocking and starvation is described.

In Chapter 6, in the process of implementing the model, three tests are proposed. The first of three test criteria, the acid test, is defined and is used to determine whether the calculations of the free-time concept are accurate. The manual test and automated test processes are discussed. Solutions are provided for practical problems associated with poor communication and process instability. Enthalpic certainty and entropic uncertainty are defined in the current context and used to promote the principle of conservative estimation.

Chapter 7 describes the second test criterion, the start-up test, on the basis of a data extract from the experiment done at the Valpré plant. Problems with the manual start-up test are discussed and the automated start-up is proposed as a solution to these problems.

Chapter 8 describes the third test criterion for the free-time concept, i.e. the judicious use criterion. Problems with the manual test are discussed along with an automated solution. Blocking and starvation are defined as the two lines states where non-judicious use is evident.

Chapter 9 discusses the Peninsula Beverage free time. The machines on the production line are demonstrated and specific free-time formulae are developed and tested for accuracy using a simulation spreadsheet specifically developed for this purpose. A snapshot of this simulation spreadsheet is presented at the end of Appendix J.

In Chapter 10 the hardware developed for the free-time concept is discussed in detail. Reasons why the specific hardware was chosen are provided. The hardware network illustrates how the hardware communicates, from the data gathering point through to the free-time display.

In Chapter 11 the Valpré free-time installation and experiment is discussed. The machines on the production line are demonstrated and specific free-time formulae are developed and tested for accuracy and used in an experiment over a period of eight weeks.

Chapter 12 presents the findings, after the Valpré experiment was completed and the data for the various tests gathered. Qualitative and quantitative data analysis shows how the free-time installation improved the production line's efficiency.

In Chapter 13 as the conclusion, the problem statement is confirmed. A summary of the methodology applied in the research of the free-time solution is presented. The solution found and the tests conducted in the experiment are summarised. The criteria used for evaluation, the contribution to science and the extent to which the results can be generalised are discussed. Limitations of the theory are outlined and a proposal for further research is made.

1.8 SUMMARY

In this chapter, the concept of free time available during production is introduced. The case is made that most production-improvement and problem-solving techniques rely on historic information to drive action and decision making. From observations, it was found that techniques, such as JIT and Kanban, have limited use in modern coupled manufacturing processes. In the TOC, the focus is to service the constraint as the only important point of interest.

The free-time concept, introduced in this chapter, is focused on the non-constraint and the opportunity that exists in using this free time productively. A research question was formulated and four sub-questions were added, as the problem was better understood.

The research design and methodology were explained using the research onion metaphor. As each layer was peeled back, the next step in the design process was explained, until the core of the onion representing the data collection and analysis was reached.

The objective of the research was to develop a concept that has practical benefits and can be exploited in a commercial sense by developing an appropriate theoretical model and by demonstrating the successful implementation of the model in a real-life situation.

An outline of the rest of the dissertation was then presented.

In order to explore the current dome of knowledge in this field, the next chapter summarises the current state of knowledge in the form of a literature survey.

CHAPTER 2
LITERATURE REVIEW

2.1 INTRODUCTION

Substantial research has been done on automated serial coupled processes connected via finite inter-stage storage buffers with unreliable machines, characterised as having variable throughput and being deliberately unbalanced, to improve performance.

In this chapter, the existing knowledge of the following characteristics and their relevance to the free-time concept are highlighted:

- The coupled process;
- The bowl phenomenon, also referred to as the V-profile in this study;
- Unbalanced process;
- Finite buffers;
- Serial production;
- Unreliable machines;
- Variable throughput;
- Parallel machines;
- Different products;
- Buffer allocation;
- Excess capacity and idle time;
- Maintenance opportunity windows;
- Critical downtime.

Literature on these aspects of serial manufacturing has been scrutinised in order to establish the current available knowledge base and to find ideas that will assist in defining the problem and help with the development and validation of the free-time concept.

Research regularly focuses on reaching the optimum performance solution for a given set of circumstances, leaving one or more aspects free to be optimised either analytically or through simulation. For this reason, various production line models have been developed.

In managing the performance of a production process, various management tools and techniques are used to improve performance. In this chapter, the tools used to improve serial manufacturing, such as Just in Time (JIT), Kanban, Theory of Constraints (TOC) and World Class Manufacturing (WCM), are studied as they have the same goal as the free-time concept – to improve process efficiency.

2.2 SOME DISTINCTIVE ASPECTS OF COUPLED MANUFACTURING

2.2.1 The coupled process

Coupled manufacturing or processes present unique problems; when machines are coupled, the phenomena of starvation and blocking occur when machines are unreliable, or production rates vary.

Konishi (2010) compared the blocking and starvation phenomena to the problem experienced during traffic congestion. The optimal velocity traffic model proposed by Bando, Hasebe, Nakayama, Shibata and Sugiyama (1995) has played an important role in this field. Konishi (2010) developed a mathematical model and proposed a solution of selecting and tuning the work cells to avoid these phenomena. He verified the proposed strategy by showing simulations.

In Figure 2.1 Konishi illustrates how blocking and starvation can be prevented. A sensor measures the level in the buffer and then controls the velocity of the machine for each production station. By continuously tuning the velocity or throughput rate of the machines, to compensate for unreliability, the levels in the buffers can be controlled to prevent blocking and starvation.

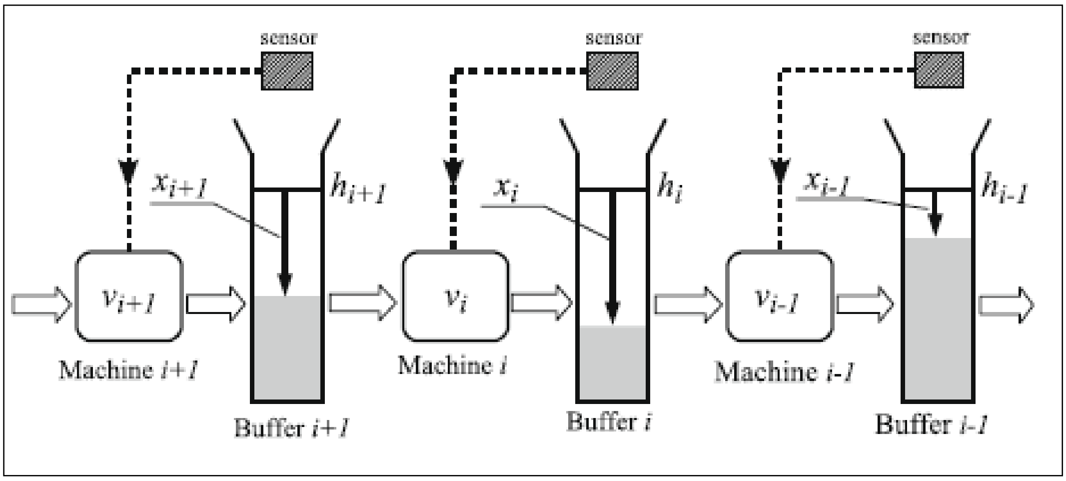


Figure 2.1: Schematic illustration of a buffered production line

Source: Konishi, 2010: 617.

In the model and its solution, the ability to change the production machine velocity to respond to the buffer conditions is necessary. In many production lines the V-profile design rule introduced in the next section, lock machines in with a set average throughput. Konishi’s model cannot be used to optimise production processes if the design velocity is fixed and cannot be adjusted, as is the case of a fixed V-profile line. Konishi’s model also did not consider the production line as a whole.

2.2.2 The bowl phenomenon or V-profile

The bowl phenomenon, also referred to as the V-profile by production managers, refers to the design method applied that has protected a key machine in coupled manufacturing (Hillier & Boling, 1966). This is the type of work design wherein the machines feeding and drawing from the key machine run at a faster pace than the key machine. The further the observed machine is away from the key machinery, the higher the throughput speed. This enables the key machine to run smoothly and blocking and starvation of machines along the production process is minimised. The focus of the production run is maintained at the bottom of the V-profile. Tuning of machines as proposed by Konishi (2010) that are governed and fixed by the bowl phenomenon is therefore not possible without disturbing this focus.

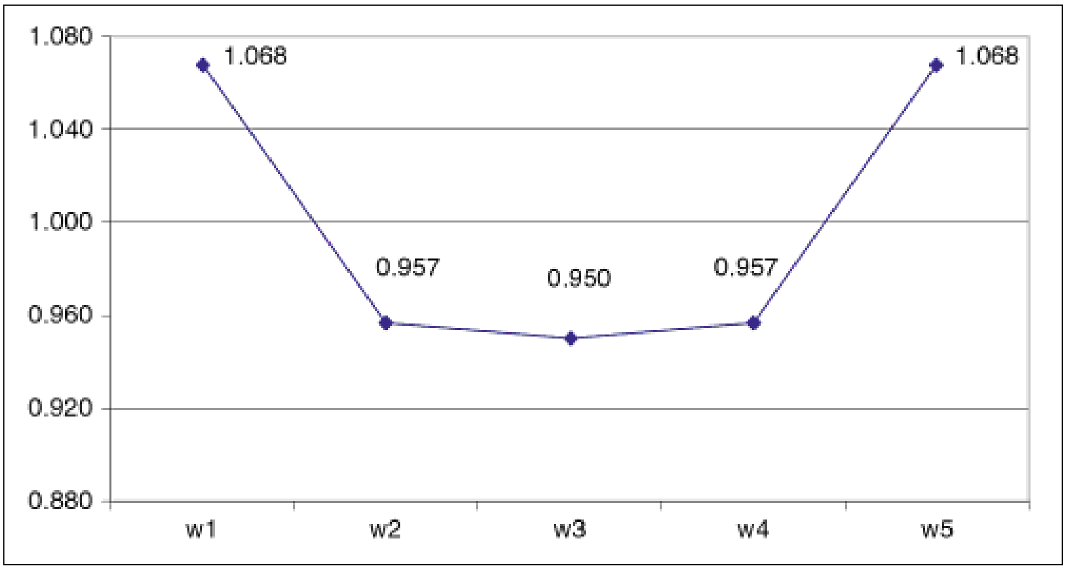


Figure 2.2: The two-level approximation to a bowl phenomenon

Source: Papadopoulos, O'Kelly, Vidalis and Spinellis, 2009: 117.

In Figure 2.2, Papadopoulos *et al*. (2009) plotted five machines in a serial production graph on the X-axis from w1 to w5 with equal buffers of three units between each station. On the Y-axis are the coefficients of variation of service times. In a completely balanced line with reliable machines all the workstations will have a coefficient of variation of 1. The curve connecting the service times is concave and is representative of the cross-section of a bowl from which the title comes. The key process for this production process is w3, and is protected from the unreliability of w1, w2, w4 and w5. Production machines in a coupled process, feeding the key machine, are therefore normally rated at a higher throughput than the key machine, progressively becoming slower the closer they are positioned to the key machine. Similarly, machines taking product away from the key machine are all rated at a higher speed than the key machine, progressively becoming faster the further they are placed from the key machine. This minimises stoppages at the main machine because the V-profile or bowl phenomenon is designed to keep production running at the key machine despite inevitable stoppages at the other machines.

Hillier and So (1996) examined the robustness of the bowl phenomenon, namely, the effect of an incorrect estimate of the optimum bowl allocation of workload. They concluded that even errors of 50 per cent in the optimum allocation of workload on production stations are still better than the perfectly balanced load. This means that a greater number of units are produced on a deliberately unbalanced line with 1.5 times the ideal throughput capacity than a perfectly balanced line. Therefore, they concluded, that it is better to aim at a bowl profile than at a balanced one.

According to Castellucci and Costa (2015: 58), “The theory behind the Bowl phenomenon is not yet fully understood. Nevertheless, the effect may lead to adjustments in optimisation methods in order to enhance throughput of assembly lines in practical contexts”. This statement is a clear indication that Castellucci and Costa believed the opportunity for improving production throughput could lie in new methods using the bowl phenomenon as point of departure.

Castellucci and Costa (2015) presented an eight-workstation or machine representation of the bowl phenomenon on a graph where the workstation load, or throughput speed of the workstations are plotted on the y-axis together with an evenly-spaced sequence of the workstations on the X-axis. In this example, workstations 4 and 5 are rated the same throughput rate, whereas an uneven number of machines, such as the five-number machine described in Chapter 5, has a distinct V-profile rather than the ‘bowl’ profile referred to in most literature on the topic.

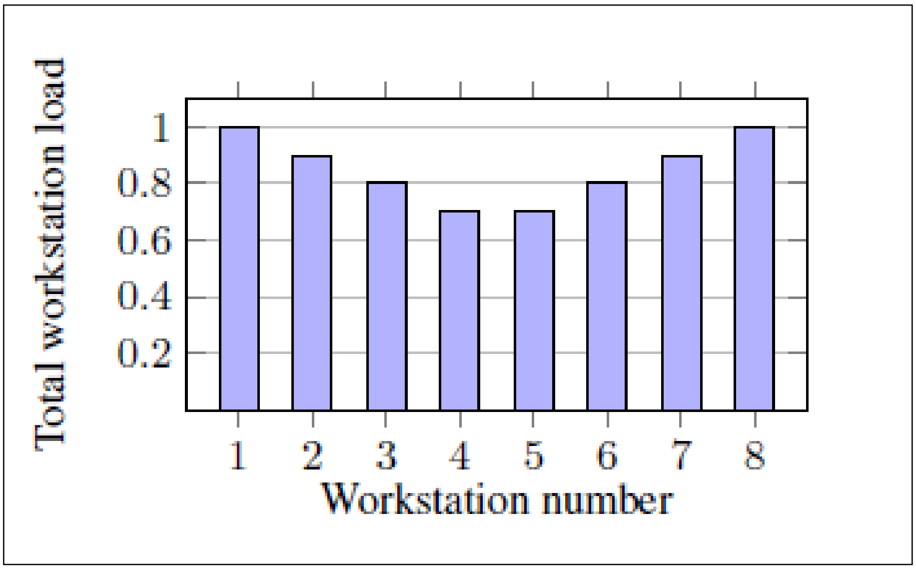


Figure 2.3: An eight-workstation bowl phenomenon or V-profile

Source: Castellucci and Costa, 2015: 61.

Furthermore, Papadopoulos *et al*. (2009: 117) explained the real issue with the bowl phenomenon as whether the “mathematical throughput are accurate models of the realities of actual production lines. This brings into question the validity of specifying processing times in stochastic terms generally using phase-type distributions. It might be the case that in production lines where there is significant human operator involvement, as well as machine involvement, the bowl phenomenon is more relevant". They continued and said that they as the authors: "would encourage readers to make up their own minds about this controversy" (Papadopoulos *et al*., 2009).

The human aspect and involvement in production lines makes the specification of processes in stochastic terms difficult. Simulation is therefore not the best tool to study the free-time concept, but rather an experiment in the real-life situation.

2.2.3 Unbalanced lines

The benefits of unbalanced lines, described by Hillier and Boling (1966), were discovered using a simulation-based approach. After some initial claims that the best allocation would be to alternate fast and slow stations (Patterson, 1964), research showed that if the designed throughput was following an exponential distribution, the assembly line performance could be enhanced by introducing specific machine unbalances, thereby creating an unbalanced line. The V-profile is a specific type of an unbalanced line.

2.2.4 Finite buffers

Researchers also developed line-balancing algorithms for serial production processes with finite buffers. Buffer capacities of manufacturing processes are optimised resulting in successive steady distribution of items at different stations.

Gershwin and Berman (1981) found a compact solution and investigated limiting behaviour for a Markov (1906) process model of a transfer line for two machines with a single finite buffer.

Solutions for more than one buffer are more complex and have many more variables to consider. Dincer and Deler (2000) proposed an analytical method for estimating the mean and variation of the throughput of a serial production system with reliable machines and finite buffers. They determined the steady state and transient behaviours of the system using the evolution of stochastic processes under consideration.

Due to the complexity created by numerous buffers, Gershwin (1987) proposed a decomposition model for the approximation of transfer lines with finite buffers. Gershwin (2014) showed that variability can determine the optimal finite buffer size.

Dallery, David and Xie (1988) developed a new algorithm for situations when Gershwin's decomposition method with an iterative algorithm failed to converge.

Alvarez-Vargas, Dallery and David (1994) published a study of the continuous flow model of production lines with unreliable machines and finite buffers in the *Journal of Manufacturing systems*. Finite buffers continue to be a topic of much research and study.

2.2.5 Serial production

Huang (2010) developed a tactical planning model for a serial flow manufacturing system. In his project, Huang aimed to improve the operation and planning of a specific type of manufacturing system, a serial flow line that entails a sequence of process stages. Facing the challenges of inventory management, material arrival uncertainty and machine failures, the best option was to decouple the buffers to protect the project outcomes from the mounting uncertainties.

This type of manufacturing process is very systematised and easier to organise when compared to other types of production processes; however, problems arise whenever one machine becomes defective because of its domino effect on the entire production run.

2.2.6 Unreliable machines

Machines are defined as reliable in the manufacturing context (Business Dictionary, 2015) as when: "The probability of failure-free performance over an item's useful life, or a specified timeframe, under specified environmental and duty-cycle conditions. Often expressed as mean time between failures (MTBF) or reliability coefficient. Also called quality over time".

The stochastic nature of machine failures presents difficulties for models to emanate real-life production lines.

Li and Meerkov (2000) addressed the problem of production variability in serial manufacturing lines with unreliable machines. In their paper, three problems were considered: (i) the problem of production variance; (ii) the problem of constant demand satisfaction; and (iii) the problem of random demand satisfaction generated by an unreliable production line. They proved that long lines smooth out the production and reduce the variability.

In the study of the continuous flow model of production lines with unreliable machines and finite buffers, Alvarez-Vargas, Dallery and David (1994: 222) made the statement that "No exact solution of asynchronous flow lines has been obtained so far, even in the case of two-machine lines". Unreliable machines pose significant complexity when coupled with a finite buffer.

2.2.7 Variable throughput

In the Konishi (2010) solution, the case of the blocking and starvation problem is solved by tuning the throughput of the production machines. Variable throughput complicates solutions for optimising the production process.

2.2.8 Parallel machines

Nahas, Nourelfath and Ait-Kadi (2007) formulated an optimal design for series-parallel machines with in-process buffers. They proved that the production rate could be maximised subject to a total cost constraint by the use of parallel machines. Parallel machines pose a unique challenge to optimising and measuring techniques.

2.2.9 Different products

Given the continuous need for improved flexibility of production processes and studied in World Class Manufacturing (WCM) (refer Section 2.4.4), production lines are increasingly required to produce different products on the same production line. Colledani, Matta and Tolio (2005) presented an analytical method for the performance evaluation of a production line with finite buffer capacity, multiple nodes and multiple part types. In this study, the main experiment was carried out at a production plant with multiple product types to prove the free-time concept given this challenge.

2.2.10 Buffer allocation

In serially coupled manufacturing, the optimised allocation of buffer capacity has been studied extensively. Levantesi, Matta and Tolio (2001) published the development of a new algorithm for buffer allocation in production lines. The algorithm works on an iterative scheme that manipulates the buffer capacity until the target production rate is reached. This algorithm can therefore not be applied to coupled processes with defined finite buffer sizes.

2.2.11 Excess capacity and idle time

Bernhard (2014) described idle time as the most obvious forms of wasted capacity. He further explained that idle time happens for two reasons:

i) Every resource, which is not the bottleneck normally, has some excess capacity compared to the bottleneck. This excess time is called idle time.

ii) If there is a constraint on a demand, even the bottleneck could have some idle time.

Bernhard (2014) proposed two solutions to the problem: line balancing and scaling up production. The solution in both these methods involves adjustment of velocity to optimise the production process. Again, the relevance of the bowl phenomenon is neglected. Many coupled production processes are set up with fixed machine velocities.

2.2.12 Maintenance opportunity windows

Chang, Ni, Bandyopadhyay, Biller and Xiao (2007) defined maintenance opportunity windows (MOWs) as hidden opportunities for maintenance during production time while the production continuity is still guaranteed. In their work, they predicted passive maintenance opportunity windows (PMOWs) that can be estimated from a machine's blockage and starvation that is induced by the propagation of the downtime of other machines in the system. In their technique, only the stochastic random failures are propagated to predict the resulting passive maintenance.

2.2.13 Critical downtime

Critical downtime is defined by Chang *et al.* (2007) as the maximum time that one machine can be down without making the bottleneck machine idle. In their model, they always assume the bottleneck is the slowest machine on the production line and that travelling time through the buffers is negligible.

In practice, the bottleneck machine moves around the production line resulting from unpredictable failures on the production machines. The lack of practical case studies is evident in the literature.

2.2.13 Case studies

In the review by Kobbacy and Murthy (2008: 283) it was shown that case studies are not represented very well in this field: "This is surprising, since maintenance is something which should be done in practice and not in theory. In our opinion, many models are just (mathematical) extensions of existing models and most of the times models are not validated empirically. Case-studies can lead to new models, both in the context of cost structures and dependencies between components."

2.3 PRODUCTION LINE MODELS

Dallery and Gershwin (1992) discussed production line models as well as their features in detail. A detailed and exhaustive review of these topics in literature can be found in the work of Gershwin and Goldis (1995).

Substantial research has been done on production line evaluation and optimisation by Koenigsberg (1959), Buxey, Slack and Wild (1973), Buzacott and Hanifin (1978), Papadopoulos and Heavey (1996), Buzacott and Shanthikumar (1993), Gershwin (1994) and Altiok (1997). Exact solutions for two machine lines and approximate approaches for longer lines have been evaluated. To analyse the performance of longer lines, various decomposition and aggregation methods have been proposed to approximate the system throughput (see, for instance, Buzacott, 1967; 1971; Gershwin, 1987; De Koster, 1987; Dallery, David & Xie, 1988; Lim, Meerkov & Top, 1990; Jacobs & Meerkov, 1995; Chiang, Kuo & Meerkov, 2000; 2001; Le Bihan & Dallery, 2000; Li & Meerkov, 2003).

Analysing long lines are usually done through decomposition to simplify the resulting algorithms. In solving the free-time problem and answering the research questions, the whole line must be observed in its transient state without decomposition.

2.4 PRODUCTION PROCESS IMPROVEMENT TOOLS

2.4.1 Just in Time

The Just in Time (JIT) principle coined by Toyota in the late 1970s has a different problem when we attempt to apply the principle to improve performance in already installed coupled manufacturing processes.

Generally, the time a product takes to travel from one operation to the next is determined by the size and type of the buffer. Conveyor systems require a product to be transported over long distances due to the buffer times designed to protect the key production machine. This design philosophy does not allow a product to arrive just in time, but rather after it has travelled a compulsory route through the accumulator.

However, the Just in Time concept of manufacturing is used by other manufacturers because of its ease of implementation. This principle was introduced by Japanese manufacturing companies to remove processes that are time-consuming for the workers and continuously improve production (Jozefowska, 2007). Among these sources of wastage are overproduction and excessive waiting time. This exhausts the resources of the company without giving future returns. This concept can be implemented fully in organisations through scheduling of production or by means of the reduction of costs (Jozefowska, 2007). Although the main aim of this manufacturing concept is to make sure that production and customer needs are met on a timely basis, while directly linking the demands of the customers to the number of finished goods in one production run, this concept tries to schedule the production algorithm to create practical solutions within the overall production series already existing in the company.

This philosophy is applicable to an organisation that has readily available access to the level of supply and demand of the product. Because the level of production is dependent on the demand of the market, information regarding the estimated number of produced goods should be generated before the production run is started. With this type of system illustrated in Figure 2.4, inventories are minimised and production runs are well structured to fit the needs of end users. Although this system limits costs in production, it also leads to irregular operations for the company. The workers' jobs depend entirely on the level of need of the buyers; therefore, their time in operating the equipment under their function is varied.

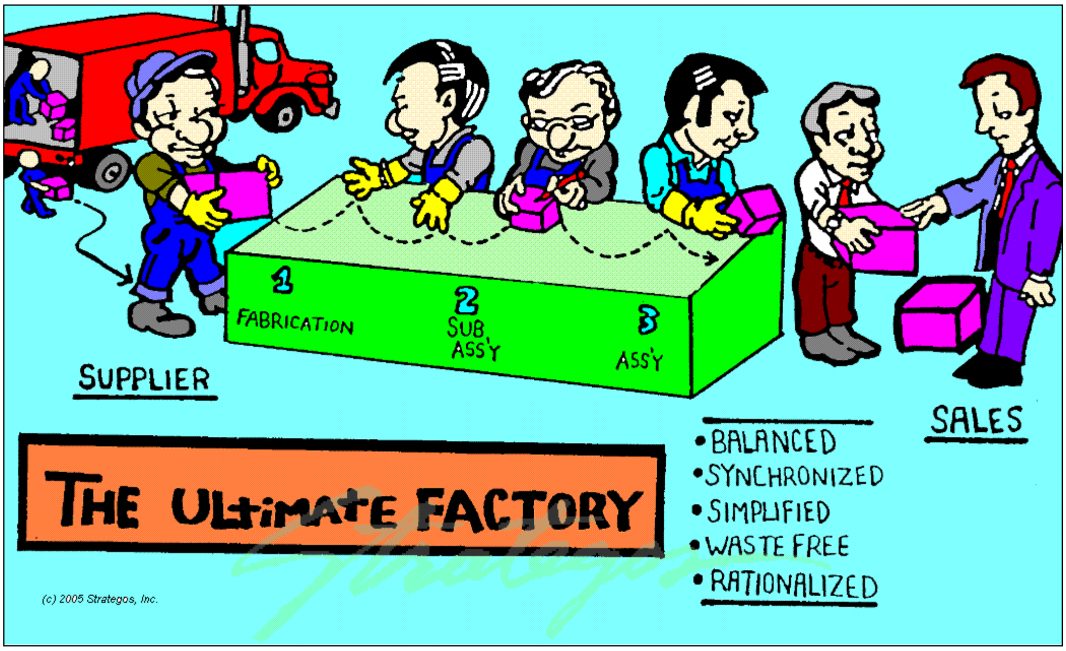


Figure 2.4: An illustration of Just in Time

Source with permission: Strategos, 2015.

2.4.2 Kanban

Toyota collaborated with Taiichi Ohno to develop core concepts of production that later became known as "the Toyota way" and one of the most popular systems introduced is the Kanban system (Ohno, 1988). Kanban is a system of labelling parts used on assembly lines as illustrated in Figure 2.5.

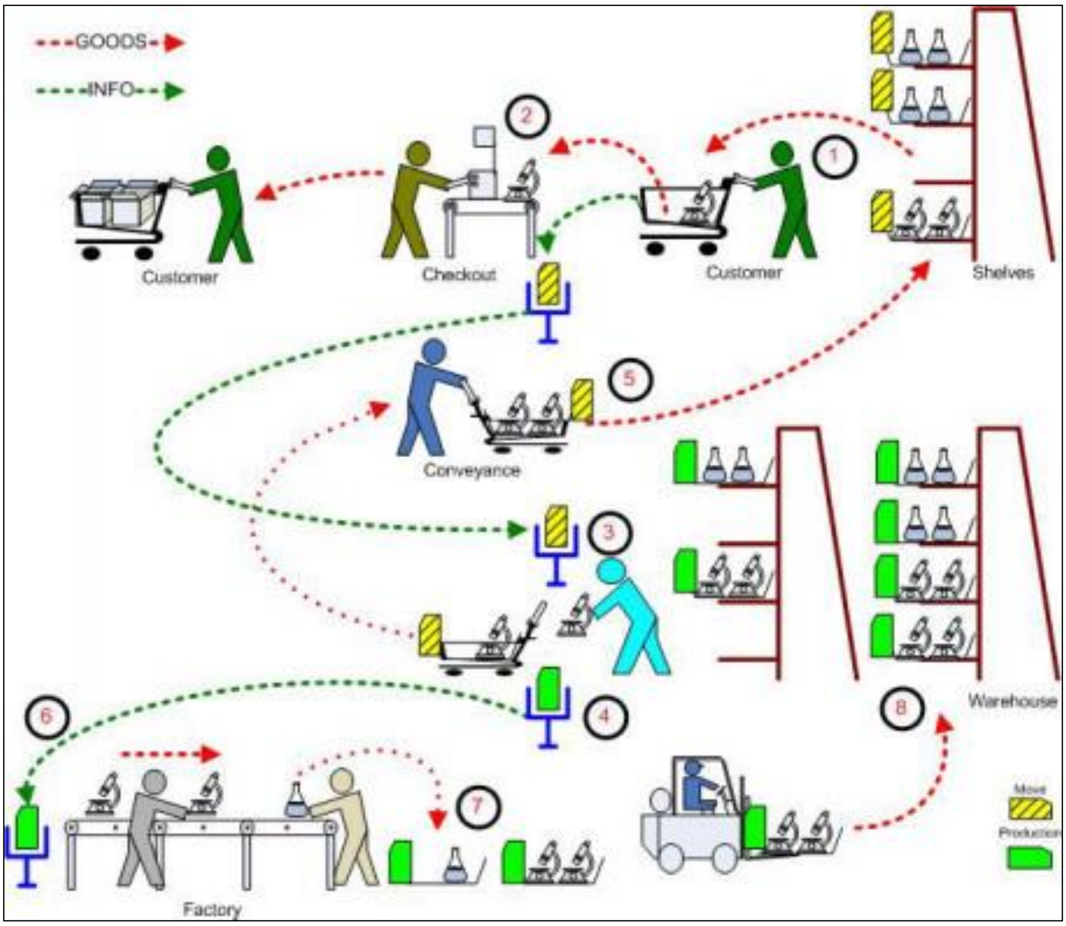


Figure 2.5: Kanban system product and information flow illustration

Source: The Lean Man, 2015.

This system requires inventory to be called in a 'pull' system through the production process, to minimise inventory in the accumulation zones. In the case of coupled manufacturing processes, the inventory cannot be held back until required; it simply continues to travel through the buffer to the next station. When the coupled manufacturing line is designed with a V-profile, the system by default operates in a push system for all machines before the bottleneck and in a pull system after the bottleneck. We can therefore not reduce inventory with the use of Kanban for optimising a modern coupled production process.

2.4.3 The Theory of Constraints

In the literature, the TOC has been used in many combinations (Mabin & Balderstone, 2000). However, in a book *The Goal* by Goldratt and Cox (2004), the basic TOC was again defined in five focus steps:

i) Identify the system's constraints;

ii) Decide how to exploit the system's constraints;

iii) Subordinate everything else to the above decisions;

iv) Elevate the system's constraints;

v) If a constraint is broken, go back to step 1.

In every organisation, it is normal to encounter constraints that restrict a system from reaching its maximum production. To counter sub-optimal production rates, the overall system of an organisation should be reorganised. Scientists call this process of isolating constraints and synchronising the series of production stations into a better system, the Theory of Constraints (Arora, 2004).

For systems that utilise series of stations in their production run, the manner of resolving constraints must be planned in a consecutive manner in association to the cause and effects of these constraints to every station connected to each other. Since the stations depend on each other to finish one production run, the elimination of some constraints may lead to the overwork of other equipment, especially if the lag time that is perceived by the management as a constraint is the needed time to set up the next machine to be used. Figure 2.6 points out the constraint of a typical system.

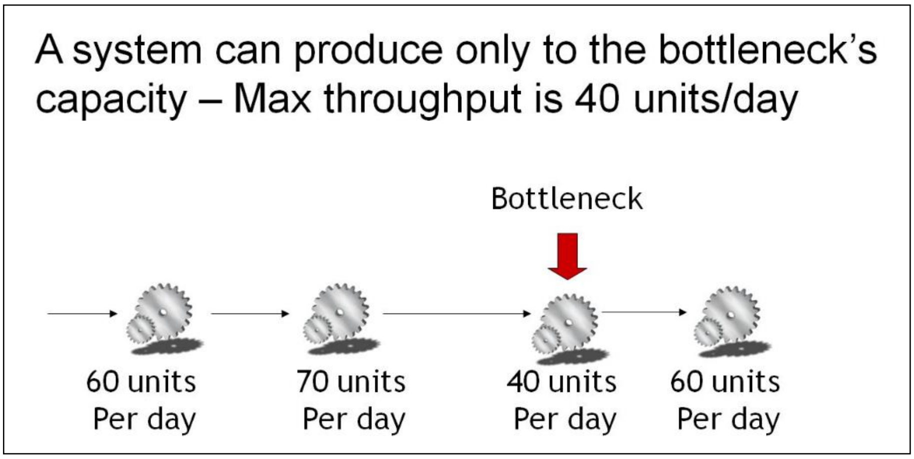


Figure 2.6 The Theory of Constraints focuses only on the bottleneck

Source: Atreya, 2014.

The Theory of Constraints deals exclusively with the bottleneck in a serial process and does not evaluate the non-constraint, as is the topic of this research study. Research on using the non-constraint of existing installations is non-existent.

2.4.4 World Class Manufacturing

The concept of World Class Manufacturing (WCM) was developed in the nineties. Companies realised that current methods of measuring the performance of manufacturing organisations were no longer sufficient. It therefore became necessary to develop a new concept that would allow for benchmarking on the global stage.

World Class Manufacturing is generally defined as follows: It means matching or exceeding any competitor on quality, lead time, flexibility, cost/price, customer service and innovation (Schonberger, 1996)

Optimising the manufacturing line and improving the efficiency can improve product quality by reducing blocking and starvation as these states create product contact and scuffing. Lead-time is also improved by improving efficiency as the average throughput time for product moving through the coupled production line is improved (Shi, 2012). This proved that by improving the buffer design in a coupled manufacturing and using free time, the cost/price of the product can be reduced.

This also led to the conclusion that companies are becoming more competitive, not only in their gross profits but also in the effective use of their time. Studies showed that the output per hour of labourers in the United States' manufacturing industry increased by 1.1 per cent in 2013 (US Bureau of Labor Statistics, 2014). Although not all industries had increased profits throughout the year, the level of productivity of workers in the manufacturing industry increased. This shows the conscious efforts of companies to increase their advantage against other organisations by pushing their labourers to achieve higher production given the same number of work hours. From 1987 to 2011, outputs per hour in the manufacturing industry had grown the most in the computer and electronic products sector, i.e. by 18.4 per cent (US Bureau of Labor Statistics, 2014).

In order to meet the standards of World Class Manufacturing, different production strategies such as Total Quality Management (TQM), re-engineering, activity-based costing and lean manufacturing were introduced in the manufacturing process of organisations (Schonberger, 1996). Companies use these concepts in order to minimise costs in production, while fully maximising the profits that can be earned from every production run. Aside from allotted break periods in the workplace, scrap, breakdowns and rework of products are normal parts of every manufacturing process (Chiu, Wang & Chiu, 2007).

Given these times that workers are not productive, the company's resources are being exhausted without reaching the expected profits. In order to be globally competitive, companies should develop total quality control, not only on the products made available to the market, but also on the manufacturing process itself (Sharma, Kumar & Kumar, 2006).

2.5 SUMMARY

In this chapter, research of literature on the coupled manufacturing line was presented. The bowl phenomenon was identified as a successful method to deal with variability in the case where finite buffers are present and was identified as a subject of potential further investigation. The opportunity for improving production throughput could lie in new methods using the bowl phenomenon as point of departure.

Other distinct aspects of coupled manufacturing were researched, such as variable throughput, paralleled machines and the manufacturing of different products, as all these are relevant in the context of this study.

Maintenance opportunity windows and critical downtime were researched and it was found that these techniques are designed to describe how the maintenance window can be predicted following the use of a technique where the failure has propagated to the bottleneck machine. A discussion on excess built-in capacity as a source of free time could not be found in the available literature.

In all cases, the models referenced dealt with optimisation of the process by keeping some parameters constant, while changing one or more parameters to optimise. In most cases, either the velocity of machines was adjusted or buffer sizes were varied to optimise the coupled process. No evidence of research was found that studied existing overdesigned infrastructure.

World Class Manufacturing (WCM) was introduced as the international way of benchmarking best practice in manufacturing. Kanban, Just in Time and the Theory of Constraints were referenced and their relevance to this study was highlighted.

Another area of potential similarities to the free-time concept is Queueing Theory and the Theory of Constraints. In the next chapter, the concept of free time is compared to Queueing Theory and the Theory of Constraints.

CHAPTER 3

THE FREE-TIME CONCEPT, QUEUEING THEORY AND THEORY OF CONSTRAINTS

3.1 INTRODUCTION

Two theories that have been well studied, that relate to the concept of time and throughput in a linear manufacturing setup, are Queueing Theory and the Theory of Constraints (TOC). The research question from Chapter 1, 'How can one calculate useful idle time or free time in a coupled production process?' might very well find some answers or clues to answers in these two theories.

In this chapter, the concept of free time is compared to Queueing Theory and the TOC. The theories are defined and explained together with a method used in implementing a typical solution. Differences and touch points with the free-time concept are highlighted.

Finally, dynamic and static free time are defined and illustrated by way of adding idle time under the V-profile graph.

3.2 QUEUEING THEORY

Queueing Theory deals with the phenomenon of waiting. Waiting effects occur when the product flow in a production process is asynchronous. This happens when the need for capacity from the predecessor station and the availability of capacity after the work has been completed are not coordinated in time.

Queueing Theory is a branch of applied mathematics that uses powerful mathematical analysis to describe the waiting effect. It involves the simulation and study of complex models to predict the behaviour of a production process where the processing times at a station is stochastic in nature. When looking at a production process, the processing times at a machine can be stochastic due to manual operations at a machine, if machine failure occurs, if a machine is starved or blocked.

The need for an analytical model to quantify waiting times in a production process arose from this random nature of a production process. The first problems with Queueing Theory arose in a call centre and Erlang (1909) was the first to deal with these congestion problems. He inspired many engineers and mathematicians to develop probability models to solve queueing problems.

Many production processes can be modelled as a network of queues, which makes the Queueing Theory relevant in the design of a production process. If a production process is built with a too small queueing capacity, it could risk the production process failing due to the process underperforming and not reaching the desired throughput.

Several Queueing Theory models can be solved for a manufacturing system to analyse the process's performance. The oldest and most famous model is the M/M//n/n queue which was developed by Erlang.

3.2.1 Definition

Queueing Theory is a mathematical method of analysing the congestions and delays of waiting in line. Queueing Theory examines every component of waiting in line to be served, including the arrival process, service process, number of servers, number of system places and the number of 'customers' (which might be people, data packets, cars, etc.). Real-life applications of Queueing Theory include providing faster customer service, improving traffic flow, shipping orders efficiently from a warehouse and designing telecommunication systems such as call centres. Queueing Theory is used to develop more efficient queueing systems that reduce customer wait times and increase the number of customers who can be served.

3.2.2 Kendall's notation

With so many Queueing Theory models created, Kendall derived a notation by which all Queueing Theory models can be described (Kendall, Stuart, Ord, Arnold and O'Hagan, 1994). The system is denoted by:

$$A / B / m / K / n / D \qquad \text{...(3.1)}$$

where:

A – distribution function for the inter-arrival times

B – distribution of the service times

m – number of servers

K – capacity of the system

n – number of sources of customers

D – service discipline

The inter-arrival times refer to the source of customers and at what rate they enter the system. The service times are the time it takes a server to help a customer. The capacity of the system is the sum of the customers in the system being serviced and waiting to be serviced. The service discipline can be either of the following:

- FIFO – first in first out;
- LIFO – last in first out;
- RS – randomly selected; or
- Priority.

3.2.3 Prominent Queueing Theory models

There are many Queueing Theory models available to solve for complex production processes, but this section only mentions the most popular models for coupled production processes. There are two types of queueing models: finite-source and infinite-source models. Finite-source models are more complicated, because the customer arrival intensity depends on the state of the system. For infinite-source models, this is not the case, which makes these models easier to deal with.

3.2.4 M/M/1

The M/M/1 queue system is the simplest queueing system and is an infinite-source queueing system. The 'M' in Kendall's notation stands for Markovian or Memory less, which means that these elements are not dependent on any other factors and are exponentially, distributed random variables. For the M/M/1 queue system, the customers arrive according to a Poison process. The service times are assumed to be the same (following a Poison process). The other random variables involved are also supposed to be independent of each other. The G/G/1/N queue system is similar, except that the 'G' in Kendall's notation stands for general. This means that the service times at servers are known for certain jobs (Kendall *et al*., 1994).

3.2.5 M/M/n/n Erlang-Loss queue system

This is the oldest and most famous queue system and is an infinite-source queue system. This was the first of the queue theories that Erlang obtained while working on traffic and congestion problems in a call centre. The M/M/n/n queue system also assumes Poison customer arrival times and Poison service times, but what makes it unique, is that a customer cannot enter the system when all the servers are busy. This frequently happens in a call centre; a customer cannot enter the system if all the operators are busy helping customers who came before him. The most important result of this model is the number of customers lost.

3.2.6 Method to solving a Queueing Theory model

Although each Queueing Theory model has its own algorithm to follow in order to arrive at an optimal solution, the methodology stays the same. The steps to applying a Queueing Theory model are as follows:

i) Select a manufacturing process with waiting effects to study. This is an obvious statement, but Queueing Theory is only applicable if there are queues.

ii) Collect data for each node where work is done. The scope is: Customers' arrival times; customers' leave times; number of operators at a node; and throughput rate at a node.

iii) Analyse the data for the arrival and exit times to determine their distribution. This distribution can determine which Queueing Theory model should be used e.g. Exponential or Poison distribution model.

iv) Use Queueing Theory models to calculate each workstation's performance. The following values are important in this case: The number of customers in the system; the number of customers in the queue; waiting time spent in the system; waiting time spent in the queue; task times; workstation idle time; and utilisation factor.

v) Use the information gathered in point (i) to calculate the workstation's efficiency. Also, compare the throughput rates with the theoretical rates of the manufacturing process.

vi) Use Queueing Theory models in point (iii) to optimise the system's performance and propose a new method of utilising the manufacturing system.

3.3 THE THEORY OF CONSTRAINTS

The Theory of Constraints (TOC) is a rapidly-growing management philosophy that was first introduced by Dr. Eliyahu Goldratt in 1986. The principle on which the Theory of Constraints is based is that the goal of any business or process is to "make money, now as well as in the future" (Goldratt, 2004: 40). Any business' capacity to make profit is determined by its constraints. The Theory of Constraints suggests that a company should focus on its constraints in order to increase its profit-making potential. Similarly a production process should focus on its constraints to improve efficiency and thus productivity.

The Theory of Constraints also states that a business or process must have a constraint; otherwise it can achieve infinite production. The Theory of Constraints attempts to identify the constraint of the system and then proceeds to focus all the resources available on the constraint in order to increase productivity. The constraint is then elevated until it becomes a non-constraint, while another element of the business or process becomes the new constraint. The new constraint can appear anywhere in the business or process. If effort is made to improve non-constraints in the business, resources are effectively wasted. This is why it is necessary for a business or process to know where its constraint is and to know when the constraint moves.

3.3.1 Definition

The Theory of Constraints is a management paradigm that attempts to increase the productivity of a business or process by focusing on increasing the throughput of the constraint of the business. The constraint is the part of the business or process that limits throughput due to underperforming. Five focusing steps are used to standardise and structure the approach to addressing the constraint.

3.3.2 The five focusing steps

Although the Theory of Constraints appear to be logical and simple, it is far from simplistic. According to Goldratt and Cox (2004), before the constraint can be identified, the following two prerequisites must be met: (i) The goal of the process must be known; and (ii) a method of measuring the process goal must be in place.

The Theory of Constraints suggests a five-step systematic decision-making process to ensure that a business is constantly improving (referred to in Section 2.4.3):

i) Identify the system's constraints;
ii) Decide how to exploit the system's constraints;
iii) Subordinate everything else to the above decisions;
iv) Elevate the system's constraints;
v) If a constraint is broken, go back to step 1.

3.3.2.1 Identify the constraint

The constraint of a business or process is defined as what is keeping the business or process from reaching infinite production. For a coupled production process, it will be the bottleneck machine. The current constraint machine (CCM) moves around the production process following the stochastic nature of failures and the associated performance unreliability of machines.

According to Goldratt and Cox (2004), the constraint can be located at the following three places: (i) there could not be enough sales to the market; (ii) there could be insufficient capacity for production; or (iii) not enough resources or materials for production.

For a coupled process, the constraint is found in one of two places: (i) the designed constraint, which is normally the slowest and most critical part of the process that needs protection against the influence of other machine failures; or (ii) at an unreliable machine currently demonstrating poor efficiency performance.

3.3.2.2 Exploit the constraint

Now that the constraint has been identified as the limiting factor of the business or process, improvement can be made to the total throughput of the business or process. The question that Goldratt and Cox (2004) asked is: How should the constraint change in order to improve total throughput?

Organisations exploit the constraint by utilising every bit of the constraining component without committing to potentially expensive changes and/or upgrades.

A business or process can only have one constraint at a time; either located internally or externally. An example of an external constraint is the market. The strategy to handle this constraint should then suggest something in the line of more advertising that should be done, higher quality product should be made or client relationships should be strengthened. The business should then focus its available resources towards the strategy.

3.3.2.3 Subordinate everything else

In this step, the organisation adjusts the rest of the business or process to enable the constraint to operate at maximum effectiveness.

The constraint, for example, should not stop due to a lack of inventory. For this reason, buffers are put in place to store and release inventory as needed. In this way, other processes are made subordinate to the constraint.

Goldratt and Cox (2004) used the analogy of a group of children walking in line; some walking faster and some walking slower. He tied the fastest child to the slowest child with a rope so that the fastest child does not run out in front and the slowest child does not fall behind. In this way all other processes maintain the pace of the constraint and are therefore subordinate to the constraint.

The method used to ensure all other machines are by default subordinate to the constraint in a coupled production process, is to design the throughput of the other machines using the V-profile design technique. This ensures that by design all other machines are protecting the constraint of the key machine in the case of a production process.

3.3.2.4 Elevate the constraint

The first three steps represent the Theory of Constraints' approach to maximising the throughput of the constraint. Focus now moves to increasing the constraint's throughput. The Theory of Constraints suggests putting effort into improving the constraint's performance, for example, if the constraint is a certain resource, then effort should be made in acquiring more of that resource. At this point, the organisation elevates the constraint by taking whatever action needed to eliminate it. The result should be that the current constraint is no longer the constraint and a new constraint emerges. The five focusing steps according to Goldratt should be re-evaluated.

3.3.2.5 Go back to Step 1

In paragraph 3.3.2.4, the constraint is elevated to non-constraint status. When the constraint shifts without the business knowing, effort and time will be wasted by continuing to work on a non-constraint. The Theory of Constraints, therefore, suggests that the inertia of improving the constraint should not become a business or process constraint in itself. When a constraint is fixed, go back to step 1 immediately to find the new constraint. At the same time, the organisation needs to monitor how the changes related to subsequent constraints impact the already improved constraints.

3.4 THE FREE-TIME CONCEPT

Queueing Theory and the Theory of Constraints are business tools for design engineers and managers that are used to optimise the flow of people and goods and improve efficiency by focusing on the constraint. These theories assist in optimising the layout and design of workflow systems. The Theory of Constraints goes further and continues to improve a system with repeated management input. Typically, supervisors, middle and senior management use these tools.

There are very few tools available for the shop floor operators to improve their performance in real time. Tools used by production operators are usually reactive in nature, such as quick-fix routines, end-state defect analysis and quality checks. The free-time concept includes a maintenance opportunity window that assists the production operator to act proactively, by making transparent available free time in transient states of the system.

Shop floor operators working on a coupled manufacturing process are in most cases unaware of where the current constraint or bottleneck is. This is a result of the dynamic nature of coupled systems, line of sight challenges and unskilled operators. The free-time concept aims at identifying the current bottleneck on a continuous basis and clearly pointing out to operators where and who the constraint is. This implies transient real-time transparency to capitalise on maintenance opportunity windows.

The free-time concept gives the operator more information on where the constraint is so that his decision-making can be improved in real time. The free-time concept also gives managers and supervisors more information about each machine’s free-time usage. This information can be used to manage underperforming workers.

The concept continuously makes use of calculations to determine how much time a machine has available before becoming the constraint. Where Queueing Theory is a once-off exercise to optimise a system, the free-time concept continuously works and calculates the current situation and sheds light on how to improve the process in real time.

3.4.1 Definition

The free-time concept is a way of continuously calculating and signalling free time at points of interest along a serially coupled production system. The free-time concept points out the effect that installed over-capacity has on the requirement of production machines to run. Additional capacity is locked into coupled production systems due to overdesign caused by protecting key processes against starvation and blocking. Real-life applications of free time include calculating free time in bottling lines, highly automated assembly processes, refineries and other continuous chemical processes to improve overall efficiency of the production process. The free-time concept is used to exploit current production installations by allowing operators to do tasks such as minor opportunistic maintenance, cleaning, inspection and adjustment during normal production runs.

3.4.2 Method to implement a free-time use solution

The steps to applying a free-time use solution are as follows:

i) Select an installed and already-producing coupled manufacturing process with finite buffers, a designed constraint and unbalance in a V-profile around the constraint.

ii) Collect live counting data from each point of interest where work is done. Determine the maximum accumulator capacity between the points of interest.

iii) Use the live count at each point of interest to calculate the throughput rate at each point of interest, in real time.

iv) Determine, using iteration or fixed line logic, the prime quantity for accumulators upstream from the key machine and clear quantity for accumulators downstream from the key machine.

v) Use free-time formulae to calculate the live free time at every point of interest.

vi) Display/present the free time live at every point of interest.

vii) Identify free-time opportunistic preventative maintenance, cleaning and inspection tasks that can be performed at each point of interest during maintenance opportunity windows. Continue to perform these free-time tasks at every opportunity so as to improve the overall efficiency of the process. Tasks that are carried out in free time will not have to be carried out at a later stage, when it could be less opportune to do so.

3.4.3 Application of the free-time concept

The free-time concept is well suited to improve production efficiency in large fully-automated processes with limited but necessary operator involvement. The concept works best where excess capacity due to over engineering is abundant. Free time is generated in two ways: (i) over speed of the feed and discharge machines due to the bowl phenomenon design; and (ii) breakdowns at the bottleneck machine. Over speed or excess capacity free time is defined as dynamic free time (DFT); and free time generated by breakdowns in the bottleneck or key machine is defined as static free time (SFT). The next section illustrates the two types of free time in an example with five machines.

3.4.3.1 Dynamic free time (DFT)

The word ‘dynamic’ means changing with respect to time. The constraint is moving around the production process and does not always remain where it was designed to be. Dynamic free time is the free time a machine has, due to the state of the accumulators and throughput of the other machines in the production process. A machine can gain dynamic free time if it is performing faster than its calculated steady state and it will lose free time if it is underperforming.

Dynamic free time generally becomes available at machines that have higher speeds than the drum machine. This type of free time is available when machines feeding and those drawing from the drum machine can run faster than the drum machine. Faster machines have to wait for slower machines because they are connected in a coupled manufacturing system. Using our 5-machine model from

Figure 3.1, we assign throughput speeds, calculate the over speed factor and in the last column the total dynamic free time per machine in an eight-hour shift.

Table 3.1: Dynamic free time hours generated per eight-hour shift due to over speed

Machine number	Throughput speed (units per hour)	Over speed factor relative to M3	Free time in an 8-hour day (hrs.)
M1	52 000	$\frac{52,000 - 40,000}{40,000}$	2.4
M2	48 000	$\frac{48,000 - 40,000}{40,000}$	1.6
M3	40 000	$\frac{40,000 - 40,000}{40,000}$	0
M4	48 000	$\frac{48,000 - 40,000}{40,000}$	1.6
M5	52 000	$\frac{52,000 - 40,000}{40,000}$	2.4

Figure 3.1 plotted the rates throughput on the Y-axis and the machines on the X-axis. The DFT is presented is the area under the V-profile. Each machine has free time independently from the other. Four different operators can use these times concurrently.

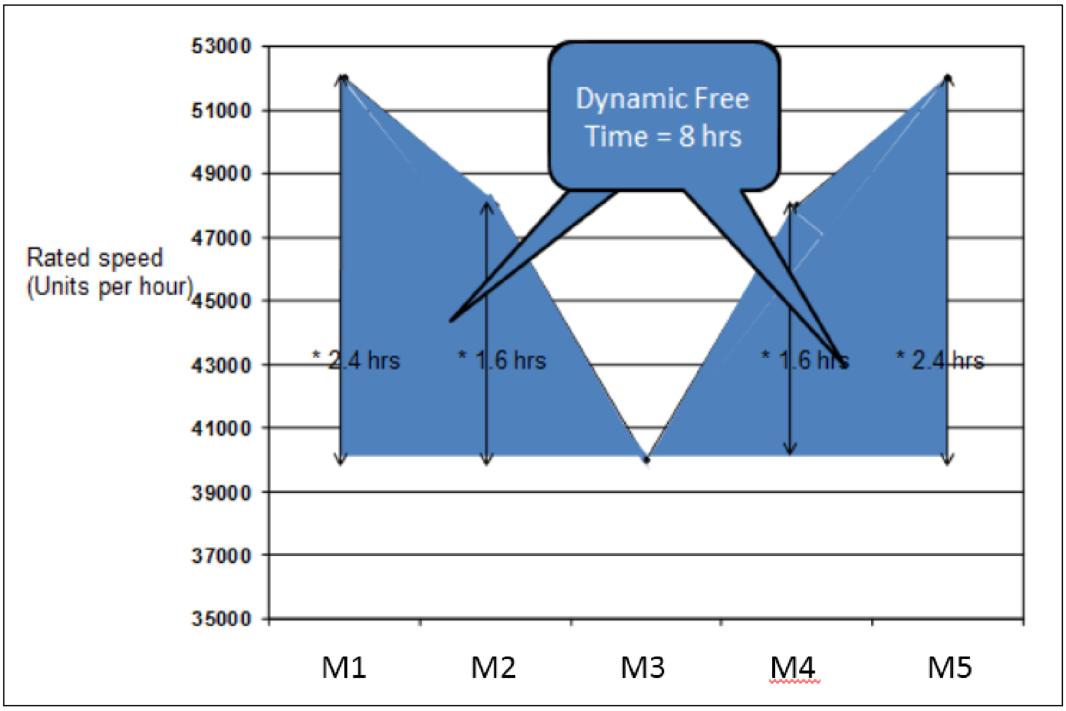


Figure 3.1: Dynamic free time (DFT)

Source: Researcher's own illustration.

We can thus add the total free time for an eight-hour shift as follows:

Total DFT $= FT_{M1} + FT_{M2} + FT_{M3} + FT_{M4} + FT_{M5}$ ...(3.2)

$= 2.4 + 1.6 + 0 + 1.6 + 2.4$

$= 8$ hours

This means that there are eight hours of free time that can be utilised by the operators of M_1, M_2, M_4 and M_5 during a shift where the key machine runs at 100 per cent efficiency.

3.4.3.2 Static free time (SFT)

Static free time (SFT), also known as breakdown free time (BDFT), is the free time that all the other machines get when the bottleneck machine breaks down. The free-time concept relies here on human intervention to obtain the maximum benefit. An operator would estimate the downtime at the bottleneck machine when the machine breaks down. This downtime information then must be shared live with all the other operators in the coupled process. The other operators can then use the breakdown free time to perform opportunistic preventative maintenance.

BDFT normally becomes available from unreliability at M_3 (the bottleneck). The bottleneck is usually at the key machine, but any other machine can become the bottleneck if it becomes more unreliable than the key machine.

In the example illustrated in Figure 3.2, the key machine M_3 experienced a combined total of one-hour stoppages during the eight-hour shift. This equates to finally achieving 87.5 per cent efficiency for the shift. The total free time available at all the other machines due to the one-hour stoppage at the key machine M_3 equates to five hours of static free time.

Total free time = DFT + BDFT ...(3.3)

= 8 + 5

= 13 hrs.

The total free time resulting from DFT and BDFT is 8 hours + 5 hours = 13 hours of free time during an eight-hour shift.

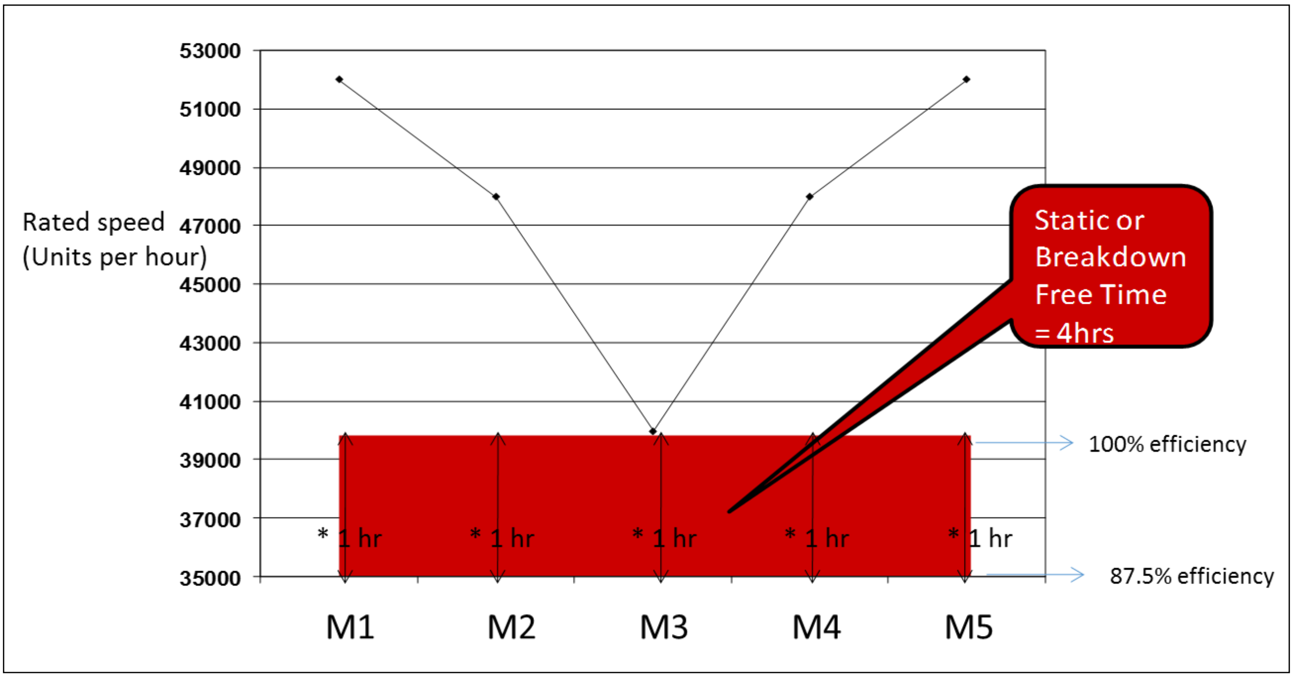


Figure 3.2: Static or breakdown free time (BDFT)

Source: Researcher's own illustration.

Accurate estimation of BDFT by the operator facing the breakdown situation is important. Over-estimations of BDFT, causes overall loss in line efficiency due to other production machines becoming an unnecessary self-created constraint when those operators have already started doing opportunistic maintenance, cleaning and inspection.

3.5 SUMMARY

The purpose and practical applications of the free-time concept, Queueing Theory and the Theory of Constraints differ significantly.

Queueing Theory solves mathematical equations in order to calculate the optimum capacity of a system. Queueing Theory for production processes is used for designing optimum systems given a set of assumptions. Design engineers make decisions regarding the optimal size of buffers using the solution of these equations.

The Theory of Constraints is a management paradigm that promotes the continuous improvement of a system. The Theory of Constraints places emphasis on the constraint and encourages management to spend all of its resources to improve the constraint. The Theory of Constraints supplies a strategy for improvement, which requires planning. The Theory of Constraints is well suited for systems that have already been commissioned and is not normally applied in a system during the design stages.

The free-time concept focuses on the non-constraints of the production process and attempts to assist the operators with improving production efficiency in real time. The free-time concept is aimed at improving the efficiency of an existing coupled manufacturing system. The concept identifies and quantifies the non-constraint free time to assist operators in making better decisions. For the application of free time, dynamic and static free time were defined and illustrated by means of an example.

In the next chapter, the conceptual model for the free-time concept is developed.

CHAPTER 4

DEVELOPMENT OF THE CONCEPTUAL MODEL FOR FREE-TIME CALCULATIONS

4.1 INTRODUCTION

In this chapter, the conceptual model and definitions necessary to illustrate the free-time concept are developed. Five different machine types and six production line states are defined and illustrated. Other principles required, for the model to calculate free time, are developed. Two key levels in the accumulator, the prime quantity and clear quantity, are defined and illustrated. To assist with identifying the current line state, accumulator states and stages are defined. The importance of accurate accumulator levels are emphasised and a reset strategy used later during the experiment at the Valpré plant is described using the accumulator stages developed here. Two throughput rates are defined, i.e., the current throughput rate (CTR) and the historic throughput rate (HTR). From these throughput rates, the relevant throughput rate (RTR), used in all free-time calculations, is formulated. Refer to Appendix A for a full list of definitions used in this dissertation.

4.2 TYPICAL PRODUCTION PROCESS

A coupled production process in Figure 4.1 is modelled as a set of pumps in series with liquid tanks in between to represent the accumulators typical of finite buffer production processes.

In this model pumps M1 to M5 are representing five production machines and buffer tanks A1 to A4, four accumulators between the production machines. For this model, we assume there is infinite buffer storage before M1, and there is infinite buffer storage after the M5. The fastest machines are M1 and M5, and the slowest machine is M3.

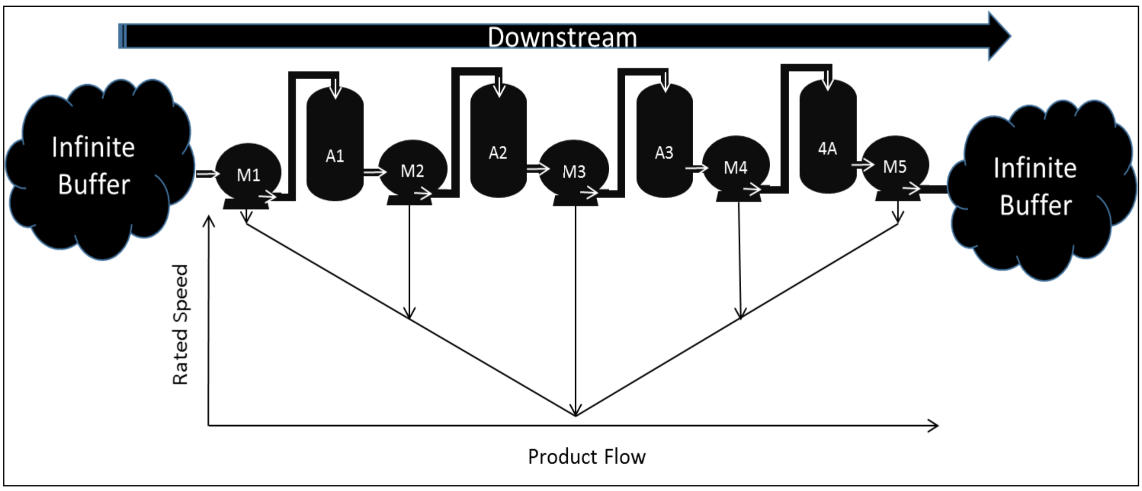


Figure 4.1: Model of a production process depicted as pumps and accumulator vessels

Source: Researcher's own illustration.

4.3 MACHINE TYPES

4.3.1 Overview

A V-profile is also exhibited in Figure 4.1 below the pumps and accumulators. The machine types are defined as a function of the relative speeds of the machines before and after the machine and in combination with where the machine is situated in the production process.

4.3.2 Type-1 machine

A type-1 machine is the machine that starts the process (see Figure 4.2). It has an infinite buffer on its inbound side and a finite buffer on its discharge. Its normal throughput rate is faster than its downstream machine M2. During normal running and no stoppages, the accumulator A1 should gradually fill due to the faster throughput of M1.

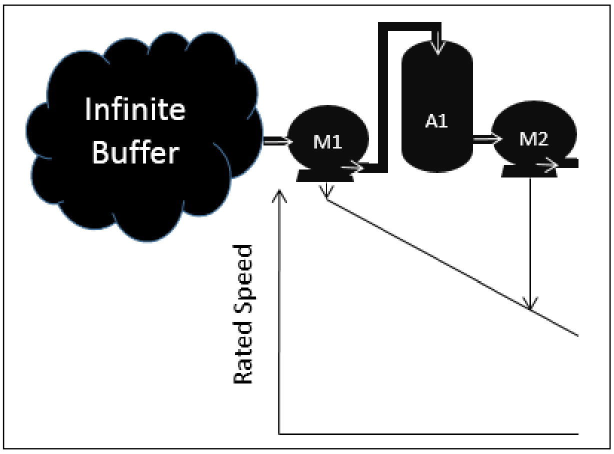


Figure 4.2: Type-1 machine

Source: Researcher's own illustration.

4.3.3 Type-2 machine

A type-2 machine is the machine on the in-feed side of the key machine (see Figure 4.3). The machine is locked between finite buffers on both sides. The machine upstream from the type-2 machine is faster than the type-2 machine, and the machine downstream from the type-2 machine is slower than the type-2 machine. Under normal running conditions and no stoppages, both these accumulators should fill gradually.

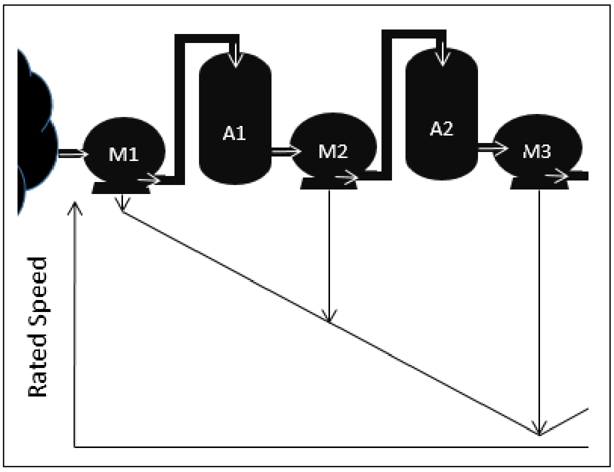


Figure 4.3: Type-2 machine

Source: Researcher's own illustration.

4.3.4 Type-3 machine

A type-3 machine, in a typical V-profile serial process, is the 'bottom of the V-machine', also known as the key machine and is the slowest machine in the process (the bottleneck) (see Figure 4.4). The machine is locked between finite buffers on both sides. Machines both upstream and downstream from the V-machine are faster than the V-machine. Its neighbours, therefore, protect the key machine from build back and blocking by accumulation and having a greater throughput. During normal running conditions and no stoppages, the upstream accumulator should fill gradually and the discharge accumulator will drain gradually to an equilibrium level. This level is determined by the quantity of product carried by the conveyer because of the travel time the product has between the two machines.

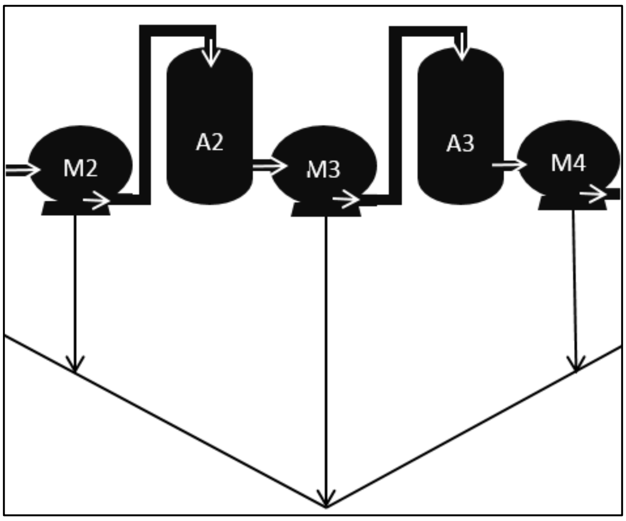


Figure 4.4: Type-3 machine also called the drum machine or key machine

Source: Researcher's own illustration.

4.3.5 Type-4 machine

A type-4 machine is the machine on the discharge side, downstream from the key machine (see Figure 4.5). The machine is locked-in between finite buffers on either side. The type-4 machine is faster than the key-machine but not as fast as the following machine downstream. During steady state conditions and no stoppages, the upstream and downstream accumulators will drain gradually to an equilibrium level. This level is determined by the quantity of product carried by the conveyer because of the travel time the product has between the two machines.

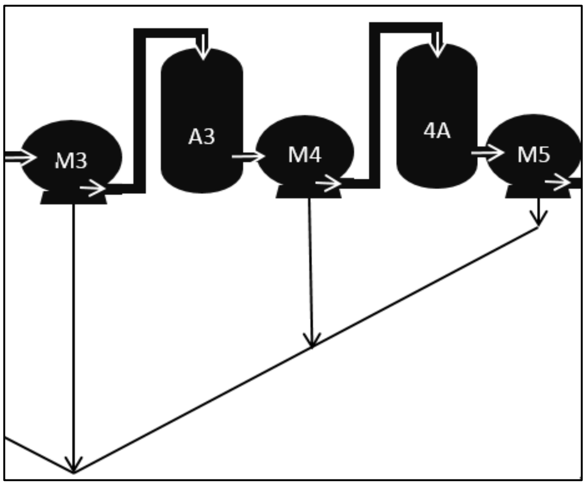


Figure 4.5: Type-4 machine

Source: Researcher's own illustration.

4.3.6 Type-5 machine

A type-5-machine is the machine that ends the process (see Figure 4.6). The machine has a finite buffer on its in-feed side and on its discharge side, is open to an infinite buffer. It is faster than the upstream machine and during normal running with no stoppages, the accumulator A4 should drain gradually to an equilibrium level. This level is also determined by the quantity of product carried by the conveyer because of the travel time the product has between the two machines.

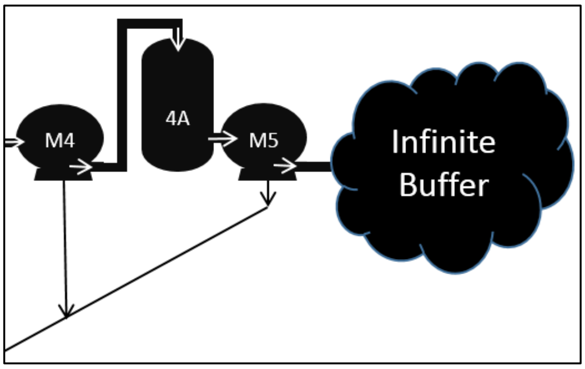


Figure 4.6: Type-5-machine

Source: Researcher's own illustration.

4.4 PRODUCTION PROCESS STATES

With the production machine types defined, the process stages for the conceptual model as explained in Figure 4.1 are now defined and illustrated. Product will starts moving from left to right through Machines 1 to 5. While this is happening, various production process states can be defined. When there is no product in any of the accumulators in the coupled section and no machines are running, the process is in a sleep state. The production process then moves to a start-up state, normal running (with blocking and starving) and then finally to the run-out state. Therefore, a production process can be in only one of the six states, as illustrated in Figure 4.7).

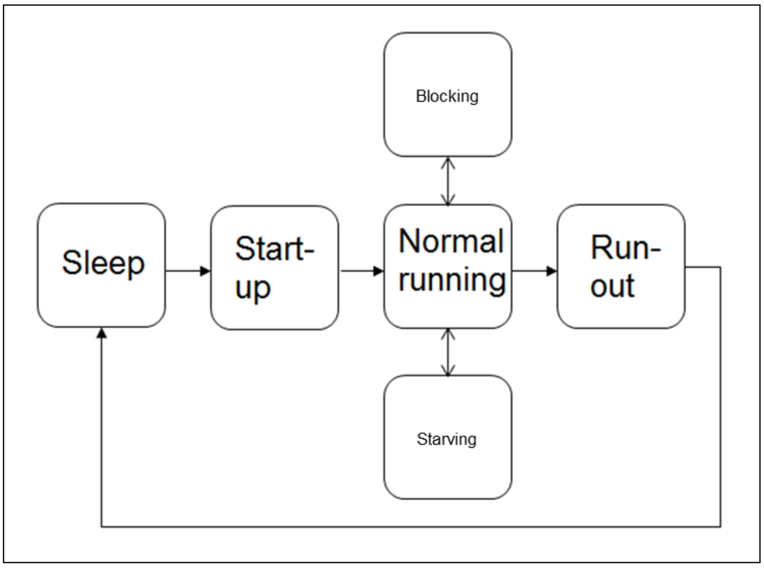


Figure 4.7: The six states of a production process

Source: Researcher's own illustration.

4.4.1 The sleep state

The sleep state is the state in which no production takes place and no production has been taking place for the time-out period. This state follows the run-out state from the previous shift and is always followed by the start-up state.

4.4.2 The start-up state

The start-up state is the state that follows on from the sleep state. A product enters the production process. The product starts filling the accumulators or buffers in sequence from left to right in Figure 4.1 until it reaches M3. Once the key machine, at the bottom of the V-profile, is reached, the production line has completed the start-up state and enters the normal running state.

4.4.3 The normal running state

Normal running or the steady state is the condition where the bottleneck machine is reliable and accumulator levels are neither full nor empty. All the other machines operate at their normal throughput rates and stop from time to time to stand idle due to the designed rule of the bowl phenomenon.

4.4.4 The blocked state

Blocking happens when the key machine becomes congested with material on its discharge. This happens when any of the downstream machines from the key machine becomes unreliable and accumulators start filling progressively from the said unreliable machine until the key machine is reached and cannot produce anymore.

4.4.5 The starved state

Starving happens when any machine upstream from the key machine becomes unreliable and its discharge accumulator starts to drain. Subsequently accumulators progressively drain in sequence until the shortage of material reaches the key machine. Starving occurs if the machine does not become reliable in good time. The key machine will eventually starve when all the accumulators between the unreliable machine and the key machine are empty.

4.4.6 The run-out state

A run-out state can be triggered when the first machine in the production line M1 stops due to either breaking down or if it is the end of the planned production run and the machine is starved by the infinite buffer side. Accumulators A1 and A2 drain until the key machine stops. This will first mimic a starving state until accumulators A3 and A4 continue to drain, past the key machine. The production line has now entered the run-out state. The sleep state follows the run-out state after the time-out period has lapsed.

To further assist in placing the production process in a certain state, accumulator statuses must first be defined. When defining the conditions for each production process state, accumulators' statuses are considered. An accumulator status is a function of its fill level.

4.5 ACCUMULATOR STATUS

In order to identify a line or process state, the accumulators are used as the triggers to identify what state the line is in. For this purpose, an accumulator is given a status. The accumulator has either a value of 1 or 0. An accumulator is defined with a value of 1 as an accumulator with ≥50 per cent level. For each of the six process states: sleeping, start-up, normal running, blocking, starving and run-out, the specific accumulator status and machine conditions are described in Table 4.1.

Table 4.1: Accumulator and machine status

Line or process state	Accumulator and machine status								
	M_1	A_1	M_2	A_2	M_3	A_3	M_4	A_4	M_5
Sleep	Stopped	0	Stopped	0	Stopped	0	Stopped	0	Stopped
Start-up	Running	1	Stopped	0	Stopped	0	Stopped	0	Stopped
Normal running	Running	1	Running	1	Running	0	Stopped	0	Stopped
Blocked					Stopped	1	Stopped		
Starving			Stopped	0	Stopped				
Run-out	Stopped	0	Stopped	0	Stopped				

Specific accumulator status and machine conditions include:

i) **Process in sleep state**. When all the accumulators are ≤50 per cent full and all the machines has stopped for the run-out period, the process is in the sleep state.

ii) **Process in start-up state**. The first accumulator starts filling due to M1 running, the production process enters the start-up state when the A1 accumulator is >50 per cent full.

iii) **Process in normal running state**. When accumulator A2 has reached the >50 per cent mark and M3 has started running, the coupled production process enters the normal running state.

iv) **Process in blocking state**. The production line is blocked when A3 is >50% full and M3 stops as a result.

v) **Process in starving state**. The production line is starved when M2 stops and A2 drains and eventually M3 stops because it is starved of product.

vi) **Process in run-out state**. The production line enters the run-out state when accumulators A1 and A2 are empty and M3 stops as a result.

In the free-time experiment described in Chapter 11, the problem of inaccurate accumulator levels was experienced. An accumulator is inaccurate when the theoretical count kept for the number of units in an accumulator does not match the physical count of the units in the accumulator. In dealing with this problem, accumulators need to be reset to their correct levels. The reasons why accumulator levels become inaccurate, the accumulator state definitions, and the remedy to deal with this inaccuracy are described in the next three sections of this chapter.

4.6 ACCUMULATOR INACCURACY

There are four main reasons why the theoretical accumulator or buffer level, derived from counters on the production line during the experiment in Chapter 11, does not match the actual level in the accumulator:

i) **Physical product loss**. Reasons for losses include: removing samples for quality testing, removing defective products from the process for rework or destruction, accidental spillage from the accumulator due to machine or conveyor malfunction, pilferage and removing stagnant products from the process from a previous production run.

ii) **Physical product gain**. Reasons for product gain in an accumulator are mainly product placed on the line for re-work due to quality problems and products placed back on the production line that have spilled from the accumulator or buffer.

iii) **Inaccurate counts**. Reasons for inaccurate counts include a defective photocell, a sensor not correctly calibrated, a sensor incorrectly specified, an intermittent electronic interference and environmental conditions, such as moisture, heat or light, triggering a false signal from the detector.

iv) **Human interference.** Operational and maintenance staff work in and around the machines to do opportunistic maintenance and cleaning. Their physical movements can trigger photocells, light beams and proximity devices used for counting products on the production line.

To deal with accumulator inaccuracy, accumulators must be reset to their correct levels. For this, one needs to describe the accumulator state. The accumulator state is a function of the behaviour of its neighbouring machines.

4.7 ACCUMULATOR STATES

During a typical production run, accumulators or buffers are either filling up, draining or stable in level. Accumulator states are defined to assist with the reset of accumulators. Accumulators or buffers need to be reset due to losses and inaccuracies explained in the previous section. The five states for an accumulator are defined as follows:

i) **Slow draining.** When machines upstream and downstream of the accumulator are running and the relevant throughput rate of the downstream machine is bigger than the relevant throughput rate of the upstream machine.

ii) **Slow filling.** When machines upstream and downstream of the accumulator are running and the relevant throughput rate of the upstream machine is higher than the relevant throughput rate of the downstream machine.

iii) **Fast filling.** When the machine upstream of the accumulator is running and the downstream machine has stopped.

iv) **Fast draining.** When the machine upstream of the accumulator has stopped and the downstream machine is running.

v) **Neutral state.** When both the upstream and the downstream machines have stopped or are running at identical speed.

With accumulators now described in a defined state, this state can assist in making decisions on when to reset the accumulators to deal with inaccuracies.

4.8 ACCUMULATOR RESET

A reset is necessary under the following five conditions.

i) **When the maximum level of the accumulator is reached.** The maximum accumulator capacity is known and fixed for a given finite buffer. When the theoretical count exceeds the maximum level of the finite buffer, the accumulator must be capped in the theoretical count not to exceed the maximum level. The accumulator in this case must be reset to its known maximum level.

ii) **When the minimum level of the accumulator has been reached.** When the theoretical count of the number of units in the buffer reaches zero, the count must consciously be reset to avoid a negative value in the accumulator. In this case, the accumulator must continuously be reset to zero. As previously discussed, this can be the result of product removed from the production process for rework or quality testing.

iii) **When the downstream machine stops and the upstream machine runs for a period that would typically fill the buffer and then stops**. It is possible to calculate the time when the accumulator is expected to be full. When the process reaches this point, the theoretical level must be reset to the maximum buffer level.

iv) **When the upstream machine stopped and the downstream machine runs for a period that would typically drain the accumulator and then stops**. When this condition is reached, the theoretical count in the accumulator must be reset to zero.

v) **During steady state.** The steady state reset buffer level depends on the throughput difference of the two machines hugging the buffer. If the in-feed machine to the accumulator is faster than the discharge machine (left of the V-profile machine) the steady state reset will be a full accumulator. However, if the in-feed machine is slower than the discharge machine, the steady state reset level will be a level determined by the accumulator capacity, distance, travel time and type. This level is determined by experimental observation of the accumulator levels during long steady production runs.

Now that the production machine types, process states are defined, accumulator state and statuses are in place and a reset strategy for inaccurate levels have been formulated, the last outstanding variables and constants can be defined that are needed for the free-time calculations.

4.9 THROUGHPUT RATES

Two throughputs are defined and a third type of throughput is calculated for each production machine.

4.9.1 Real-time throughput

Real-time throughput is defined as the current throughput rate (CTR). This throughput rate is generally unstable and varies as the machine experiences line and process conditions requiring the production machine to ramp up or slow down. The rate is calculated every second and is the number of units that pass the discharge point of the particular production machine.

4.9.2 Maximum throughput

Maximum throughput is defined as the historic throughput rate (HTR). Each machine has a maximum throughput rate that is determined by the design parameters of the machine and the bowl phenomenon. The rate is calculated every second and is the maximum number of units that has ever passed the discharge point of the particular production machine. This throughput rate is used to smooth throughput rates in free-time calculations and how is explained in the next section.

4.9.3 Relevant throughput

To calculate free time we need to divide accumulator quantities by a throughput rate. From what has been seen, the CTR varies significantly over time. This will cause the free time calculated to be very unstable. Moreover, when the machine stops, the CTR is zero and calculations end up with an infinitely high free time result. Using the historic throughput rate HTR in the free time calculation, the free time calculated will not have any of these two problems; it will, however, give a conservative view of the available free time and it does not take into account the current production line conditions. To solve these three problems, a new throughput rate is proposed, i.e. the relevant throughput rate (RTR). It is a function of CTR and HTR.

As shown in Formula 4.1, The RTR is calculated by adding k number of consecutive CTRs and dividing by k to obtain a current smoothed average of CTRs and then adding Y times the HTR and dividing by Y+1 to obtain an average. Y is the factor that determines the conservative nature of the result. If we multiply by Y=1 the result is a 50 per cent HTR influence on the result. If Y=2 the HRT has a 66.666 per cent influence on the result and if Y=3 the HTR has a 75 per cent influence on the result. The result is thus a smoothed indicator of current throughput, anchored in the HTR, factored by Y.

$$RTR = ((Y \times HTR + (\sum_{n=1}^{k} CTR_n) / k)) / (1+Y) \qquad ...(4.1)$$

4.10 THE PRIME AND CLEAR QUANTITIES

In a coupled serial process, buffers or accumulators connect the machines. From the levels in the various buffers, free time can be determined. Lack of product in an accumulator can give free time to a downstream machine and excess product in an accumulator can give free time to an upstream machine.

We can monitor the accumulator level and we know the accumulator capacity. With these two numbers and the machine throughput rates, we still cannot calculate free time. Something is missing. We need to define two additional levels in an accumulator that are useful in free-time calculations. These levels will assist in describing the lack of product or the extent to which there is excess product. The two levels are conceptually defined as follows:

i) The accumulator level where the downstream machine can start running, 'point of sufficient product' or prime quantity (PQ); and

ii) The accumulator level where the upstream machine can start running due to sufficient space available, 'point of sufficient space' or clear quantity (CQ).

4.10.1 The prime quantity

The writer, while developing sleep free time calculations, first defined the prime quantity (PQ) in 2007. PQ is the level that is required in an accumulator, preceding the machine that draws from the accumulator, for the machine to start. By required level is meant the extent to which the buffer must be filled for the machine to start working productively. This level should be sufficient for the machine to start and run continuously for a productive period. The productive period is very much a function of the type of operation, as some machines must run continuously for days and others a few seconds to be seen as productive.

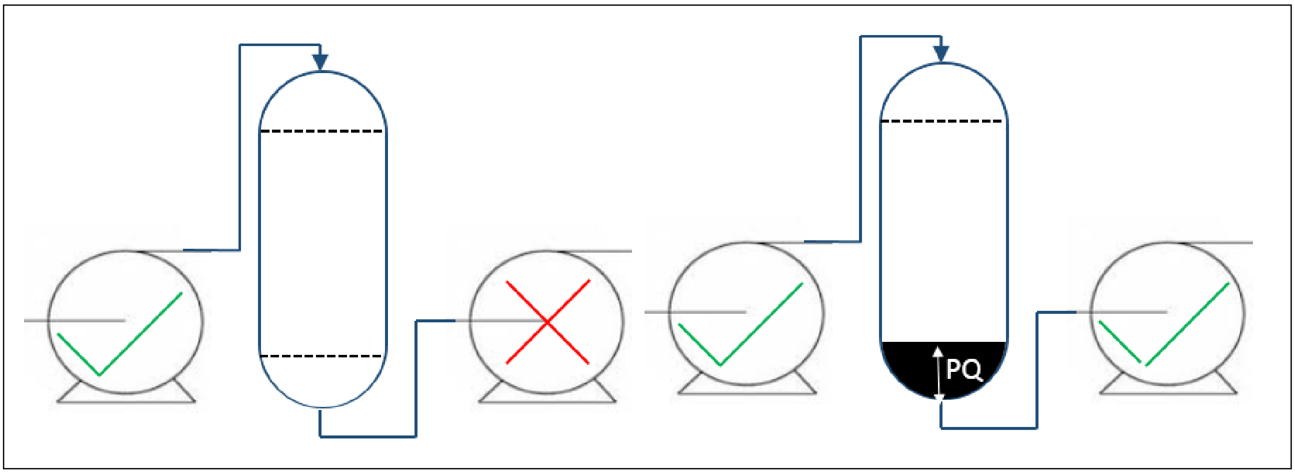


Figure 4.8: Prime quantity

In the two examples of the buffer tank and pumps on both sides in Figure 4.8, the level in the tank is primed only when the prime quantity level is reached. In the first sketch, the buffer is empty and the discharge pump cannot start. The fill level needs to be high enough to allow the pump to start without cavitating. Given the V-profile design rule, the pump on the in-feed side of the buffer illustrated in Figure 4.8 will have a higher throughput. This will cause the level to rise until the accumulator is full and the upstream machine becomes idle.

The prime quantity is a constant but could vary slightly over time as process conditions change. The quantity is ultimately a function of the rate at which the accumulator can be primed and due to the stochastic nature of the production machine performance, this is not a constant. There are two ways to determine the PQ. The first method depends on the extent the production process is controlled by line logic. If the process has built-in PLC logic, that starts the downstream machine, the quantity used by the PLC logic before starting the downstream machine must be set as the PQ. If there is no built-in logic, as is the case in the majority of production processes, trial end error has lead to the following rule of thumb: The prime quantity must initially be set at 25 per cent of the accumulator capacity. The acid test must be conducted on the downstream machine from the accumulator. If the accuracy is less than 95 per cent, the prime quantity can be reduced in steps to the maximum prime quantity that will still ensure an acid test pass rate of 95 per cent.

4.10.2 The clear quantity

The writer first defined the clear quantity (CQ) in February 2008. CQ is the level in an accumulator, once the accumulator has drained sufficiently, for the upstream machine to start and run for a productive period. In the first picture in Figure 4.9, the full accumulator prevents the pump from starting and in the second depiction, the pump can start and run productively, especially in this case where the downstream machine has a higher throughput rate than the upstream machine. The accumulator level will drop and eventually the downstream machine will become idle.

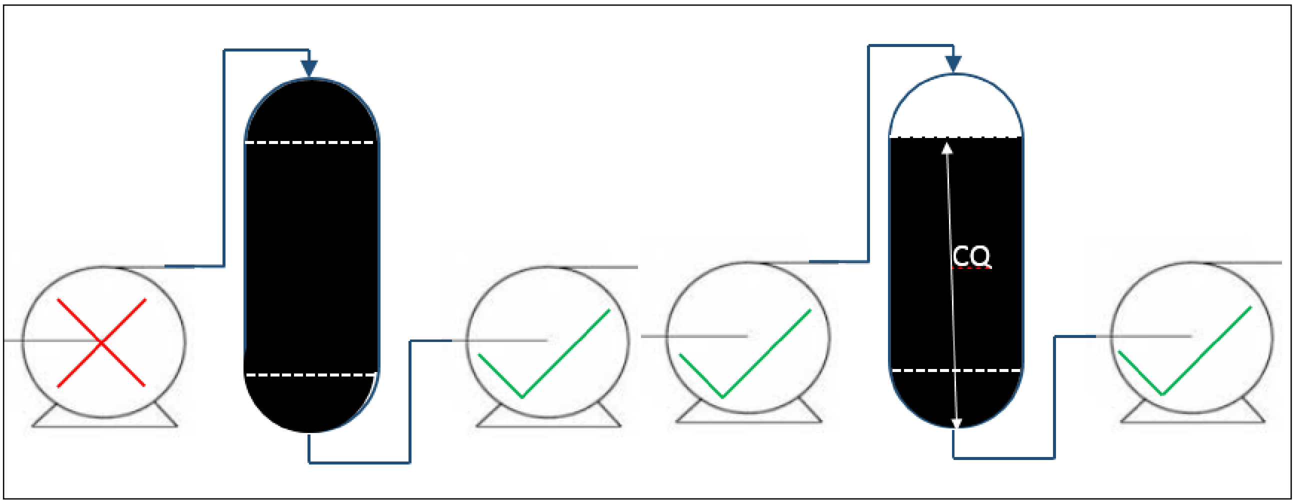


Figure 4.9: Clear quantity

The clear quantity is a constant but could also vary slightly over time as the process conditions change. The quantity is ultimately a function of the rate at which the accumulator can be cleared and due to the stochastic nature of production machine performance, this is not constant.

There are two ways to determine the clear quantity: The first method depends on the technology used by the proses. If the process has built-in PLC logic that starts the upstream machine, the quantity used by the PLC logic to start the upstream machine must be set as the clear quantity. If there is no built-in logic, as is the case in the majority of production processes, trial end error has lead to the following rule of thumb: The clear quantity must initially be set at 75 per cent of the accumulator capacity. The acid test must be conducted on the upstream machine from the accumulator. If the accuracy is less than 95 per cent, the clear quantity can be increased in steps to the minimum clear quantity that will ensure an acid test pass rate of 95 per cent.

4.11 SUMMARY

In this chapter, the coupled production process was modelled as a set of pumps with liquid tanks between them to represent the accumulators typical of large coupled production processes.

Five machine types were defined, based on their position on the V-profile. The position indicates the machine's relative throughput rate compared to its neighbours and the types of accumulators associated with the machine, i.e. finite or infinite.

Six production process states were defined and accumulator states were described. Problems with accumulator inaccuracy were highlighted and a reset strategy mapped out.

Throughput was defined in real time as the current throughput rate and the maximum observed throughput as the historic throughput rate; from this, the relevant throughput rate was calculated.

The concepts of clear quantity and prime quantity were defined and explained.

The V-profile was used to illustrate the free time available in a typical eight-hour shift. Dynamic and static free times were defined by an example of a simple five-machine production line. Total free time was calculated as the sum of excess capacity built into production processes during the design stage and from breakdowns at the bottleneck machine.

In the next chapter, free-time calculations for the stationary state and transient state of the production process are developed. The important variables and constants defined in this chapter are summarised in Table 4.2.

Table 4.2: A summarised table with all the relevant variables and constants and their respective descriptions.

Variable or constant	Description
Accumulator capacity (AC)	The accumulator capacity is a constant and used in all free-time calculations.
Accumulator level (AL)	The level in the buffer is used in all free-time calculations and is determined by adding units to the accumulator as they are counted by the in-feed machine and subtracting units as they are processed by the discharge machine.
Accumulator status	The accumulator statuses are used to define the production process state.
Countdown (CD)	Countdown is used in all start-up free time calculations to count the sleep free time down to real time.
Clear quantity (CQ)	The level in the accumulator when the accumulator has enough space for the upstream machine to start. This constant is used in all free-time calculations downstream from the key machine.
Current throughput rate (CTR)	The current throughput rate is used to make the RTR more representative of the current throughput.
Historic throughput rate (HTR)	This rate is the maximum throughput rate recorded for the specific machine and is used to make the RTR more conservative in the free-time calculation.
Machine status	The machine statuses are used to define the production process state.
Machine type	There are five (5) machine types. The machine type will determine the free-time calculation used.
Minimum accumulator travel time (MATT)	It is the minimum time a unit will take to travel through an accumulator. This travel time is used in sleep free time calculations.
Production process state	There are six (6) production process states. For each state, there are specific free-time formulations.
Prime quantity (PQ)	The level at which the accumulator is primed. This constant is used in all free-time calculations upstream from the key machine.
Relevant throughput Rate (RTR)	This rate is used for all start-up and running free-time calculations and is calculated from HTR and CTR.

With the model, constants and variables now clearly defined, in the next chapter the model is used to develop the generic equations necessary to calculate free time at the various production machines for any number of machines.

CHAPTER 5:
FREE-TIME CALCULATIONS

5.1 INTRODUCTION

From the conceptual model in the previous chapter, the free-time calculations for all the line states can now be developed. First, the matrices will be defined. There is one matrix for the five machine types and one matrix for the five accumulator types. Using matrix mathematics, the solution for a five-machine problem is developed, as there are five unique machine types in a V-profile process. Thereafter the general solution for any number of machines in a production line is developed.

5.2 THE MACHINE MATRIX

The machine matrix is developed for the general case. When the free-time calculations are developed in Section 5.8, first, the five-machine solution is presented and then the general solution is developed.

The matrix in Figure 5.1 plots the machine types and the number of machines of each type. There are i types of machine positions and j machines in each machine position.

For the i types of machine positions as defined in Figure 4.1 of the previous chapter:

- Type-1 = Start machine with infinite buffer on its in-feed and finite buffer on its discharge.
- Type-2 = A machine with a finite buffer on either side and its in-feed machine is faster and its discharge machine is slower.
- Type-3 = The bottleneck or key machine, with finite buffers on both sides and its in-feed and discharge machines are faster.
- Type-4 = A machine with a finite buffer on either side and its in-feed machine is slower and its discharge machine is faster.
- Type-5 = End machine with infinite buffer on its discharge and an infinite buffer on its in- feed.

We therefore have i = 1, 2, 3, 4 and 5.

For the j machine types, there are the following numbers of machines per type:

- One type-1 machine;
- Any number of type-2 machines;
- One type-3 machine;
- Any number of type-4 machines; and
- One type-5 machine.

Therefore j = 1, for type-1 machines

Therefore j = 1, 2, 3, 4…….∞ for type-2 machines

Therefore j = 1, for type-4 machines

Therefore j = 1, 2, 3, 4…….∞ for type-4 machines

Therefore j = 1, for type-5 machines

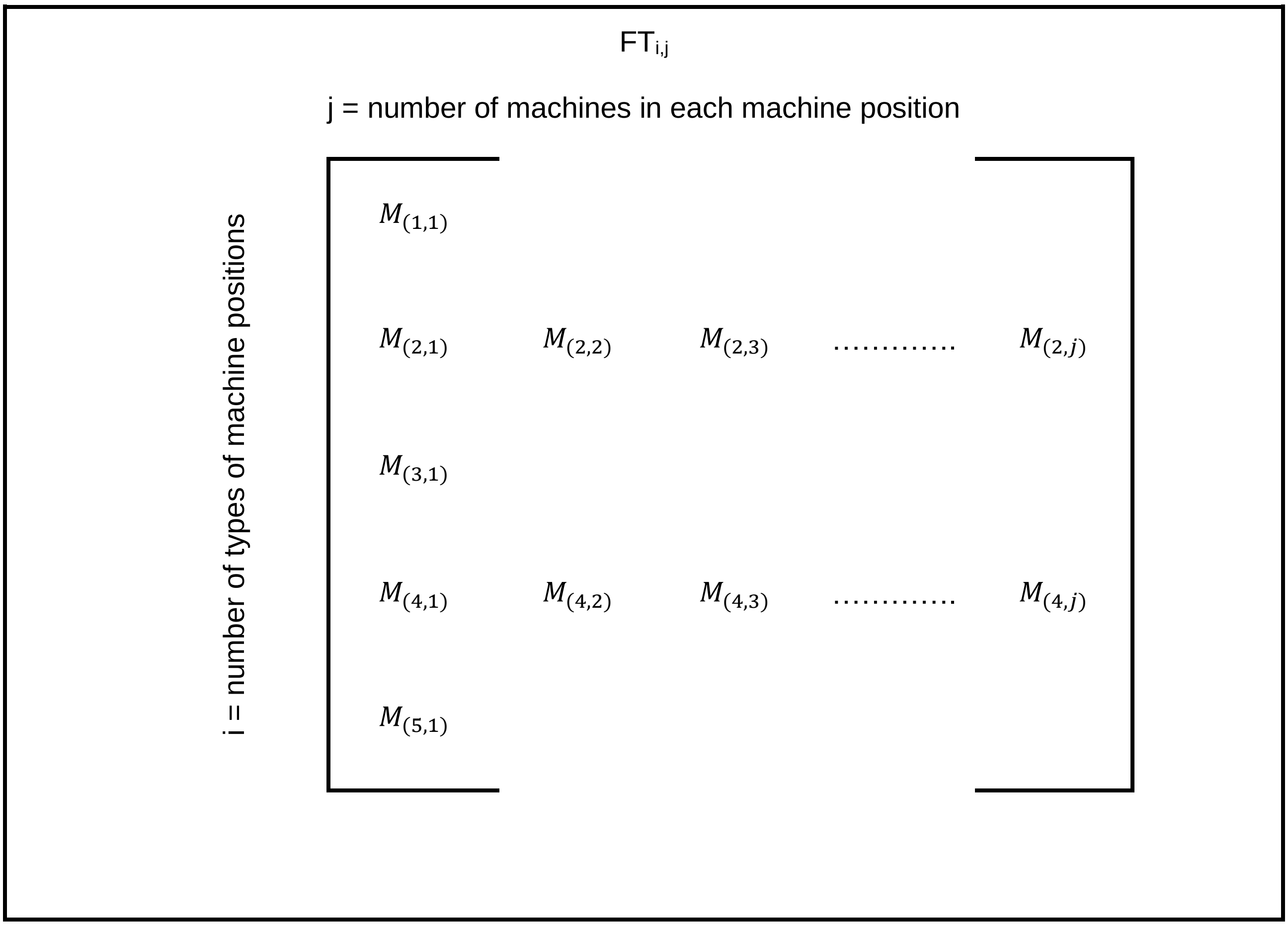


Figure 5.1: Machine matrix

5.3 THE ACCUMULATOR MATRIX

The accumulator matrix is developed for the general case. When the free-time calculations are developed in Section 5.8, first, the five-machine solution is presented and then the general solution is developed.

The matrix in Figure 5.2 plots the accumulator types and the number of accumulators for each type. There are i types of accumulator positions and j accumulators in each accumulator position.

There are five types of accumulator positions:

- Type-1 is the first machine's accumulator and is defined as the accumulator following the first machine.
- Type-2 is defined as the accumulator(s) following a type-2 machine but not connecting to the bottleneck machine.
- Type-3 are the accumulators preceding and following the bottleneck machine.
- Type-4 is the accumulator(s) following the type-4 machine and not connecting to the type-5 machine.
- Type-5 is defined as the accumulator following a type-4 machine and connecting to the type-5 machine. It is also the last accumulator on the production line.

We therefore have i = 1, 2, 3, 4 and 5.

For the j accumulator types, we have the following numbers of accumulators per type:

- One type-1 machine's accumulator;
- Any number of type-2 machines' accumulators;
- Two type-3 machines' accumulators;
- Any number of type-4 machines' accumulators; and
- One type-5 machine's accumulator.

We therefore have j = 1, for type-1 accumulator:
And j = 1, 2, 3, 4…….k for type-2 accumulators

And j = 2, for type-3 accumulators

And j = 1, 2, 3, 4…….l for type-4 accumulators

And j = 1, for type-5 accumulators

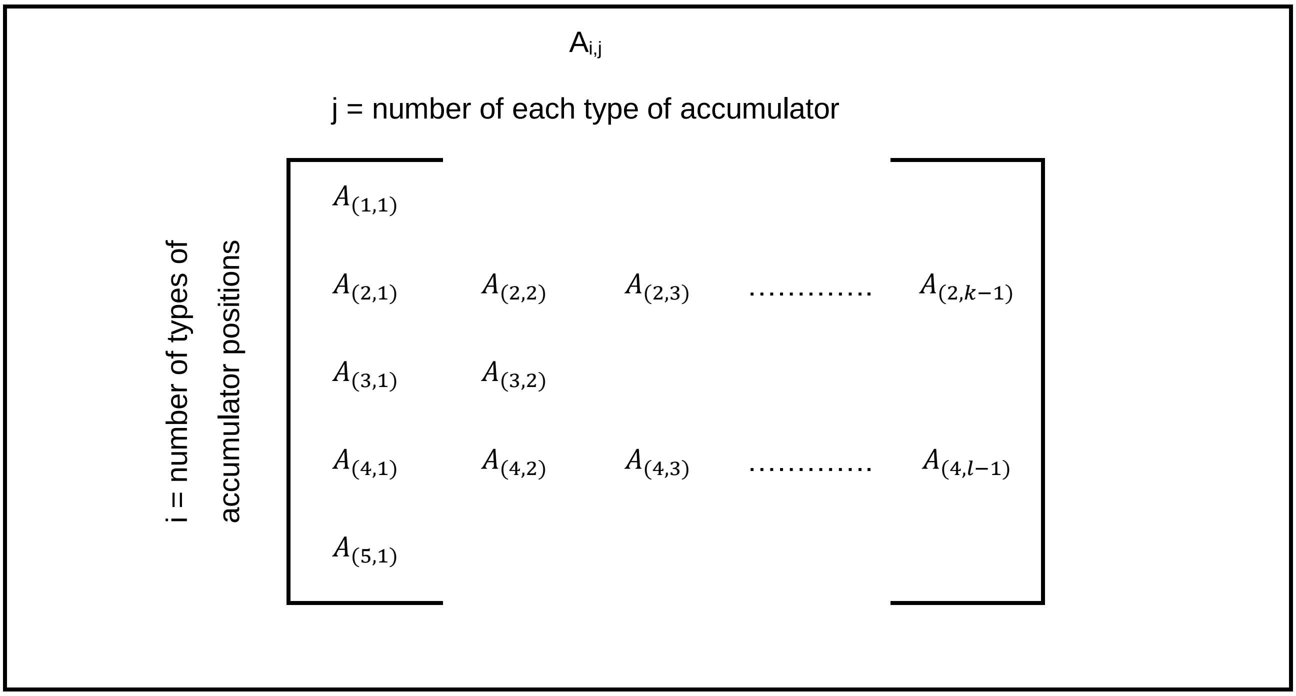


Figure 5.2: Accumulator matrix

5.4 SLEEP FREE TIME – STATIONARY

Sleep free time equations calculate free time during the inactive state of a production process. During this stationary state, the free-time calculations are stationary in contrast with the transient state of the start-up, normal running, blocking, starvation and run-out calculations. Sleep free time is, for example, the minimum time that a maintenance worker can claim the production machine when the production process is not active. The production process can start at any moment, but the product needs to travel through the accumulators to reach all the production machines down the line. The total sum of the time it takes to reach the relevant machines down the line and prime its preceding accumulators is the sleep free time. Reference will be made to the Valpré experiment data in Appendix D to illustrate the free time available during the sleep (stationary) state.

5.5 SLEEP FREE-TIME CALCULATIONS FOR ALL MACHINE TYPES

5.5.1 Machine type: i = 1

During the sleep state, the free time on the first machine M_1 (i = 1 and j = 1) is zero as the machine can be required to start work at any time. The first machine M_1 in a coupled manufacturing process, borders an infinite buffer at its in-feed side and a finite buffer on its discharge side. The expected arrival time of product at the in-feed of the first machine cannot be determined accurately using the free time model. We therefore have to assume the product can arrive at any time at M_1 and the sleep free time is therefore zero.

It therefore follows that for sleep free time for $M_{(1,1)}$

$$FT_{M_{(1,1)}} = 0{:}\,00{:}\,00\ldots\ldots\ldots\ldots\text{(1)} \qquad \text{...(5.1)}$$

An example of 0:00:00 sleep free time can be observed from the Valpré experiment data in Appendix D, identity row 314108, time stamp: 22-May-14-16-51-07, sleep free time of 0:00:00 can be observed for machine 1. A detailed explanation of Appendix D data is given in Chapter 6.

5.5.2 Machine type: i = 2

The sleep free time of the second machine M_2 in a production process is expressed as $FT_{M(2,1)}$ and is bordered by empty finite buffers in the sleep state. The free time at the second machine-station $FT_{M(2,1)}$ is the sum of the minimum accumulator travel time (MATT) for $A_{(1,1)}$, and the prime delay time (PDT) (the time it will take to prime $A_{(1,1)}$).

It therefore follows that for the second machine in the model:

$$FT_{M_{(2,1)}} = MATT_{A_{(1,1)}} + PDT_{A_{(1,1)}} \qquad \text{...(5.2)}$$

The minimum time it takes to prime accumulator $A_{(1,1)}$, the prime delay time (PDT) = $\frac{PQ_{A_{(1,1)}}}{HTR_{M_{(1,1)}}}$

Therefore

$$FT_{M_{(2,1)}} = MATT_{A_{(1,1)}} + \frac{PQ_{A_{(1,1)}}}{HTR_{M_{(1,1)}}} \qquad \text{...(5.3)}$$

An example of a machine type-2 sleep free time can be observed in the data of the Valpré experiment in Appendix D. In line identity row 314108, time stamp: 22-May-14-16-51-07, the sleep free time of 11 minutes and 2 seconds can be observed for machine 2.

For the general solution, k number of type-2 machines can be present. Sleep free time is therefore the sum of the type-1 sleep free time plus the entire preceding type-2 machines and is expressed as

$$FT_{M_{(2,j)}} = MATT_{A_{(1,1)}} + \frac{PQ_{A_{(1,1)}}}{HTR_{M_{(1,1)}}} + \sum_{j=1}^{k-1}\left(MATT_{A_{(2,j)}} + \frac{PQ_{A_{(2,j)}}}{HTR_{M_{(2,j)}}}\right) \qquad \text{...(5.4)}$$

5.5.3 Machine type: i = 3

During the sleep state, the free time at the bottleneck machine M_3 is the sum of the minimum accumulator travel time (MATT) for all the preceding accumulators, the prime delay time (PDT) of all the preceding accumulators and the time it takes to fill the accumulator just before the bottleneck machine to its prime quantity (PQ). The minimum time it could take to fill the accumulator before the bottleneck machine to its prime quantity = $\frac{PQ_{A_{(2,k-1)}}}{HTR_{M_{(2,j)}}}$

It therefore follows that sleep free time for the bottleneck machine:

$$FT_{M_{(3,1)}} = FT_{M_{(2,j)}} + \frac{PQ_{A_{(2,k-1)}}}{HTR_{M_{(2,j)}}} \quad \text{...(5.5)}$$

An example can be observed in Appendix D in line identity row 314108, time stamp: 22-May-14-16-51-07 sleep free time = 16 min and 5 seconds for machine 3.

5.5.4 Machine type: i = 4

The sleep free time for machines following the bottleneck machine M_4 is the sum of the sleep free time at the bottleneck machine $FT_{M_{(3,1)}}$ and all the type-4 sleep free times before the specific type-4 machine being expressed plus the time it takes to fill the preceeding accumulator to its clear quantity.

It therefore follows that for type-4 machines, sleep free time with l number of type-4 machines can be expressed as:

$$FT_{M_{(4,j)}} = FT_{M_{(3,1)}} + \sum_{j=1}^{l-1} (MATT_{A_{(4,j)}} + \frac{CQ_{A_{(4,j)}}}{HTR_{M_{(4,j)}}}) \quad \text{...(5.6)}$$

5.5.5 Machine type: i = 5

The sleep free time for the last machine in the process M_5, is the sum of the sleep free time at the last type-4 machine, the minimum time it takes to travel through the last finite buffer of the process $A_{(5,1)}$ and the time it takes to fill the final buffer $A_{(5,1)}$ to its clear quantity.

It therefore follows that for the type-5 machine the sleep free time can be expressed as

$$FT_{M_{(5,j)}} = FT_{M_{(4,j)}} + MATT_{A_{(5,1)}} + \frac{CQ_{A_{(5,1)}}}{HTR_{M_{(5,1)}}} \quad \text{...(5.7)}$$

5.6 THE CURRENT CONSTRAINT MACHINE DURING THE SLEEP STATE

In order to add breakdown free time, the current constraint machine must always be identified. Each process state has a different current constraint machine (CCM) rule. During sleep process state, the CCM is always the first machine in the process $M_{(1,\ 1),}$ bounded by the infinite buffer on its in-feed and finite buffer on its discharge.

From the sleep state, the production process enters the start-up mode. A countdown (CD) starts on each machine, starting with the sleep free time total and counting down to zero. The 'handover' from sleep free time to normal running is done with the countdown. The inclusion of the countdown in the calculation of normal running free time is included in the next section.

5.7 START-UP AND NORMAL RUNNING FREE TIME – TRANSIENT

During the transient state, free time is calculated by dividing the accumulator quantity by the live throughput rate of the machine filling or draining the accumulator (whichever is relevant given the prime or clear condition).

$$FT = \frac{Accumulator\ Quantity}{Throughput\ Rate} \qquad ...(5.8)$$

When the first production machine starts running, the transient state is triggered and the each machine starts a countdown from the stationary state free time to zero. This countdown (CD) is used in all the equations during the start-up state. Start-up and normal running formulations are combined by a formula that returns the maximum of the various building blocks for accumulators in the free-time concept, for example:

$$FT = MAX\ of\ X\ or\ Y \qquad ...(5.9)$$

will return the biggest number between X and Y.

In this way, start-up and normal running can also be handled in the same equation.

5.8 START-UP AND NORMAL RUNNING FREE-TIME CALCULATIONS

Four generic free time types are defined as follows:

Type-1: The time to fill an accumulator upstream from the key machine to its prime level is

$$\frac{PQ_{A_{(i,j)}} - AL_{A_{(i,j)}}}{RTR_{M_{(i,j)}}}$$

Type-2: The time to fill an accumulator downstream from the key machine to its clear level is

$$\frac{CQ_{A_{(i,j)}} - AL_{A_{(i,j)}}}{RTR_{M_{(i,j)}}}$$

Type-3: The time to drain an accumulator upsteam from the key machine to its prime level is

$$\frac{AL_{A_{(i,j)}} - PQ_{A_{(i,j)}}}{RTR_{M_{(i,j)}}}$$

Type-4: The time to drain an accumulator downstream from the key machine to its clear level is

$$\frac{AL_{A_{(i,j)}} - CQ_{A_{(i,j)}}}{RTR_{M_{(i,j)}}}$$

The four generic types of DFT are developed into 16 building blocks to construct the available free time for any number of production machines.

A summary of the sixteen building blocks are set out in Table 5.1 below.

Table 5.1: Free-time building block formulae

Type	Free time formula	Free time condition or requirement
1	$\frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \ldots (a)$	Type-1 free time for type-2 to 5 machines because of type-1 accumulator.
	$\sum_{n=1}^{j-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \ldots (b)$	Type-1 free time for type-2 machines because of type-2 accumulator. j = {2, 3, 4, 5 … k}
	$\sum_{n=1}^{k-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \ldots (c)$	Type-1 free time for type-3 to 5 machines because of type-2 accumulator.
	$\frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,k)}}} \ldots (d)$	Type-1 free time for Ttype-3 to 5 machines because of type-3,1 accumulator.
2	$\frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}} \ldots (e)$	Type-2 free time for type-4 and 5 machines because of type-3,2 accumulator.
	$\sum_{n=1}^{j-1} \frac{CQ_{A_{(4,n)}} - AL_{A_{(4,n)}}}{RTR_{M_{(4,n)}}} \ldots (f)$	Type-2 free time for type-4 machines because of type-4 accumulator. j = {2, 3, 4, 5 … l}
	$\sum_{n=1}^{l-1} \frac{CQ_{A_{(4,n)}} - AL_{A_{(4,n)}}}{RTR_{M_{(4,n)}}} \ldots (g)$	Type-2 free time for type-5 machines because of type-4 accumulator.
	$\frac{CQ_{A_{(5,1)}} - AL_{A_{(5,1)}}}{RTR_{M_{(4,l)}}} \ldots (h)$	Type-2 free time for type-5 machines because of type-5 accumulator.
3	$\frac{AL_{A_{(1,1)}} - PQ_{A_{(1,1)}}}{RTR_{M_{(2,1)}}} \ldots (i)$	Type-3 free time for type-1 and 2 machines because of type-1 accumulator.
	$\sum_{n=j}^{k-1} \frac{AL_{A_{(2,n)}} - PQ_{A_{(2,n)}}}{RTR_{M_{(2,n+1)}}} \ldots (j)$	Type-3 free time for type-2 machines because of type-2 accumulator. j = {2, 3, 4, 5 … k}
	$\sum_{n=1}^{k-1} \frac{AL_{A_{(2,n)}} - PQ_{A_{(2,n)}}}{RTR_{M_{(2,n+1)}}} \ldots (k)$	Type-3 free time for type-1 machines because of type-2 accumulator.
	$\frac{AL_{A_{(3,1)}} - PQ_{A_{(3,1)}}}{RTR_{M_{(3,1)}}} \ldots (l)$	Type-3 free time for type-1 and 2 machines because of type-3 accumulator.
4	$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \ldots (m)$	Type-4 free time for type-1 to 4 machines because of type-3 accumulator.
	$\sum_{n=1}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \ldots (n)$	Type-4 free time for type-1 to 3 machines because of type-4 accumulator.
	$\sum_{n=j}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \ldots (o)$	Type-4 free time for type-4 machines because of type-4 accumulator. j = {2, 3, 4, 5 … l}
	$\frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \ldots (p)$	Type-4 free time for type-1 to 4 machines because of type-5 accumulator.

5.8.1 Machine type: i = 1

For a five-machine solution, during start-up and normal running the free time at the first machine M_1 is the biggest of the time available to bring accumulator 1,1 and 3,1 to its prime quantity level OR the free time available in accumulators 3,2 and 5,1 in bringing them down to their clear quantity.

$$FT_{M_{(1,1)}} = MAX\ of\ \frac{AL_{A_{(1,1)}} - PQ_{A_{(1,1)}}}{RTR_{M_{(2,1)}}} \ldots (i) + \frac{AL_{A_{(3,1)}} - PQ_{A_{(3,1)}}}{RTR_{M_{(3,1)}}} \ldots (l)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \ldots (m) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \ldots (p)\ or\ 0 \qquad \ldots(5.10)$$

The general solution for k number of type-2 machines and l number of type-4 machines

$$FT_{M_{(1,1)}} = MAX\ of\ \frac{AL_{A_{(1,1)}} - PQ_{A_{(1,1)}}}{RTR_{M_{(2,1)}}} \ldots (i) + \sum_{n=1}^{k-1} \frac{AL_{A_{(2,n)}} - PQ_{A_{(2,n)}}}{RTR_{M_{(2,n+1)}}} \ldots (k) + \frac{AL_{A_{(3,1)}} - PQ_{A_{(3,1)}}}{RTR_{M_{(3,1)}}} \ldots (l)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \ldots (m) + \sum_{n=1}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \ldots (n) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \ldots (p) \qquad \ldots(5.11)$$

Note: There is no countdown for machine type: i = 1, because its sleep free time is always zero.

5.8.2 Machine type: i = 2

For a five-machine solution, during start-up and normal running, the free time at the type-2 machine FT_{M2} is the biggest of the following four numbers:

1. The countdown CD of the particular machine;

2. The time it takes to bring accumulator 1,1 up to its prime level;

3. The time it takes to bring accumulator 3, 1 down to its prime level; or

4. The time it takes to bring accumulator 3, 2 and 5,1 down to its clear quantity.

$$FT_{M_{(2,1)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \ldots (a)\ or\ \frac{AL_{A_{(3,1)}} - PQ_{A_{(3,1)}}}{RTR_{M_{(3,1)}}} \ldots (l)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \ldots (m) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \ldots (p) \qquad \ldots(5.12)$$

The solution for k number of type-2 machines and l number of type-4 machines is:

$$FT_{M_{(2,j)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \ldots (a) + \sum_{n=1}^{j-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \ldots (b)\ or$$

$$\frac{AL_{A_{(1,1)}} - PQ_{A_{(1,1)}}}{RTR_{M_{(2,1)}}} \ldots (i) + \sum_{n=j}^{k-1} \frac{AL_{A_{(2,n)}} - PQ_{A_{(2,n)}}}{RTR_{M_{(2,n+1)}}} \ldots (j) + \frac{AL_{A_{(3,1)}} - PQ_{A_{(3,1)}}}{RTR_{M_{(3,1)}}} \ldots (l)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \ldots (m) + \sum_{n=1}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \ldots (n) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \ldots (p) \qquad \ldots(5.13)$$

5.8.3 Machine type: i = 3

For a five-machine solution, during start-up and normal running, the free time at the type-3 machine FT_{M3} is the biggest of the following three numbers:

1. The countdown of the type-3 machine;

2. The time it takes to bring accumulator 1,1 and 3,1 from below its prime quantity to back to its prime level;

3. The time it takes to bring accumulators 3,2 and 5,1 current level down to its clear quantity.

$$FT_{M_{(3,1)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}}-AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \ldots (a) + \frac{PQ_{A_{(3,1)}}-AL_{A_{(3,1)}}}{RTR_{M_{(2,1)}}} \ldots (d)\ or$$

$$\frac{AL_{A_{(3,2)}}-CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \ldots (m) + \frac{AL_{A_{(5,1)}}-CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \ldots (p) \qquad \ldots(5.14)$$

The solution for k number of type-2 machines and l number of type-4 machines is:

$$FT_{M_{(3,1)}} = MAX\ od\ CD\ or\ \frac{PQ_{A_{(1,1)}}-AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \ldots (a) + \sum_{n=1}^{k-1} \frac{PQ_{A_{(2,n)}}-AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \ldots (c) + \frac{PQ_{A_{(3,1)}}-AL_{A_{(3,1)}}}{RTR_{M_{(2,k)}}} \ldots (d)\ or$$

$$\frac{AL_{A_{(3,2)}}-CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \ldots (m) + \sum_{n=1}^{l-1} \frac{AL_{A_{(4,n)}}-CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \ldots (n) + \frac{AL_{A_{(5,1)}}-CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \ldots (p) \qquad \ldots(5.15)$$

5.8.4 Machine type: i = 4

For a five-machine solution, during start-up and normal running, the free time at the first type-4 machine FT_{M1} is the biggest of the following four numbers:

1. The countdown CD of the particular machine;

2. The time it takes to bring accumulator 1,1 and 3,1 up to its prime level;

3. The time it takes to bring accumulator 3,2 up to its clear level; or

4. The time it takes to bring accumulator 5,1 down to its clear level.

$$FT_{M_{(4,1)}} = The\ MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}}-AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \ldots (a) + \frac{PQ_{A_{(3,1)}}-AL_{A_{(3,1)}}}{RTR_{M_{(2,1)}}} \ldots (d)\ or$$

$$\frac{CQ_{A_{(3,2)}}-AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}} \ldots (e)\ or\ \frac{AL_{A_{(5,1)}}-CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \ldots (p) \qquad \ldots(5.16)$$

The solution for k number of type-2 machines and l number of type-4 machines is:

$$FT_{M_{(4,j)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \dots (a) + \sum_{n=1}^{k-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \dots (c) \quad + \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,k)}}} \dots (d)\ or$$

$$\frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}} \dots (e) + \sum_{n=1}^{j-1} \frac{CQ_{A_{(4,n)}} - AL_{A_{(4,n)}}}{RTR_{M_{(4,n)}}} \dots (f) + \frac{CQ_{A_{(5,1)}} - AL_{A_{(5,1)}}}{RTR_{M_{(4,l)}}} \dots (h)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \dots (m) + \sum_{n=j}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \dots (o) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \dots (p) \qquad \dots(5.17)$$

5.8.5 Machine type: i = 5

For a five-machine solution, during start-up and normal running, the free time at the type-5 machine FT_{M5} is the biggest of the following three numbers:

1. The countdown CD of the particular machine;

2. The time it takes to bring accumulator 1,1 and 3,1 up to its prime level; or

3. The time it takes to bring accumulator 3,2 and 5,1 down to its clear level.

$$FT_{M_{(5,1)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \dots (a) + \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,1)}}} \dots (d)\ or$$

$$\frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}} \dots (e) + \frac{CQ_{A_{(5,1)}} - AL_{A_{(5,1)}}}{RTR_{M_{(4,1)}}} \dots (h) \qquad \dots(5.18)$$

The solution for k number of type-2 machines and l number of type-4 machines is:

$$FT_{M_{(5,1)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \dots (a) + \sum_{n=1}^{k-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \dots (c) \quad + \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,k)}}} \dots (d)\ or$$

$$\frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}} \dots (e) + \sum_{n=1}^{l-1} \frac{CQ_{A_{(4,n)}} - AL_{A_{(4,n)}}}{RTR_{M_{(4,n)}}} \dots (g) + \frac{CQ_{A_{(5,1)}} - AL_{A_{(5,1)}}}{RTR_{M_{(4,l)}}} \dots (h) \qquad \dots(5.19)$$

5.9 BLOCKING AND STARVATION FREE-TIME CALCULATIONS

More free time is allocated to the type-3 machine, the key machine, during blocking and starvation conditions. Only once the downstream conveyor of the type-3-machine has been filled during blocking can the free time calculated in the next downstream accumulator be added and so on and so on. Similarly, upstream free time can only be added progressively to the type-3 (key machine), if the type-3 upstream accumulator has been drained. Examples of starvation and blocking free time are described as logical operators in the plant specific solutions in Chapters 9 and 11.

5.10 THE CURRENT BOTTLENECK MACHINE (CBM) DURING DIFFERENT PROCESS STATES

With the stationary (sleep) and trancient free time or DFT calculations in place, the BDFT must be added to calculate the total free time. BDFT is added to the current bottleneck machine (CBM). It is therefore important to know where the CBM is during any of the production line states.

For a V-profile serial production process system with reliable machines, the bottleneck normally is the machine with the slowest designed throughput. However, serial production processes have inefficient machines with stochastic breakdown behaviour. It therefore follows that the bottleneck on a serial production processes moves around the process in a random fashion. In Figure 5.3 free time in seconds is plotted on the horizontal axis and the five second time intervals on the vertical axis. In the example, extracted from data obtained in the Valpré experiment described in Chapter 11, M_2 becomes the bottleneck at 05:16:20 pm when its DFT drops below that of $M_{1.}$

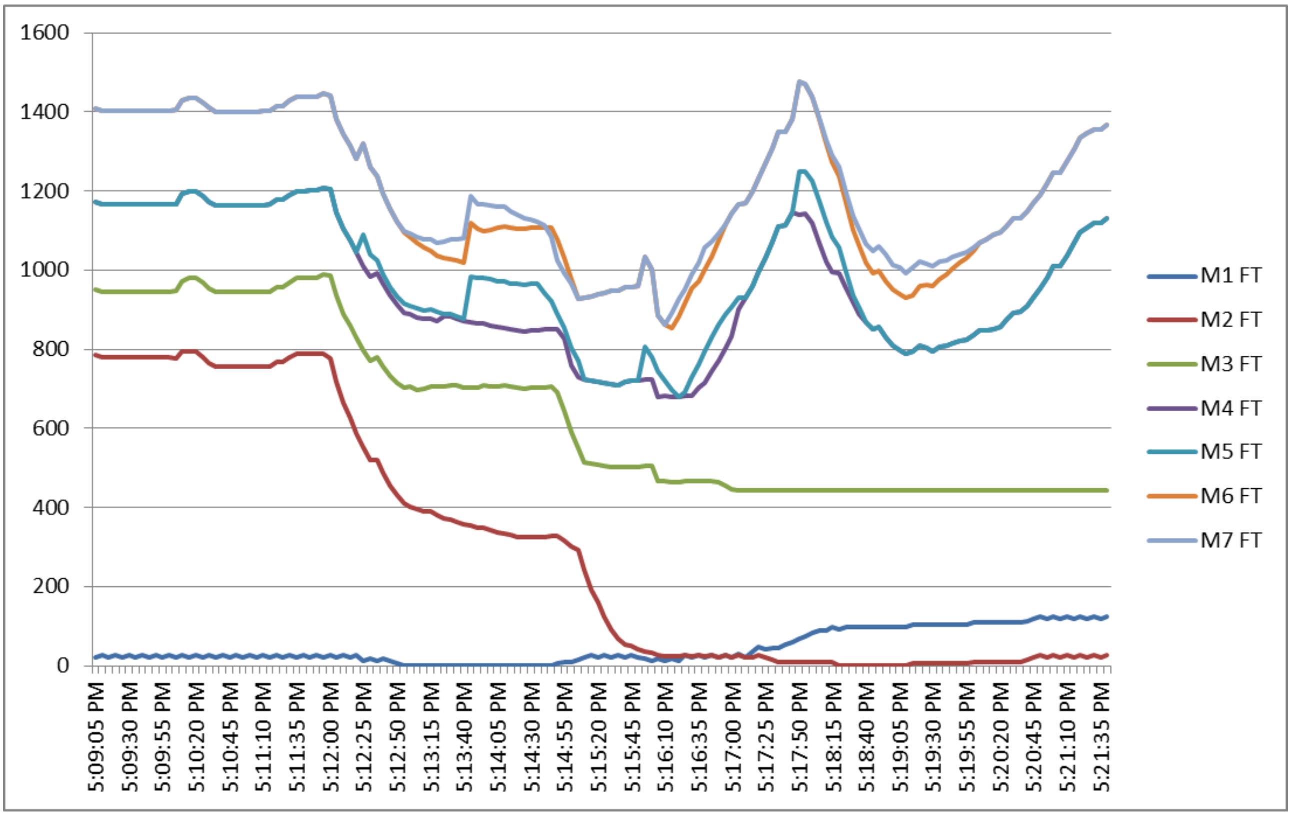


Figure 5.3: An example where M2 free time drops below M1 and becomes the new CCM

Source: Researcher’s own illustration.

The magnitude of free time is ideally suited to indicate, during normal running, the location of the bottleneck some time before the relevant machine becomes the constraint. Free time acts as an early indicator of the location of the bottleneck as it moves around the production process. The current bottleneck machine is defined during different process states as follows:

- **Sleep state:** During the sleep state, the CBM is the first machine on the serial production process.
- **Start-up and running state:** During start-up and running state, the machine with the smallest dynamic free time defines the CBM.
- **Run-out state:** During the run-out state, we effectively have no production from the first production machine in the production process. This machine should be able to start at any time. This first machine then becomes the CBM.

If a production machine is the current bottleneck machine (CBM) and stopped by the operator or due to blocking or starvation, it becomes the current constraint machine (CCM). So in short, an unreliable CBM becomes the CCM.

5.11 SUMMARY

With the aid of matrix mathematics, a machine and an accumulator matrix were developed that cater for any number of machines in any serially coupled process. The equations for sleep, start-up and normal running were first developed for a five-machine solution and then for each type; a general solution was developed for any number of machines. The equations are now ready to test the presence, location and magnitude of free time in a coupled serial production process with finite buffers in a real-life experiment.

The current constraint and current bottleneck machines were clearly defined for each production process state. Section 5.10 demonstrated how the current bottleneck machine (CBM) and the current constraint machine (CCM) are identified and how they can be used to manage the identification and presentation of breakdown free time (BDFT).

From the general solution for free time, plant-specific formulae for the production process at Parow and Valpré are developed in Chapter 9 and Chapter 11 respectively by changing the number of type-2 and type-4 machines to represent the process at the respective locations.

But first, the next three chapters outline three propositions with test criteria that were specifically developed to test the model in a real-life experiment at the Valpré plant in Heidelberg, South Africa.

CHAPTER 6:

THE IMPLEMENTATION OF THE MODEL – THE ACID TEST CRITERION

6.1 INTRODUCTION

With the theoretical model now in place and the formulae developed, it is important to define and develop the criteria by which the concept will be evaluated. Three test criteria were developed: (i) the acid test; (ii) the start-up test; and (iii) the judicious use test. The start-up test and the judicious use tests are detailed in Chapter 7 and Chapter 8.

The first challenge was to design a test that determines the accuracy of free-time calculations. The acid test was specifically designed to test free time accuracy. This chapter also demonstrates that the testing process can be done manually by the supervisor or automatically by software developed for the test, without the knowledge of the production operator.

During the automated acid test, the problem of uncertainty was experienced. This problem also manifested itself in the Valpré plant experiment. The problem is described in this chapter together with the solution (conservative estimation) and reference is made to the practical problems experienced during the experiment.

Production machines are unreliable and can, therefore, break down at any moment. Uncertainty is dealt with by the introduction of two variables, i.e. entropic uncertainty and enthalpic certainty. These variables are not used in this dissertation with their original meaning in thermodynamics, but rather as an analogy in the free-time context. Uncertainty is also dealt with by adjusting the prime quantity in accumulators upstream from the key machine and adjusting the clear quantity in accumulators downstream from the key machine, in a process called conservative estimation. By adjusting these two variables, free time will be governed and deliver better results from the acid test. In the case of formula 5.15, by increasing the clear quantity, free time is reduced and by decreasing the prime quantity, free time is reduced.

The lower the free time, the more conservative it is in practice.

6.2 CONSERVATIVE ESTIMATION

Variables can be adjusted to produce a conservative estimation of free time. When we calculate free time conservatively, the outcome of the acid test is more likely to be successful. We could however lose out in obtaining the maximum available free time. We therefore need to adjust controllable parameters in the calculation to optimise free time.

The free time results can be made more conservative (indicating less free time) by adjusting the clear quantity (CQ) level upwards and free time can be made more conservative (indicating less free time) by decreasing the prime quantity (PQ). See Formula 5.15 from Chapter 5 below as an example:

$$FT_{M_{(3,1)}} = MAX\ od\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \dots (a) + \sum_{n=1}^{k-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \dots (c) + \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,k)}}} \dots (d)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \dots (m) + \sum_{n=1}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \dots (n) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \dots (p) \qquad \dots(5.15)$$

Uncertainty is caused by many factors. Here are five factors that were observed during the experiment:

i) Temporary or permanent wireless communication failure from one or more detectors in the process. Many factors affect the ability of the wireless devices to communicate constantly and at exactly the perfect moment when the calculation is made. Calculations are made every five (5) seconds for the production line experiment. This period may vary from process to process. If one detector is down, there is still sufficient good information available and free time calculated need not be compromised to the extent as will be the case if most of the detectors are not operational.

ii) Repeated power failures are causing boot-up delay issues and sequenced start-up problems. The loss of information during power failures can be very disruptive. Information during this time can be lost and product can move around the production line without being monitored. The result is incorrect counts that need to be fixed with the reset mechanism.

iii) Product and packaging quality problems in the production process are requiring product to be reworked. A very common problem is rework. Machines, material, method and man can fail. During any of or any combination of these failures, the product quality may be compromised. Poor product quality cannot be released to the next stage. The inevitable consequence is rework. Rework will affect accumulator levels in the calculation estimate not to match the physical count. Poor quality product can be removed from one accumulator, leaving the system to overstate the accumulator level. This product can be placed back onto a prior accumulator to be reworked and the effect will be an understated accumulation level in the placed accumulator.

iv) Unskilled operators are not operating production machines to their correct settings. A serial production machine is part of a coupled system in which each machine needs to fit into the flow of the production process. If a machine is set to run too fast, it will cause unnecessary shunting just as a car speeding in an even traffic flow pattern. The car will be required to stop periodically. This behaviour is defined as shunting. Shunting creates inaccurate throughput observations and could affect the free-time calculation accuracy. To deal with shunting, the throughput rate is smoothed mathematically by evaluating the history array and cancelling this effect from the free-time calculation.

v) Poor quality raw material that affects the throughput speed of the relevant machine. In many cases, production machine throughput speeds are affected by product quality. A good example is the thermal shrink-wrapping of product by a film to produce multipacks. When the film is newly manufactured and residual static is not removed properly, the machine has to deal with these electromagnetic forces and runs at a much slower and erratic speed than normal. This behaviour affects the accuracy of the throughput rate.

6.3 ENTROPIC UNCERTAINTY

Entropy, in thermodynamics, is commonly understood as a measure of disorder. In this context, entropic uncertainty is used as an analogy for the disorder on a specific production machine. The extent of the disorder is measured by calculating the real-time current throughput variation over ten (10) or more consecutive results. As the variation rises, the entropic uncertainty increases. This is evidence of repeating stop-and-start (shunting) events in the process. The entropic uncertainty variation is unique to each machine and first factored and then divided into the free-time calculation to govern the result.

6.4 ENTHALPIC CERTAINTY

Enthalpy is a state function in thermodynamics relating to the total energy of a system. Enthalpic uncertainty in this context is used as an analogy for the extent to which we have wireless signals from all the detectors discussed in Chapter 10. Enthalpic certainty is a machine-specific condition. Hundred per cent enthalpic certainty equates to all wireless signal communication between a specific machine and the free time computer to be in place. If we, for example, lose 1 out of 10 opportunities to communicate with the free time computer, the enthalpic certainty drops to 90 per cent and a further ten per cent for every five seconds that communication is lost. The calculated free time is multiplied by the factor of certainty 1 to 0 derived from the enthalpic certainty calculation.

For example in Appendix D line item 315495, the enthalpic certainty for M_2 is 60 per-cent. The DFT is 3 minutes and 47 seconds. Considering the enthalpic certainty of the machine, the 227 seconds are multiplied by 0.6 to give you 136.2 seconds = 2 minutes and 16 seconds. Enthalpic certainty is therefore used to adjust the DFT according to the certainty available given the extent to which the wireless signal is reliable.

The following proposition was formulated to test the theory of the conceptual model and more specifically the accuracy of the free-time calculations.

6.5 PROPOSITION 1: DEMONSTRATE THAT FREE TIME CAN BE CALCULATED ACCURATELY IN REAL-TIME

To demonstrate that free time can be calculated accurately, in real time, the acid test for free time accuracy was developed. This proposition is most important to the concept, as all other propositions are dependent on the success of this proposition. It forms the foundation on which the next two propositions were built.

The acid test, designed for testing this proposition, was specifically designed to address the first of the sub-questions in the research proposal: ‘How can I confirm that the calculated free time is accurate?’

If we, for example, calculate 20 minutes of free time at a production station and the operator starts using this free time and later this calculated free time proves to be inaccurate, the efficiency of the production process will be negatively affected. Moreover, in turn, operators could be rewarded by mistake for using free time judiciously while they are actually acting on incorrect information. Production machines could be started during start-up cycles of the production run, at incorrect times and cause shunting in the process with resulting loss in efficiency including wear and tear in the process.

6.5.1 The acid test definition

The acid test is defined as a physical test performed by stopping a production machine during the normal cause of its duties for a period, no longer than the free time displayed on the free time display described in Chapter 10 and starting the machine again before the free time runs out. The test then continues by observing the effect the stoppage has had on the bottleneck machine. A successful acid test is one where the test did not influence the bottleneck machine.

6.5.2 The manual acid test

The very first acid tests were performed manually. The supervisor would carry out the test while the production process was running. For the test, the supervisor would need a clipboard, a pen, a stopwatch, a wristwatch and the form to complete.

The operator had to perform this test randomly and not be expected by the production process operator. If the production machine had stopped prior to the test being performed, the test had to be planned at a different time.

The supervisor ensured the situation is safe by inspecting the workstation first. The supervisor then recorded the time of the test on the form. The supervisor took note to record the exact time in minutes and seconds as with the experiment, every second counts. It was therefore advised that the supervisor carried a digital watch. The supervisor immediately recorded the free time displayed on the free time display, started his stopwatch and simultaneously stopped the production machine. This was done by requesting the operator to do so or in the case where the supervisor had the knowledge; he stopped the machine himself. In most cases an emergency stop was used for this test, but some machines have a manual stop that protects the machine from the sudden stop normally associated with an emergency.

The rest of the document could be completed while the test continued. This included the machine location, the date and the supervisor's details. The supervisor had to take note, to start the machine on or before the stopwatch reached the time originally indicated on the display. The display continued to calculate free time due to the changes elsewhere in the production process. Therefore not all the free time necessary would have run out every time the test is performed. The supervisor must observe the production process for a period after the machine had been started to observe the effect of the stoppage on the bottleneck machine. This effect, depending on the location of the machine being tested, might only be seen long after the test was performed. This is because the shortage of production caused by the test would only be experienced when the sum of all the minimum accumulator travel times (MATT) of all the conveyors between the machines being tested and the bottleneck machine has been reached.

The supervisor had to carefully observe the bottleneck machine. If the bottleneck machine continued to run without any stoppage, the acid test was passed. If the bottleneck machine stopped, the supervisor had to first identify the root cause of the stoppage. If the bottleneck machine stopped due to a bottle neck machine problem, the test was discarded as invalid and the result was inconclusive. If the bottleneck machine was stopped due to starvation or blocking, the supervisor had to first determine if the starvation or blockage was not caused by another machine not currently being tested. If the supervisor had established that the stoppage was not caused by another machine, the free-time calculation had failed the acid test. In this case, the supervisor had to indicate on the form that the test had failed by marking the YES block on the question: 'Did the machine stop the filler before the free time has lapsed?' A small adjustment is then made to the relevant clear or prime quantity as this will be the reason for the failure.

The form that was used can be viewed in Appendix C.

6.5.3 Problems with the manual acid test

In many cases, the manual acid test results were inconclusive due to many other factors influencing the outcome. It therefore became difficult to conclude that the key machine stopped due to the stoppage imposed by doing the acid test. It therefore became necessary to develop an automated acid test that can be performed without any human interface.

6.5.4 The automated acid test

To prevent human error, the automated acid test was developed. During the normal cause of production many stoppages of machines occur. These stoppages are typically due to breakdowns, magazine replenishment, cleaning, maintenance, quality problems, etc. Each one of these stoppages presents the opportunity for an automated acid test.

To do the acid test, all the data is scrutinised. The test no longer takes a sample, as the total population of events are tested and, therefore, the results are without any uncertainty. The computer automatically tests conditions where downstream and upstream machines are stopped and the effect on the bottleneck machine is noted. The data in Appendix D is used to illustrate the automated acid test.

6.6 DATA EXTRACT EXPLANATION

All three tests that were developed as criteria for the model used the data in Appendix D to illustrate the test methods. For this reason, the data structure, descriptions and detail in Appendix D are explained in the following section:

The dataset has 42 columns and 2 069 rows. It represents 2 hours and 52 minutes of production, from 16H51 to 19H44 on 22 May 2014 and was recorded at the Valpré spring water production plant. Eight more months of data was available at the time of writing this document.

6.6.1 Column 1 label: id

The first column is an identity column used to refer to a specific 5-second interval in the data. For example on line 314500 the m2_speed is zero. Therefore, the machine has stopped.

Example: 314500

6.6.2 Column 2 label: read time example

The second column id shows the date and time stamp. It records the date and time up to the second. It records every five (5) seconds.

Example: 22-May-14-16-51-22

6.6.3 Column 3 label: m1_ft

The third column shows the free time as calculated by the free time formulae.

Example: 0:18:52

6.6.4 Column 4 label: m1_status

The fourth column shows a status for production machine 1. If the status is 1, the machine is not running; whereas a status of 2 indicates that the machine is running.

Example: 2

6.6.5 Column 5 label: m1_speed

The fifth column indicates the speed at which the machine is currently running. The speed is indicated in units per second up to one decimal place.

Example: 10.8

6.6.6 Column 6 label: enthalpic certainty

The sixth column indicates the enthalpic certainty of the machine. Enthalpic certainty is a measure of the extent to which we have reliable communication from the machine counter. The range is from 0 to 100. The lower the enthalpic certainty, the less reliable the count is and the more we cut back on the calculated free time, so as to not over-estimate the free time and cause inaccurate judicial use. See that in line 31506 the enthalpic certainty of machine 4 has dropped to 50.

Example: 80

6.6.7 Column 7 label: al_lev

The seventh column indicates the level in the accumulator. Each accumulator has a different maximum level designed by the original equipment manufacturer. Accumulator 1, defined as A1 and being the accumulator following machine 1, is at its maximum level 6300 and reached this level in line 314415 at exactly 22 May-14 17:17:03.

Example: 4184

6.6.8 Column 8 label: a1_cq

The eighth column indicates the clear quantity and is defined in Appendix B as the quantity of product in the accumulator after the required product have been drained from a completely full accumulator (during blocking) to allow the upstream machine to start effectively.

Example: 5300

6.6.9 Column 9 through 42 labels: various

The ninth through 42 columns are a repeat of columns 3 to 8 for machines 2, 3, 4, 5, 6 and 7.

Example: various

6.7 THE AUTOMATED ACID TEST EXPLANATION

The automated acid test is triggered every time a machine other than the key machine stops. In this section, the successful acid test is illustrated along with an inconclusive acid test, which happens if the requirements for the acid test to proceed, are not met.

6.7.1 A successful acid test

In Appendix D in identity line 315541 timestamp 22 May-14 18:51:32, the m2_speed for m2 changes to 0. The machine has therefore stopped. This is the trigger for an automated acid test. The free time at machine 2 when the machine stops is 0:03:19. See Table 6.1.

Table 6.1: Appendix D line item 315541 showing Machine 2 stopped

id	Read time	M1_ft	M1_status	M1_speed	M1_enthalpy	A1_lev	A1_cq	M2_ft	M2_status	M2_speed	M2_enthalpy	A2_lev	A2_cq
315541	22 May-14 18:51:32	0:00:00	2	11.2	100	3023	5300	0:03:19	1	0.0	100	2159	3600

The machine starts again on identity line 315564 timestamp 22 May-14 18:53:27, 1 minute and 55 seconds later. See Table 6.2.

Table 6.2: Appendix D line item 315564 showing Machine 2 starts

id	Read time	M1_ft	M1_status	M1_speed	M1_enthalpy	A1_lev	A1_cq	M2_ft	M2_status	M2_speed	M2_enthalpy	A2_lev	A2_cq
315564	22 May-14 18:53:27	0:00:00	2	10.6	100	4270	5300	0:01:30	2	1.5	100	1087	3600

During the time of the stoppage, the bottleneck machine M_1 never stopped and continued running long after the effect of M_2's stoppage has depleted. Only on identity line 315793 and timestamp 22 May-14 19:12:32 M_1 stops. This is 20 min and 25 seconds after the event. The MATT for accumulator 1 is 3 minutes 25 seconds. This stoppage is an example of an acid test passed.

6.7.2 An inconclusive acid test

In Appendix D in identity line 314500 timestamp 22 May-14 17:24:17, the m2_speed for M_2 is 0. The machine has therefore stopped. The free time at machine 2 when the machine stops is 0:01:31. The machine starts again on identity line 314541 timestamp 22 May-14 17:27:45, this is 2 minutes and 28 seconds later. M_2 was therefore stopped longer than the calculated free time and the test can be discarded. This stoppage is therefore an example of an inconclusive acid test. In this case, the information is discarded and not recorded in the acid test data summary.

This experiment continuously monitored the free time accuracy in the experiment and was maintained at more than 98 per cent accuracy by adjusting the clear quantities and thereby maintaining a conservative free-time calculation.

6.8 SUMMARY

This chapter defined free-time calculation accuracy as a criterion whereby we can test the model we have developed. Uncertainty was pointed out, resulting from factors such as temporary or permanent wireless communication failures, product and packaging quality problems in the production process, unskilled operators not operating production machines to their correct settings and poor quality raw material that affect the throughput speed of the relevant machine.

Two new variables were introduced to deal with uncertainty, namely enthalpic certainty and entropic uncertainty. These variables govern the effect of the uncertainty on the free-time calculation and ensure a conservative free time estimate during periods of heightened uncertainty.

With the free-time calculation now stable, the acid test was defined as the method whereby the criterion of accuracy can be tested.

The manual acid test was explained and also the way to manage the acid test passed rate by increasing the clear factor. The problems associated with the manual acid test in this high-speed environment were pointed out. An alternative automated method was designed and explained and data from the extract in Appendix D was scrutinised. One of the advantages of automating the acid test, is to replace sample information with an investigation of the full population of occurrances.

Another criterion in terms of which the model can be tested that builds nicely on the acid test, is the ability to co-ordinate activities during the start-up phase of the production process. In the next chapter, this criterion is discussed.

CHAPTER 7:
THE IMPLEMENTATION OF THE MODEL – THE START-UP TEST CRITERION

7.1 INTRODUCTION

Once the acid test had been developed as the test which would ensure accurate free-time calculations, the next challenge was attempted.

A classic problem in running large coupled production processes is to sequence the start-up and to avoid shunting. The following proposition was formulated to test the theoretical model during the start-up phase of the production process: Demonstrate that operators can start production processes better, given free-time start-up information.

In this chapter, the start-up test is defined. The manual start-up test is explained and problems with the manual start-up test are pointed out. The automated start-up test is developed and examples from the Valpré data set in Appendix D are used to demonstrate a late start-up and an early start-up.

7.2 PROPOSITION 2: DEMONSTRATE THAT OPERATORS CAN START PRODUCTION PROCESSES BETTER GIVEN FREE-TIME START-UP INFORMATION

Now that the challenge of accurate free time calculation has been solved, attention can be given to the start-up of the production process by way of the proposition that operators can start production processes better given free time start-up information. In production, process start-up is a very important phase of the production process. Many large processes can take weeks or even months to start up. During the start-up of a production process, significant efficiency can be gained or lost. Smaller production processes can start up in a much shorter time and normally do so more frequently. In both these cases there is a strong case to be made that improving the operator practices during this key activity will improve the efficiency of the production process. The start-up experiment tests the accuracy of the operator start-up behaviour. Free time displayed at production stations reduces as the product flow approaches each production station for the first time during start-up. The theoretical ideal moment for an operator to start a production machine is the moment when his machine has the lowest free time of all the machines in the production process. This indicates that the operator has been attentive of the current bottleneck signal and is now starting the production machine and preventing the machine from becoming a constraint during start-up and causing the production process to shunt.

The time leading up to the start-up moment was free time. If the operator had left the machine in automatic mode, the machine would have started when it was sufficiently primed. This would have lead to an early start-up and eventually starvation; the machine would then have experienced idle time, which is unpredictable and less useful.

7.2.1 Start-up test definition

A start-up test is performed during the start-up of a production process by measuring the time (duration) between the theoretical ideal start-up moment as calculated by the free time formulae and the actual start-up moment as observed by the tester.

7.2.2 The manual start-up test

This test can be done every time the production process starts up. The supervisor who is tasked to carry out the manual start-up test needed the following items: a clipboard, a wristwatch, a pen and a stopwatch. The supervisor had to take care as not to influence the operator's actions during the start-up. Typically, the operator would also monitor the free-time display if available and hence defeat the purpose of the experiment. For this reason, during the experimental period of eight weeks, the display was only mounted after the third week, making the ideal start-up moment invisible to the operator for the first three weeks, but visible to the supervisor on a hand-held device.

The supervisor had to ensure that the situation is safe by inspecting the workstation first. The supervisor stationed himself at machine 1 and monitored the machine 1 start-up without recording anything. Only once machine 1 was running smoothly, the supervisor walked the line downstream to machine 2. The supervisor could then record the date, the time on his wristwatch and his personal details on the form provided. The supervisor also then monitored the free-time display carefully together with the operator actions. If the operator started the machine before the free-time display indicated zero free time, the display time at the moment of start-up had to be recorded against the space provided for machine 2. Alternatively, if the free time ran out before the operator started the machine, the supervisor had to initiate the stopwatch and measure the time the operator took before starting the machine. This time had to be entered into the form provided for this purpose. The supervisor could then record any other information relating to the experiment such as external events that could have interfered, stoppages by machine 1 etc. The form for the manual start-up test is available in Appendix C.

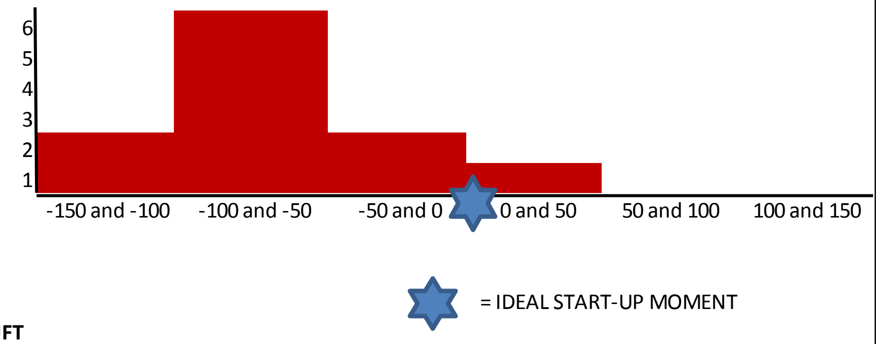
The supervisor then continued to follow the product down the production process to the position of machine 3 and repeated the experiment at machine 3 and at machine 4. The supervisor had to repeat the experiment as many times as possible to get an accurate picture of the current start-up behaviour. The aim was to train the operators and measure the change in start-up performance resulting from the training.

In Figure 7.1, the results of a typical manual start-up experiment can be observed. A negative number indicates an early start-up and a positive number identify a late start-up. Fifteen tests had been carried out for machine 2 before and fifteen tests were carried out after the free-time intervention training. The results in the first distribution show 13 cases of early start and two (2) cases of late start-up. The second distribution shows four (4) cases of early start and ten (10) cases of late start-up. Both early and late start-ups represent a loss in efficiency for the process. The ideal start-up moment is indicated by a blue star.

BEFORE PUFT

id	Start-up VAR
1	30
2	15
3	-45
4	-75
5	15
6	5
7	25
8	-40
9	-90
10	-120
11	-85
12	-90
13	-125
14	-70
15	-65

interv	Frequency
-150 and -100	2
-100 and -50	6
-50 and 0	2
0 and 50	5
50 and 100	0
100 and 150	0



AFTER PUFT

id	Start-up VAR
1	15
2	5
3	-20
4	30
5	35
6	45
7	60
8	-15
9	-5
10	5
11	10
12	35
13	45
14	40
15	35

interv	Frequency
-150 and -100	0
-100 and -50	0
-50 and 0	3
0 and 50	11
50 and 100	1
100 and 150	0

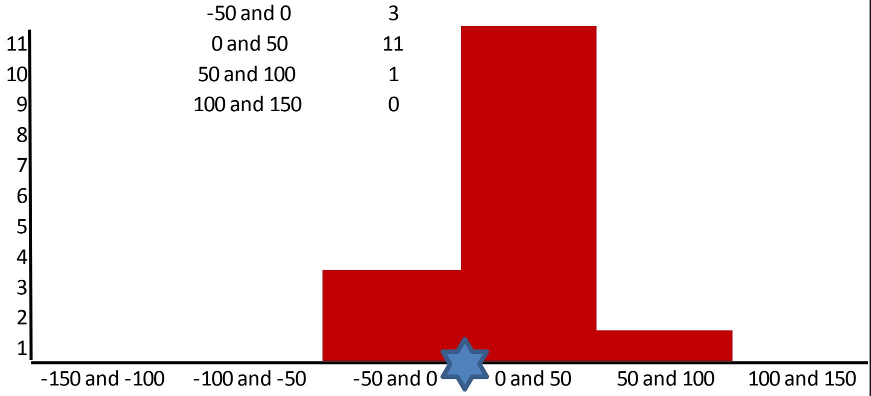


Figure 7.1: Start-up variation frequency distribution before and after free-time intervention

The arithmetic mean has improved from -76 seconds before the intervention to 21.3 seconds after the intervention. The range has been reduced from 160 seconds to 80 seconds. The mode from the first distribution was -75 seconds and has improved to 25 seconds after training. The median has shifted from -75 seconds early to only 25 seconds late after the intervention and the standard deviation improved from 38.56 seconds to 23.13 seconds.

Table 7.1: Statistical results for the distributions in Figure 7.1

Metric	Before PUFT training	After PUFT training
Arithmetic mean	-76.0 sec	21.3 sec
Range/Span	160.0 sec	80.0 sec
Mode	-75.0 sec	25.0 sec
Median	-69.6 sec	27.3 sec
Standard deviation	38.6 sec	23.1 sec

7.2.3 Problems with the manual start-up test

As was the case with the acid test, the start-up test was plagued by many human factors and limited in the number of experiments that could be carried out due to the the cost associated with these experiments. The fact that the operator had to make a decision, in the presence of his supervisor, further complicated the matter. An automated start-up test can eliminate all the human factors and can change the experiment from a sampling process to the ability to evaluate all the data in the population.

7.2.4 The automated start-up test

To prevent human error and to handle the vast number of opportunities for the start-up test, the automated start-up test was developed. With each stoppage at machine 1 that causes the process to run out completely, an opportunity to do the automated start-up test presents itself. The computer automatically detects the conditions for a start-up test and performs the test without the knowledge of the operators, therefore not influencing their behaviour.

7.3 THE AUTOMATED START-UP TEST EXPLANATION

7.3.1 A late start-up example

In Appendix D, in identity line 314154 and time stamp 22 May-14 16:54:58, m1_speed (the speed for machine 1) turns to 2.4 units per second after all the machines experienced a long stoppage. M2_speed, M3_speed, M4_speed etc. are all zero. The line was thus in sleep state (see Table 7.2). The first machine in the production process had started. This was the trigger for an automated start-up test to begin. At this point, M2_speed was zero and M2_ft = 0:10:40 giving the machine 2 operator 10 minutes and 40 seconds to start his machine.

Table 7.2: Appendix D line item 314154 showing Machine 1 starts

id	Read time	M1_ft	M1_status	M1_speed	M1_enthalpy	A1_lev	A1_cq	M2_ft	M2_status	M2_speed	M2_enthalpy	A2_lev	A2_cq
314154	22 May-14 16:54:58	0:00:00	2	2.4	100	114	5300	0:10:40	1	0.0	100	773	3600

Machine 2 was then tested by the start-up test. In identity line 314253 and time stamp 22 May-14 17:03:18 machine 2 starts, M2_speed = 3.5 units per second and M2_ft is already 0:00:00 (see Table 7.3).

Table 7.3 Appendix D line item 314253 showing Machine 2 starts

id	Read time	M1_ft	M1_status	M1_speed	M1_enthalpy	A1_lev	A1_cq	M2_ft	M2_status	M2_speed	M2_enthalpy	A2_lev	A2_cq
314253	22 May-14 17:03:18	0:00:26	2	11.2	100	5559	5300	0:00:00	2	3.5	100	843	3600

In fact, the free time was already depleted (M2_ft = 0) in identity line 314248 and time stamp 22 May-14 17:02:53 (see Table 7.4). The start-up therefore was 25 seconds late. This is an example of a late start-up. The operator should have started the machine 25 seconds earlier.

Table 7.4: Appendix D line item 314248 showing Machine 2 free time depleted

id	Read time	M1_ft	M1_status	M1_speed	M1_enthalpy	A1_lev	A1_cq	M2_ft	M2_status	M2_speed	M2_enthalpy	A2_lev	A2_cq
314248	22 May-14 17:02:53	0:00:00	2	11.6	100	5351	5300	0:00:00	1	0.0	100	773	3600

7.3.2 An early start-up

In Appendix D, in identity line 316044 and time stamp 22 May-14 19:33:27, Machine 1 starts (m1_speed = 3.8 units per second) after a long stoppage (see Table 7.5). The first machine in the production process therefore started with M2_speed, M3_speed, M4_speed etc. all zero. This was again the trigger for an automated start-up test.

Table 7.5: Appendix D line item 316044 showing Machine 1 starts

id	Read time	M1_ft	M1_status	M1_speed	M1_enthalpy	A1_lev	A1_cq	M2_ft	M2_status	M2_speed	M2_enthalpy	A2_lev	A2_cq
316044	22 May-14 19:33:27	0:00:00	2	3.8	100	190	5300	0:10:39	1	0.0	100	711	3600

In identity line 316118 and time stamp 22 May-14 19:39:37, machine 2 started with the speed at 2.8 unit per second and the free time at machine 2 still at 1 min 33 seconds (M2_ft = 0:01:33). See Table 7.6.

Table 7.6: Appendix D line item 316118 showing Machine 2 starts

id	Read time	M1_ft	M1_status	M1_speed	M1_enthalpy	A1_lev	A1_cq	M2_ft	M2_status	M2_speed	M2_enthalpy	A2_lev	A2_cq
316118	22 May-14 19:39:37	0:00:00	2	11.3	100	4219	5300	0:01:33	2	2.8	100	766	3600

With the free time not completely run-out at the time of starting machine 2, the operator had executed an early start-up.

This experiment continuously monitors every start-up of the production process for all machines and the need for training can be deducted from the results.

7.4 SUMMARY

In this chapter production process start-up accuracy was defined as a criterion whereby the model we have developed can be tested. The effects of late and early start-up were discussed and how it can affect production efficiency. The manual start-up test was explained and the difficulties experienced resulting from the human factor. An alternative automated method was demonstrated.

With the free-time calculation now stable and proven by the acid test and an automated start-up test in place, the ability of the operators to start the machines at the ideal moment could now be tested continuously. Examples of the automated early and late start-up test were explained using data from the extract in Appendix D. A further benefit in automating the start-up test is the move from sampling start-up data, to testing the entire population of data. Another criterion where the model can be tested that builds nicely on the start-up test, is the use of free time during production. In the next chapter, the criterion of judicious use is demonstrated.

CHAPTER 8:

IMPLEMENTATION OF THE MODEL – THE JUDICIOUS USE CRITERION

8.1 INTRODUCTION

With the successful calculation of accurate free time achieved in Chapter 6 and the start-up test successfully developed in Chapter 7, the third and final criterion can be addressed. Operators, as part of their normal duties, have to make choices while the production process is running. One of these choices is the decision when to stop a production process to do minor tasks such as repair, clean, measure or the changing of magazines. The operator is generally not aware of free time and simply allows a machine to run idle with the consequential inefficiency and additional energy consumed during the idle period. Free time can be used productively if the operator stops his production machine, does useful work while the machine is stationary, while saving energy in the process.

In theory, there are good times to stop a production machine and there are bad times to stop a production machine. Simply put, when a production operator stops a production machine for a period and without affecting the bottleneck machine or current constraint machine, the event is defined as the judicious use of free time.

The following proposition was formulated to test the theoretical model during the normal running of the production process: Demonstrate that operators can stop production processes judiciously given accurate free-time information.

In this chapter, judicious use of free time is defined. The manual judicious use test is explained together with the manual form that had to be completed. Problems experienced with the manual judicious use test are explained and the automated judicious use test is described with the aid of the data extracted from the Valpré experiment in Appendix D. Examples of judicious use and non-judicious use are explained.

8.2 PROPOSITION 3: DEMONSTRATE THAT OPERATORS CAN STOP PRODUCTION PROCESSES JUDICIOUSLY GIVEN ACCURATE FREE-TIME INFORMATION

Having now demonstrated that free time and start-up effectiveness can be measured accurately, the last proposition on the judicious use of free time is examined.

Stopping the production machine at the right time is very important to maintain production efficiency. The free time displayed at production stations constantly changes as the randomness of minor stoppages causes the bottleneck to move around the process. Theoretically, the ideal moment for an operator to stop a production machine is when there is sufficient time available to carry out the task or activity that is required. In other words, the operator must stop the process only when he will not become the bottleneck; there must thus be sufficient excess capacity at his disposal. The operator cannot always choose when to stop a machine, for example, he cannot choose the moment when raw material runs out; these tasks are non-discretionary. Non-discretionary tasks are typically the stopping of a production machine for the changing of magazines or film rolls, etc.

However, there are many small discretionary tasks where the operator can choose the moment to stop the process. Taking a break, inspecting, cleaning or maintaining the machine are all examples of discretionary stoppages. The judicious use of free time measures the extent to which the operator changes his behaviour and starts to use free-time windows to stop the process. Missing these free-time windows will evidently end up as unplanned downtime in the form of idle time.

To demonstrate that productive free time can replace idle time and that operators can use free time judiciously, operators were tested before they had knowledge and access to free-time information, and again after they had been trained and had been given access to free-time information.

8.2.1 The judicious use test definition

This is a test performed during the normal running of the production process to evaluate if the operator has used free-time information to execute discretionary stoppages judiciously – stopping the production machine at the ideal opportunities.

8.2.2 The manual judicious use test

The form for the manual judicious test is available in Appendix C. The test can be conducted at any time during normal production. The supervisor, who was tasked to carry out the manual start-up test, needed the following items: a clipboard, a wristwatch, a stopwatch and a pen. The supervisor must take care not to influence the operator's actions during the start-up. For the experimental period of eight weeks, the display of free time was only mounted after the third week, making the ideal moment for stoppage invisible to the operator for the first three weeks, but visible to the supervisor on a hand-held device. The supervisor had to ensure that the situation was safe by inspecting the workstation first. The supervisor stationed himself at any machine for a full shift of eight hours, monitored the machine and recorded the following: the date, time, his name and the machine number being tested.

Then the supervisor had to answer the following question: 'Is the in-feed of the machine primed?' This tests whether there is sufficient product at the in-feed of the machine to start running. High-speed production process machines will not start running if there is not sufficient product at the in-feed of the machine to justify the production cycle of the machine to start. Typically in batch machines there needs to be a minimum of one batch available to process before the machine will cycle.

The next item the supervisor had to note and record on the form, was whether the discharge of the machine is clear or not. A production machine in a coupled production process cannot start production if there is no space on its discharge conveyor. The term used referring to the concept developed in Chapter 4 for describing the extent to which the conveyor needs to be cleared, is the clear quantity (CQ).

Next, the supervisor had to monitor the free time available. If there was free time available, the supervisor had to record this by marking the YES option on the form. Only once all three these conditions had been met, the machine is ready for the judicious use test. The supervisor had to wait at the machine for all the conditions to be met. The supervisor had to then prepare himself for the test by continuing to observe the three qualifying criteria. If any of the three qualifying criteria changed during the period of observation, the test had to be paused and started again only after the criteria had been met.

The supervisor had to witness an incident where the operator stopped his machine manually and started it within a period, with all three qualifying criteria still in place. The supervisor had to start his stopwatch and record the time of the stoppage. If the supervisor had witnessed such an event, he could mark YES on the form and record the total duration of the event. This experiment had to be repeated every time all the conditions had been met throughout the shift. At the end of the shift, the judicious use percentage could be calculated as follows:

Judicious use per cent = ((Bottleneck running hours + machine judicious running hours)/shift hours) x 100

8.2.3 Problems with the manual judicious use test

The judicious use test has many ‘moving parts’. Human error is a real problem and the fact that the test takes a full eight-hour shift to produce one record makes the process expensive and cumbersome. The estimation of prime and clear levels in the accumulators cannot be done with consistent accuracy. This poses a real problem as even a small number of samples proved very costly to obtain. For these reasons an automated judicious use test was developed.

8.2.4 The automated judicious use test

Expensive and slow progress with the manual judicious use test inspired the development of the automated judicious use test. The automated judicious use test opportunity presents itself every time a machine stops and starts again in a period where free time was available, its in-feed accumulator primed and its discharge accumulator cleared. The data was queried to analyse all instances where this incident presented itself and the total duration per shift per machine was recorded. This test is done with no human interface and represents all the data in the population. There is therefore no sampling involved.

8.3 THE JUDICIOUS USE TEST EXPLANATION

In the judicious use, there are three possible scenarios. Firstly, there is the condition of judicious use; there are also two scenarios under which non-judicious use can be observed. These refer to the non-judicious use during a blocking situation and the non-judicious use during starvation.

8.3.1 Judicious use

Observe Appendix D, identity line 314587: M2_speed, the speed for machine 2, just turned to 0 unit per second. It therefore follows that M_2 had just stopped. The A1_lev is 4018, showing that the in-feed accumulator to M_2 is primed and the A2_lev = 3376 is less than the A2 clear quantity A2_cq = 3600, the discharge accumulator for M_2 is therefore cleared (see Table 8.1).

Table 8.1: Appendix D line item 314587 showing Machine 2 stopped

id	M1_ft	M1_status	M1_speed	M1_enthalpy	A1_lev	A1_cq	M2_ft	M2_status	M2_speed	M2_enthalpy	A2_lev	A2_cq
314587	0:00:00	1	0.0	100	4018	5300	0:02:40	2	0.0	100	3376	3600

In Appendix D, in identity line 314596 and time stamp 22 May-14 17:32:28 M2_speed for M_2 turns to 1,1 units per second. It therefore indicates that M_2 had just started (see Table 8.2). The A1_lev is now 3999 showing that the in- feed accumulator is still primed and the A2_lev is 3376, still less than the clear quantity A2_cq = 3600. The discharge accumulator is therefore still cleared.

Table 8.2: Appendix D line item 314596 showing Machine 2 starting

id	M1_ft	M1_status	M1_speed	M1_enthalpy	A1_lev	A1_cq	M2_ft	M2_status	M2_speed	M2_enthalpy	A2_lev	A2_cq
314596	0:00:00	1	0.0	100	3999	5300	0:02:40	2	1.1	100	3206	3600

This shows that the operator of machine 2 had stopped and started the machine during a period where the operator had free time with its in-feed accumulator primed and its discharge accumulator cleared. He therefore had no reason related to the product for not running with free time at his disposal. This is an example of the judicious use of 47 seconds of free time on Machine 2.

8.3.2 Non-judicious use (blocking)

In Appendix D, in identity line 314500 and time stamp 22 May-14 17:24:17 M2_speed for M_2 turns to 0 units per second. It therefore indicates that M_2 had just stopped. The A1_lev is 4559 showing that the in-feed accumulator is primed but the A2_lev 4500 is more than the clear quantity A2_cq, 3600; the discharge accumulator is therefore not cleared. See Table 8.3

Table 8.3: Appendix D line item 314500 showing Machine 2 has stopped

id	M1_ft	M1_status	M1_speed	M1_enthalpy	A1_lev	A1_cq	M2_ft	M2_status	M2_speed	M2_enthalpy	A2_lev	A2_cq
314500	0:00:06	2	7.8	100	4559	5300	0:01:31	2	0.0	100	4500	3600

This indicates that the production process and not the operator, stopped machine 2. The blocking sensor in accumulator 2 had stopped the machine to prevent accumulator 2 from overflowing. This is an example where idle time was created because of free time not used when it presented itself on identity line 314253 and timestamp 22 May-14 17:03:18 20 min and 59 seconds earlier in the shift (see Table 8.4). Unused free time previously, became non-useful idle time now, M2_ft = 0.

Table 8.4: Appendix D line item 314253 showing free time available but not used

id	M1_ft	M1_status	M1_speed	M1_enthalpy	A1_lev	A1_cq	M2_ft	M2_status	M2_speed	M2_enthalpy	A2_lev	A2_cq
314253	0:00:26	2	11.2	100	5559	5300	0:00:00	2	3.5	100	843	3600

In this example M2 ‘used’ free time un-judiciously from line identity 314500 at time stamp 22 May-14 17:24:17 to line identity 314541 at time stamp 22 May-14 17:27:45. This period represents 2 minutes and 28 seconds of idle time due to blocking of accumulator 2.

8.3.3 Non-judicious use (starvation)

In Appendix D, in identity line 314716 and time stamp 22 May-14 17:42:37 M3_speed for M_3 turns to 0 units per second. It therefore indicates that M_3 had just stopped. The A2_lev is as low as 594 showing that the in-feed accumulator is not primed. The A3_lev = 2364, is less than the clear quantity A3_cq = 2550; the discharge accumulator is therefore cleared.

In this case, machine 3 was stopped due to no product available at the in-feed of the machine. This is a case of starvation – another type of non-judicious use of free time. If the operator for example stopped his machine 8 minutes and 23 seconds earlier at line identity 314617 and time stamp 22 May-14 17:34:14, he could have used this idle time productively.

8.4 SUMMARY

In this chapter the judicious use of free time was defined as a criterion by which the free time model can be tested. First, the manual method was explained with the difficulties experienced in the gathering of data. An automated solution was then presented.

The effects of not using free time when it is available and how it changes to idle time due to blocking or starvation, with the resulting efficiency loss, was discussed.

We have now reached the point where we are confident that the free time calculated is accurate – demonstrated by the acid test. Furthermore, operators can be measured on improving the start-up of their machines and operators can be observerd to establish whether they are using free time judiciously. All the tools necessary to conduct the experiment are now available. In the next chapters, the Parow and the Valpré plant experiments are discussed and the three criteria are used to put the relevant parts of the theory to test.

CHAPTER 9:
THE PAROW PLANT FORMULATIONS

9.1 INTRODUCTION

The Parow Coca-Cola plant, line number six, boasts all the aspects necessary to fit the model developed in Chapter 4. It has a complete V-profile, with large accumulation conveyors and finite buffers. This makes this line ideal for the development of the free-time formulae. In this chapter, the Parow plant is described. The V-profile for the line is plotted and the production line details are shared. The Parow machine and accumulator matrices are developed and the free-time formulae for each of the machines are formulated and important learnings from this chapter are highlighted.

9.2 BACKGROUND

The Peninsula Beverage Coca-Cola bottling plant is situated in the Parow neighbourhood in Cape Town, Western Cape, South Africa. The plant was recognised as one of the top ten bottling plants for Coca-Cola in the Eurasia and African region in 2012. (Biz Community, 2012). The plant is well known, because it is the third largest Coca-Cola licensee in South Africa with a production capacity of 28 000 bph (IHS, 2014).

9.3 THE PAROW PRODUCTION PROCESS V-PROFILE

In Figure 9.1 the unique V-profile of the Parow production plant is plotted. The production line has nine (9) machines, whereas the standard model described in Chapter 4, has five (5) machine types. There are thus more than one type-2 and type-4 machines in the production line at the Parow plant.

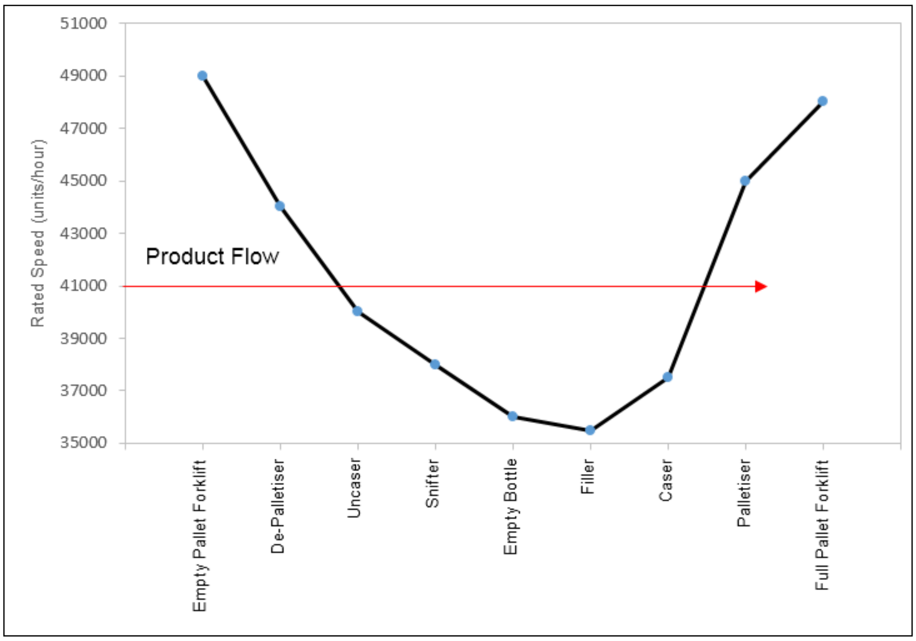


Figure 9.1: V-profile for the Parow plant

The machines and types in the downstream sequence are detailed in Table 9.1.

Table 9.1: Machine names and type justification for the Parow line

Machine	Names	Type	Type justification
1	Empty pallet forklift	1	Is the first machine in the process
2	De-palletiser	2	Its in-feed machine is faster than the de-palletiser and is rated faster than its discharge machine, the uncaser.
3	Un-caser	2	Its in-feed machine is also faster than the uncaser and is rated faster than its discharge machine, the snifter
4	Snifter	2	Its in-feed machine, the uncaser is also faster than the snifter and is also rated faster than its discharge machine, the EBI
5	Empty bottler inspector (EBI)	2	Its in-feed machine, the snifter is also faster than the EBI and is also rated faster than its discharge machine, the filler
6	Filler	3	Its in-feed and discharge machines have a higher rated speed. This machine is at the bottom of the V-profile and is the designed bottleneck or key machine.
7	Case packer	4	Its in-feed machine, the filler, is slower than the case packer and its discharge machine is faster than its own rated speed.
8	Palletiser	4	Its in-feed machine, the case packer, is slower than the palletiser and is faster than its discharge machine, the full pallet forklift.
9	Full pallet forklift	5	Is the last machine in the production process. It has an infinite buffer on its discharge and is faster than its in-feed machine, the palletiser.

9.4 PRODUCTION MACHINE DETAILS

9.4.1 The empty pallet forklift

The empty pallet forklift is the forklift that loads the empty bottles, pre-packed in cases and on pallets, into the production process. The forklift can cycle as fast as the operator can deliver pallets to the production process. The forklift is a cycle machine and its throughput in units per second is calculated by measuring the cycle time. The empty pallet forklift can hold 70 cases with 12 bottles per case. The following Figure 9.2 shows the empty pallet forklift conveyor. The pallets are placed in the first accumulator and moves to the next machine, the de-palletiser to be de-layered and the cases to be filled. The full pallet forklift can supply 34 000 bottles per hour (9.4 bottles per second) to the production line.

Figure 9.2: Empty pallet forklift conveyor

9.4.2 The de-palletiser

The de-palletiser disassembles the empty bottles pallet stack and places the layers on the production line. The cases now move in single file to the uncaser. The de-palletiser works at 31 400 bottles per hour (8.72 bottles per second).

Figure 9.3: De-palletiser

9.4.3 The uncaser

The uncaser removes the bottles from their cases and places them in singles on the production line. The uncaser works at 30 400 bottles per hour (8.44 bottles per second). The bottles then move on to the snifter machine to be inspected for internal contamination.

Figure 9.4: Uncaser

9.4.4 The snifter

A snifter is necessary on re-use bottling lines, to detect foreign liquids and residual volatilities in the bottles. The bottles are rejected if the sniffer detects any trace of a range of pre-programmed substances. The snifter operates at 29 200 bottles per hour (8.11 bottles per hour). The bottles then move on to be washed and visually inspected.

Figure 9.5: Snifter

9.4.5 The empty bottle inspector

After the bottles have been washed, in what is essentially a large accumulator, the empty clean bottles are now inspected. The empty bottle inspector (EBI) detects foreign particles in the bottles, scuffed bottles and bottles that need further cleaning. Bottles failing inspection are rejected from the bottling line and leave the finite buffer. The bottle inspector operates at 28 200 bottles per hour (7.83 bottles per second).

Figure 9.6: Empty bottle inspector

9.4.6 The filler

With a production capacity of 28 100 bottles per hour (7.8 bottles per second), the filler at the Parow plant is one of the largest bottle fillers in South Africa. The filling machine fills the bottles with the product and seals the bottle with a closure.

Figure 9.7: Filler

9.4.7 The case packer

The case packer packs bottles from the mass accumulation stage on the conveyor into returnable plastic cases. The case packer works at 29 500 bottles per hour (8.2 bottles per second).

Figure 9.8: Case packer

9.4.8 The palletiser

The palletiser arranges the full product cases from the case packer into layers, which it then stacks onto a wooden pallet. The palletiser places cases at 33 100 bottles per hour (9.19 bottles per second).

Figure 9.9: Palletiser

9.4.9 The full pallet forklift

The full pallet forklift removes the product for the coupled production process into the space where the free-time concept does not apply. The full pallet forklift handles finished product at a rated speed of 34 900 bottles per hour (9.69 bottles per second). Products are placed in the warehouse and prepared for shipping to customers.

Figure 9.10: Full pallet forklift

9.5 FREE-TIME FORMULAE

In Chapter 5 the five general solution formulae for start-up and normal running free-time calculations were developed for the five (5) machine types and were expressed as follows:

Type-1:

$$FT_{M_{(1,1)}} = MAX\ of\ \frac{AL_{A_{(1,1)}} - PQ_{A_{(1,1)}}}{RTR_{M_{(2,1)}}} \ldots (i) + \sum_{n=1}^{k-1} \frac{AL_{A_{(2,n)}} - PQ_{A_{(2,n)}}}{RTR_{M_{(2,n+1)}}} \ldots (k) + \frac{AL_{A_{(3,1)}} - PQ_{A_{(3,1)}}}{RTR_{M_{(3,1)}}} \ldots (l)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \ldots (m) + \sum_{n=1}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \ldots (n) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \ldots (p) \qquad \ldots(5.11)$$

Type-2:

$$FT_{M_{(2,j)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \ldots (a) + \sum_{n=1}^{j-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \ldots (b)\ or$$

$$\frac{AL_{A_{(1,1)}} - PQ_{A_{(1,1)}}}{RTR_{M_{(2,1)}}} \ldots (i) + \sum_{n=j}^{k-1} \frac{AL_{A_{(2,n)}} - PQ_{A_{(2,n)}}}{RTR_{M_{(2,n+1)}}} \ldots (j) + \frac{AL_{A_{(3,1)}} - PQ_{A_{(3,1)}}}{RTR_{M_{(3,1)}}} \ldots (l)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \ldots (m) + \sum_{n=1}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \ldots (n) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \ldots (p) \qquad \ldots(5.13)$$

Type-3

$$FT_{M_{(3,1)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \ldots (a) + \sum_{n=1}^{k-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \ldots (c) + \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,k)}}} \ldots (d)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \ldots (m) + \sum_{n=1}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \ldots (n) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \ldots (p) \qquad \ldots(5.15)$$

Type-4

$$FT_{M_{(4,j)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \ldots (a) + \sum_{n=1}^{k-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \ldots (c) + \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,k)}}} \ldots (d)\ or$$

$$\frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}} \ldots (e) + \sum_{n=1}^{j-1} \frac{CQ_{A_{(4,n)}} - AL_{A_{(4,n)}}}{RTR_{M_{(4,n)}}} \ldots (f) + \frac{CQ_{A_{(5,1)}} - AL_{A_{(5,1)}}}{RTR_{M_{(4,l)}}} \ldots (h)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \ldots (m) + \sum_{n=j}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \ldots (o) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \ldots (p) \qquad \ldots(5.17)$$

Type-5

$$FT_{M_{(5,1)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \ldots (a) + \sum_{n=1}^{k-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \ldots (c) + \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,k)}}} \ldots (d)\ or$$

$$\frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}} \ldots (e) + \sum_{n=1}^{l-1} \frac{CQ_{A_{(4,n)}} - AL_{A_{(4,n)}}}{RTR_{M_{(4,n)}}} \ldots (g) + \frac{CQ_{A_{(5,1)}} - AL_{A_{(5,1)}}}{RTR_{M_{(4,l)}}} \ldots (h) \qquad \ldots(5.19)$$

9.6 NOMENCLATURE

Refer to Appendix A for a full list of definitions used in this dissertation

$A_{(i,j)}$ Accumulator at position i, j

$M_{(i,j)}$ Machine at position i, j

$PQ_{A_{(i,j)}}$ Prime quantity of Accumulator $A_{(i,j)}$

$CQ_{A_{(i,j)}}$ Clear quantity of Accumulator $A_{(i,j)}$

$AL_{A_{(i,j)}}$ Accumulator level of Accumulator $A_{(i,j)}$

$RTR_{M_{(i,j)}}$ Relevant throughput rate of $M_{(i,j)}$

9.7 PAROW MACHINE MATRIX

In the matrix in Figure 9.11, i represents the number of machine positions. Parow has all five general machine types. Parow has all the possible machine types in its V-profile. j represents the number of machines associated with each machine type. The Parow line has the following number of machines associated with each machine position:

If i = 1 then j = 1

If i = 2 then j = 4

If i = 3 then j = 1

If i = 4 then j = 2

If i = 5 then j = 1

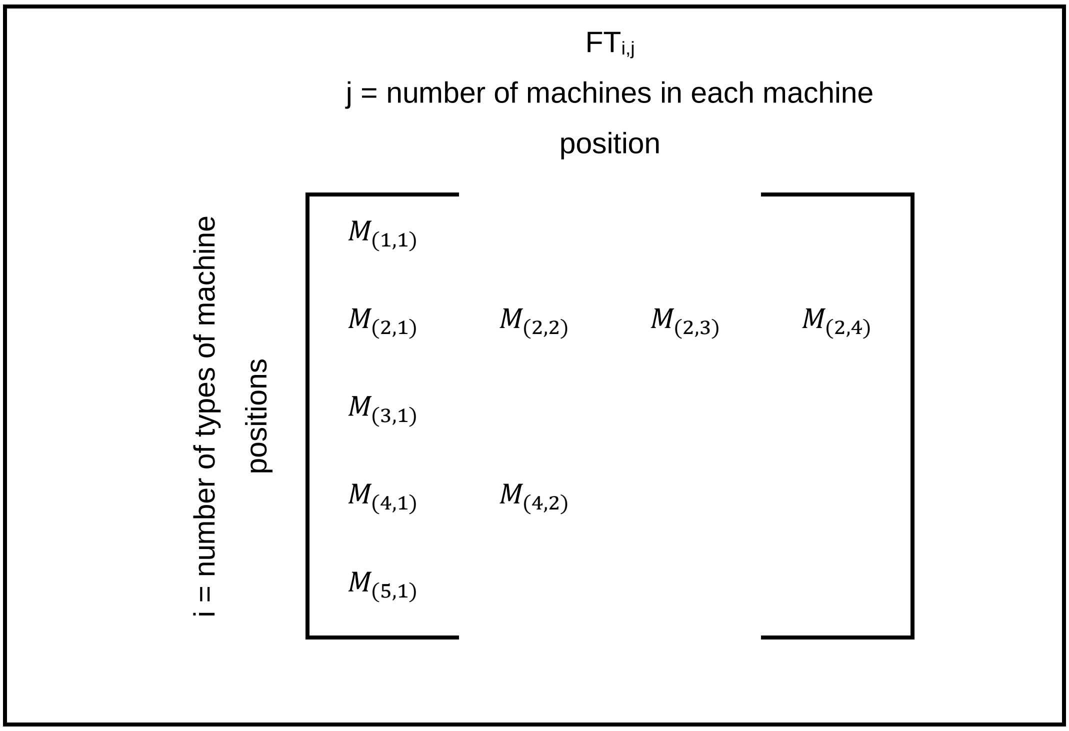


Figure 9.11: Parow machine matrix

9.8 PAROW ACCUMULATOR MATRIX

In the matrix in Figure 9.12, i represents the number of accumulators positions. Parow has all five generic accumulator position types. Parow has all possible machine types in its V-profile. j represents the number of accumulators associated with each accumulator type. The Parow line has the following number of accumulators associated with each accumulator position:

If i = 1 then j = 1

If i = 2 then j = 3

If i = 3 then j = 2

If i = 4 then j = 1

If i = 5 then j = 1

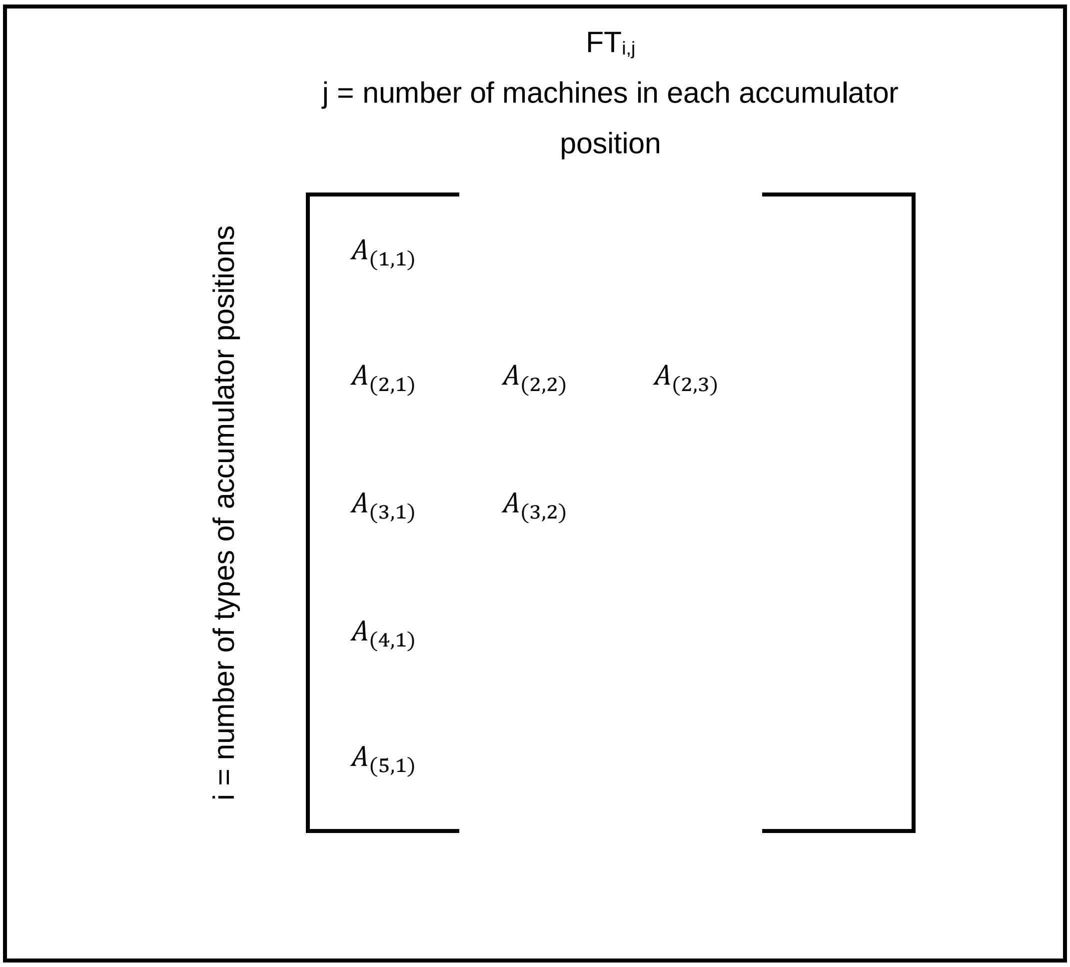


Figure 9.12: Parow accumulator matrix

9.9 PAROW FREE-TIME CALCULATIONS

The following formulae describe the free time calculations at each machine on the Parow plant:

9.9.1 Machine 1

Machine 1 is a type-1 machine. The formula that was developed in Chapter 5 for machine type-1 is:

$$FT_{M_{(1,1)}} = MAX\ of\ \frac{AL_{A_{(1,1)}} - PQ_{A_{(1,1)}}}{RTR_{M_{(2,1)}}} \dots (i) + \sum_{n=1}^{k-1} \frac{AL_{A_{(2,n)}} - PQ_{A_{(2,n)}}}{RTR_{M_{(2,n+1)}}} \dots (k) + \frac{AL_{A_{(3,1)}} - PQ_{A_{(3,1)}}}{RTR_{M_{(3,1)}}} \dots (l)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \dots (m) + \sum_{n=1}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \dots (n) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \dots (p) \qquad \dots(5.11)$$

Equations i, k and l represent free time where the accumulator levels are subtracted from the prime quantities (type-3 free time) for type (1,1), (2,j) and (3,1) accumulators. Equations m, n and p represent free time where the accumulator levels are subtracted from the clear quantities (type-4 free time) for type (3,2), (4,j) and (5,1) accumulators.

Figure 9.13 illustrates the way these formulae calculate the free time of the machine in position (1,1) in the machine matrix. Machine 1 (or 1,1) receives free time from each accumulator on the production line. Each accumulator is 'linked' to a machine's throughput rate, but an accumulator cannot be linked to the machine of which the free time is being calculated. For clarification purposes, each accumulator's contribution to machine 1's free time is summarised as an X, with a subscript that indicates the accumulator's position on the production line.

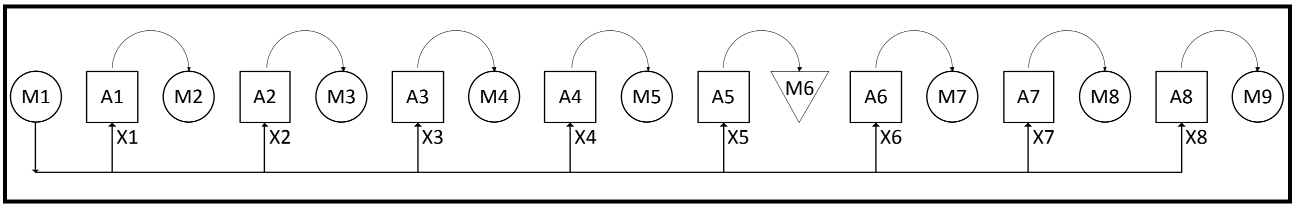


Figure 9.13: Machine 1's free time calculation

The Y terms in the equations below is used as logical operators in the software to ensure free time is only obtained from accumulators if the bridging accumulator is full. This is the additional free time obtained during blocking and starvation.

Machine 1's free time is calculated as follows:

$$FT_{M_{(1,1)}} = MAX(X_1 + X_2 + X_3 + X_4 + X_5, X_6 + X_7 + X_8, 0) \quad ...(9.1)$$

where

$$X_1 = \frac{AL_{A_{(1,1)}} - PQ_{A_{(1,1)}}}{RTR_{M_{(2,1)}}}, if\ X_1 < 0, then\ X_1 = 0, else\ X_1 = X_1$$

$$X_2 = \frac{AL_{A_{(2,1)}} - PQ_{A_{(2,1)}}}{RTR_{M_{(2,2)}}}, if\ X_2 < 0, then\ X_2 = 0, else\ X_2 = X_2$$

$$X_3 = \frac{AL_{A_{(2,2)}} - PQ_{A_{(2,2)}}}{RTR_{M_{(2,3)}}}, if\ X_3 < 0, then\ X_3 = 0, else\ X_3 = X_3$$

$$X_4 = \frac{AL_{A_{(2,3)}} - PQ_{A_{(2,3)}}}{RTR_{M_{(2,4)}}}, if\ X_4 < 0, then\ X_4 = 0, else\ X_4 = X_4$$

$$X_5 = \frac{AL_{A_{(3,1)}} - PQ_{A_{(3,1)}}}{RTR_{M_{(3,1)}}}, if\ X_5 < 0, then\ X_5 = 0, else\ X_5 = X_5$$

$$X_6 = \frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}}, if\ X_6 < 0, then\ Y_6 = X_6 and\ then\ X_6 = 0, else\ X_6 = X_6 and\ Y_6 = 0$$

$$X_7 = \frac{AL_{A_{(4,1)}} - CQ_{A_{(4,1)}}}{RTR_{M_{(4,2)}}} + Y_6, if\ X_7 < 0, then\ Y_7 = X_7\ and\ then\ X_7 = 0, else\ X_7 = X_7 and\ Y_7 = 0$$

$$X_8 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_7, if\ X_8 < 0, then\ X_8 = 0, else\ X_8 = X_8$$

9.9.2 Machine 2

Machine 2 is a type-2 machine. The formula that was developed in Chapter 5 for machine type-2 is:

$$FT_{M_{(2,j)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \dots (a) + \sum_{n=1}^{j-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \dots (b)\ or$$

$$\frac{AL_{A_{(1,1)}} - PQ_{A_{(1,1)}}}{RTR_{M_{(2,1)}}} \dots (i) + \sum_{n=j}^{k-1} \frac{AL_{A_{(2,n)}} - PQ_{A_{(2,n)}}}{RTR_{M_{(2,n+1)}}} \dots (j) + \frac{AL_{A_{(3,1)}} - PQ_{A_{(3,1)}}}{RTR_{M_{(3,1)}}} \dots (l)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \dots (m) + \sum_{n=1}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \dots (n) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \dots (p) \quad \dots(5.13)$$

Equations a and b represent free time where the prime quantities are subtracted from the accumulator levels (type-1 free time) for type (1,1), (2,j) and (3,1) accumulators. Equations i, j and l represent free time where the accumulator levels are subtracted from the prime quantities (type-3 free time) for type (1,1), (2,j) and (3,1) accumulators. Equations m, n and p represent free time where the accumulator levels are subtracted from the clear quantities (type-4 free time) for type (3,2), (4,j) and (5,1) accumulators.

Figure 9.14 illustrates the way these formulae calculate the free time of the machine in position (2,1) in the machine matrix. Machine 2 (or 2,1) receives free time from each accumulator on the production line. Note how the focus has shifted from machine 1 in Figure 9.13 to machine 2 in Figure 9.14.

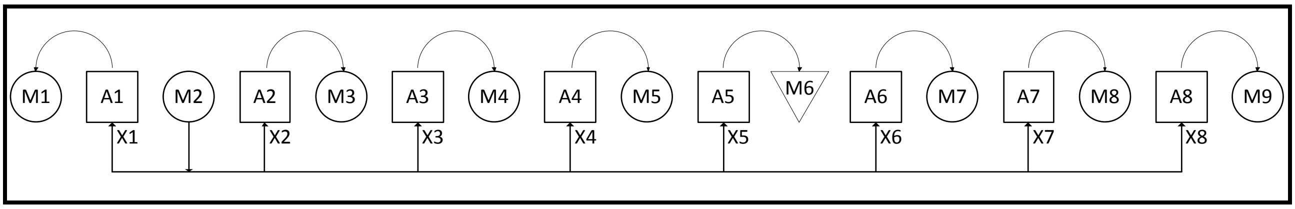


Figure 9.14: Machine 2's free time calculation

The Y terms in the equations below is used as logical operators in the software to ensure free time is only obtained from accumulators if the bridging accumulator is full. This is the additional free time obtained during blocking and starvation. Machine 2's free time is calculated as follows:

$$FT_{M_{(2,1)}} = MAX(X_1, X_2 + X_3 + X_4 + X_5, X_6 + X_7 + X_8, 0) \quad ...(9.2)$$

where

$$X_1 = \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}}$$

$$X_2 = \frac{AL_{A_{(2,1)}} - PQ_{A_{(2,1)}}}{RTR_{M_{(2,2)}}}, if\ X_2 < 0, then\ X_2 = 0, else\ X_2 = X_2$$

$$X_3 = \frac{AL_{A_{(2,2)}} - PQ_{A_{(2,2)}}}{RTR_{M_{(2,3)}}}, if\ X_3 < 0, then\ X_3 = 0, else\ X_3 = X_3$$

$$X_4 = \frac{AL_{A_{(2,3)}} - PQ_{A_{(2,3)}}}{RTR_{M_{(2,4)}}}, if\ X_4 < 0, then\ X_4 = 0, else\ X_4 = X_4$$

$$X_5 = \frac{AL_{A_{(3,1)}} - PQ_{A_{(3,1)}}}{RTR_{M_{(3,1)}}}, if\ X_5 < 0, then\ X_5 = 0, else\ X_5 = X_5$$

$$X_6 = \frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}}, if\ X_6 < 0, then\ Y_6 = X_6 and\ then\ X_6 = 0, else\ X_6 = X_6 and\ Y_6 = 0$$

$$X_7 = \frac{AL_{A_{(4,1)}} - CQ_{A_{(4,1)}}}{RTR_{M_{(4,2)}}} + Y_6, if\ X_7 < 0, then\ Y_7 = X_7 and\ then\ X_7 = 0, else\ X_7 = X_7 and\ Y_7 = 0$$

$$X_8 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_7, if\ X_8 < 0, then\ X_8 = 0, else\ X_8 = X_8$$

9.9.3 Machine 3

Machine 3 is a type-2 machine. The formula that was developed in Chapter 5 for machine type-2 is:

$$FT_{M_{(2,j)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}}-AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \ldots (a) + \sum_{n=1}^{j-1} \frac{PQ_{A_{(2,n)}}-AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \ldots (b)\ or$$

$$\frac{AL_{A_{(1,1)}}-PQ_{A_{(1,1)}}}{RTR_{M_{(2,1)}}} \ldots (i) + \sum_{n=j}^{k-1} \frac{AL_{A_{(2,n)}}-PQ_{A_{(2,n)}}}{RTR_{M_{(2,n+1)}}} \ldots (j) + \frac{AL_{A_{(3,1)}}-PQ_{A_{(3,1)}}}{RTR_{M_{(3,1)}}} \ldots (l)\ or$$

$$\frac{AL_{A_{(3,2)}}-CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \ldots (m) + \sum_{n=1}^{l-1} \frac{AL_{A_{(4,n)}}-CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \ldots (n) + \frac{AL_{A_{(5,1)}}-CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \ldots (p) \quad \ldots(5.13)$$

.

Equations a and b represent free time where the prime quantities are subtracted from the accumulator levels (type-1 free time) for type (1,1), (2,j) and (3,1) accumulators. Equations i, j and l represent free time where the accumulator levels are subtracted from the prime quantities (type-3 free time) for type (1,1), (2,j) and (3,1) accumulators. Equations m, n and p represent free time where the accumulator levels are subtracted from the clear quantities (type-4 free time) for type (3,2), (4,j) and (5,1) accumulators.

Figure 9.15 illustrates the way these formulae calculate the free time of the machine in position (2,2) in the machine matrix. Machine 3 (or 2,2) receives free time from each accumulator on the production line. Note how the focus has shifted from machine 2 in Figure 9.14 to machine 3 in Figure 9.15.

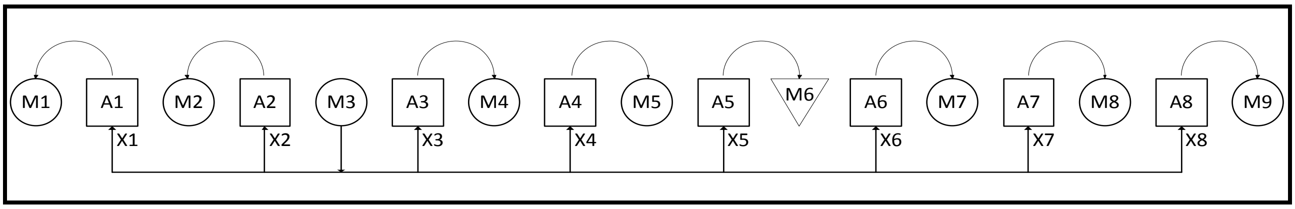


Figure 9.15: Machine 3's free time calculation

The Y terms in the equations below is used as logical operators in the software to ensure free time is only obtained from accumulators if the bridging accumulator is full. This is the additional free time obtained during blocking and starvation. Machine 3's free time is calculated as follows:

$$FT_{M_{(2,2)}} = MAX(X_1 + X_2, X_3 + X_4 + X_5, X_6 + X_7 + X_8, 0) \quad \ldots(9.3)$$

where

$$X_1 = \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} + Y_2$$

$$X_2 = \frac{PQ_{A_{(2,1)}} - AL_{A_{(2,1)}}}{RTR_{M_{(2,1)}}}, if\ X_2 < 0, then\ Y_2 = X_2\ and\ then\ X_2 = 0, else\ X_2 = X_2\ and\ Y_2 = 0$$

$$X_3 = \frac{AL_{A_{(2,2)}} - PQ_{A_{(2,2)}}}{RTR_{M_{(2,3)}}}, if\ X_3 < 0, then\ X_3 = 0, else\ X_3 = X_3$$

$$X_4 = \frac{AL_{A_{(2,3)}} - PQ_{A_{(2,3)}}}{RTR_{M_{(2,4)}}}, if\ X_4 < 0, then\ X_4 = 0, else\ X_4 = X_4$$

$$X_5 = \frac{AL_{A_{(3,1)}} - PQ_{A_{(3,1)}}}{RTR_{M_{(3,1)}}}, if\ X_5 < 0, then\ X_5 = 0, else\ X_5 = X_5$$

$$X_6 = \frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}}, if\ X_6 < 0, then\ Y_6 = X_6 and\ then\ X_6 = 0, else\ X_6 = X_6 and\ Y_6 = 0$$

$$X_7 = \frac{AL_{A_{(4,1)}} - CQ_{A_{(4,1)}}}{RTR_{M_{(4,2)}}} + Y_6, if\ X_7 < 0, then\ Y_7 = X_7 and\ then\ X_7 = 0, else\ X_7 = X_7 and\ Y_7 = 0$$

$$X_8 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_7, if\ X_8 < 0, then\ X_8 = 0, else\ X_8 = X_8$$

9.9.4 Machine 4

Machine 4 is a type-2 machine. The formula that was developed in Chapter 5 for machine type-2 is:

$$FT_{M_{(2,j)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \dots (a) + \sum_{n=1}^{j-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \dots (b)\ or$$

$$\frac{AL_{A_{(1,1)}} - PQ_{A_{(1,1)}}}{RTR_{M_{(2,1)}}} \dots (i) + \sum_{n=j}^{k-1} \frac{AL_{A_{(2,n)}} - PQ_{A_{(2,n)}}}{RTR_{M_{(2,n+1)}}} \dots (j) + \frac{AL_{A_{(3,1)}} - PQ_{A_{(3,1)}}}{RTR_{M_{(3,1)}}} \dots (l)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \dots (m) + \sum_{n=1}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \dots (n) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \dots (p) \qquad \dots(5.13)$$

Equations a and b represent free time where the prime quantities are subtracted from the accumulator levels (type-1 free time) for type (1,1), (2,j) and (3,1) accumulators. Equations i, j and l represent free time where the accumulator levels are subtracted from the prime quantities (type-3 free time) for type (1,1), (2,j) and (3,1) accumulators. Equations m, n and p represent free time where the accumulator levels are subtracted from the clear quantities (type-4 free time) for type (3,2), (4,j) and (5,1) accumulators.

Figure 9.16 illustrates the way these formulae calculate the free time of the machine in position (2,3) in the machine matrix. Machine 4 (or 2,3) receives free time from each accumulator on the production line. Note how the focus has shifted from machine 3 in Figure 9.15 to machine 4 in Figure 9.16.

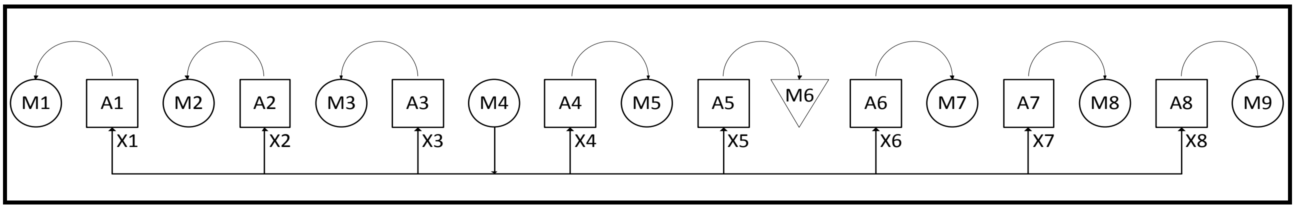


Figure 9.16: Machine 4's free time calculation

The Y terms in the equations below is used as logical operators in the software to ensure free time is only obtained from accumulators if the bridging accumulator is full. This is the additional free time obtained during blocking and starvation. Machine 4's free time is calculated as follows**:**

$$FT_{M_{(2,3)}} = MAX(X_1 + X_2 + X_3, X_4 + X_5, X_6 + X_7 + X_8, 0) \qquad ...(9.4)$$

where

$$X_1 = \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} + Y_2$$

$$X_2 = \frac{PQ_{A_{(2,1)}} - AL_{A_{(2,1)}}}{RTR_{M_{(2,1)}}}, if\ X_2 < 0, then\ Y_2 = X_2\ and\ then\ X_2 = 0, else\ X_2 = X_2\ and\ Y_2 = 0$$

$$X_3 = \frac{PQ_{A_{(2,2)}} - AL_{A_{(2,2)}}}{RTR_{M_{(2,2)}}}, if\ X_3 < 0, then\ Y_3 = X_3\ and\ then\ X_3 = 0, else\ X_3 = X_3\ and\ Y_3 = 0$$

$$X_4 = \frac{AL_{A_{(2,3)}} - PQ_{A_{(2,3)}}}{RTR_{M_{(2,4)}}}, if\ X_4 < 0, then\ X_4 = 0, else\ X_4 = X_4$$

$$X_5 = \frac{AL_{A_{(3,1)}} - PQ_{A_{(3,1)}}}{RTR_{M_{(3,1)}}}, if\ X_5 < 0, then\ X_5 = 0, else\ X_5 = X_5$$

$$X_6 = \frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}}, if\ X_6 < 0, then\ Y_6 = X_6 and\ then\ X_6 = 0, else\ X_6 = X_6 and\ Y_6 = 0$$

$$X_7 = \frac{AL_{A_{(4,1)}} - CQ_{A_{(4,1)}}}{RTR_{M_{(4,2)}}} + Y_6, if\ X_7 < 0, then\ Y_7 = X_7 and\ then\ X_7 = 0, else\ X_7 = X_7 and\ Y_7 = 0$$

$$X_8 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_7, if\ X_8 < 0, then\ X_8 = 0, else\ X_8 = X_8$$

9.9.5 Machine 5

Machine 5 is a type-2 machine. The formula that was developed in Chapter 5 for machine type-2 is:

$$FT_{M_{(2,j)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \dots (a) + \sum_{n=1}^{j-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \dots (b)\ or$$

$$\frac{AL_{A_{(1,1)}} - PQ_{A_{(1,1)}}}{RTR_{M_{(2,1)}}} \dots (i) + \sum_{n=j}^{k-1} \frac{AL_{A_{(2,n)}} - PQ_{A_{(2,n)}}}{RTR_{M_{(2,n+1)}}} \dots (j) + \frac{AL_{A_{(3,1)}} - PQ_{A_{(3,1)}}}{RTR_{M_{(3,1)}}} \dots (l)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \dots (m) + \sum_{n=1}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \dots (n) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \dots (p) \qquad \dots(5.13)$$

Equations a and b represent free time where the prime quantities are subtracted from the accumulator levels (type-1 free time) for type (1,1), (2,j) and (3,1) accumulators. Equations i, j and l represent free time where the accumulator levels are subtracted from the prime quantities (type-3 free time) for type (1,1), (2,j) and (3,1) accumulators. Equations m, n and p represent free time where the accumulator levels are subtracted from the clear quantities (type-4 free time) for type (3,2), (4,j) and (5,1) accumulators.

Figure 9.17 illustrates the way these formulae calculate the free time of the machine in position (2,4) in the machine matrix. Machine 5 (or 2,4) receives free time from each accumulator on the production line. Note how the focus has shifted from machine 4 in Figure 9.16 to machine 5 in Figure 9.17.

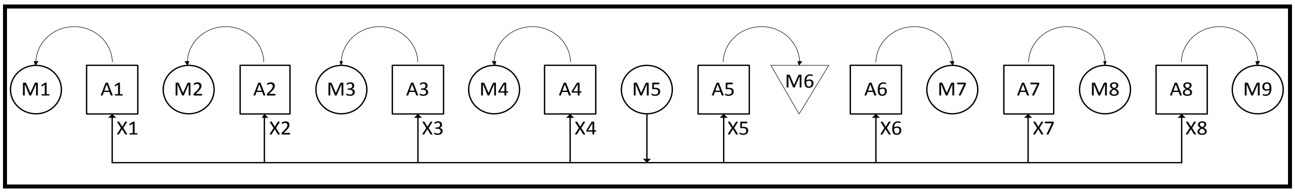


Figure 9.17: Machine 5's free time calculation

The Y terms in the equations below is used as logical operators in the software to ensure free time is only obtained from accumulators if the bridging accumulator is full. This is the additional free time obtained during blocking and starvation. Machine 5's free time is calculated as follows:

$$FT_{M_{(2,4)}} = MAX(X_1 + X_2 + X_3 + X_4, X_5, X_6 + X_7 + X_8, 0) \qquad \dots(9.5)$$

where

$$X_1 = \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} + Y_2$$

$$X_2 = \frac{PQ_{A_{(2,1)}} - AL_{A_{(2,1)}}}{RTR_{M_{(2,1)}}} + Y_3, if\ X_2 < 0, then\ Y_2 = X_2\ and\ then\ X_2 = 0, else\ X_2 = X_2\ and\ Y_2 = 0$$

$$X_3 = \frac{PQ_{A_{(2,2)}} - AL_{A_{(2,2)}}}{RTR_{M_{(2,2)}}} + Y_4, if\ X_3 < 0, then\ Y_3 = X_3\ and\ then\ X_3 = 0, else\ X_3 = X_3\ and\ Y_3 = 0$$

$$X_4 = \frac{PQ_{A_{(2,3)}} - AL_{A_{(2,3)}}}{RTR_{M_{(2,3)}}}, if\ X_4 < 0, then\ Y_4 = X_4\ and\ then\ X_4 = 0, else\ X_4 = X_4\ and\ Y_4 = 0$$

$$X_5 = \frac{AL_{A_{(3,1)}} - PQ_{A_{(3,1)}}}{RTR_{M_{(3,1)}}}, if\ X_5 < 0, then\ X_5 = 0, else\ X_5 = X_5$$

$$X_6 = \frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}}, if\ X_6 < 0, then\ Y_6 = X_6 and\ then\ X_6 = 0, else\ X_6 = X_6 and\ Y_6 = 0$$

$$X_7 = \frac{AL_{A_{(4,1)}} - CQ_{A_{(4,1)}}}{RTR_{M_{(4,2)}}} + Y_6, if\ X_7 < 0, then\ Y_7 = X_7 and\ then\ X_7 = 0, else\ X_7 = X_7 and\ Y_7 = 0$$

$$X_8 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_7, if\ X_8 < 0, then\ X_8 = 0, else\ X_8 = X_8$$

9.9.6 Machine 6

Machine 6 is a type-3 machine. The formula that was developed in Chapter 5 for machine type-3 is:

$$FT_{M_{(3,1)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \ldots (a) + \sum_{n=1}^{k-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \ldots (c) + \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,k)}}} \ldots (d)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \ldots (m) + \sum_{n=1}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \ldots (n) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \ldots (p) \qquad \ldots(5.15)$$

Equations a, c and d represent free time where the prime quantities are subtracted from the accumulator levels (type-1 free time) for type (1,1), (2,j) and (3,1) accumulators. Equations m, n and p represent free time where the accumulator levels are subtracted from the clear quantities (type-4 free time) for type (3,2), (4,j) and (5,1) accumulators.

Figure 9.18 illustrates the way these formulae calculate the free time of the machine in position (3,1) in the machine matrix. Machine 6 (or 3,1) receives free time from each accumulator on the production line. Note how the focus has shifted from machine 5 in Figure 9.17 to machine 6 in Figure 9.18.

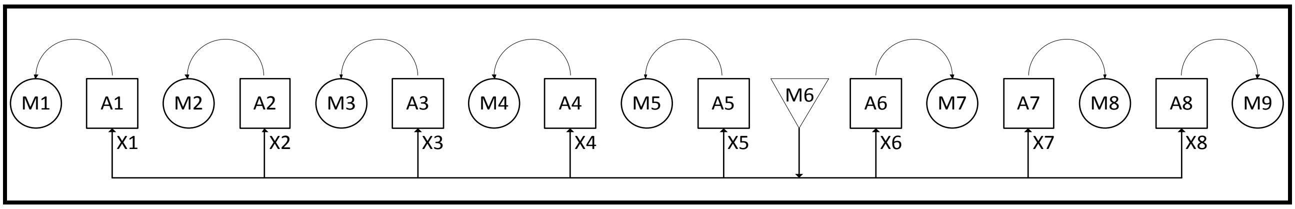


Figure 9.18: Machine 6's free time calculation

The Y terms in the equations below is used as logical operators in the software to ensure free time is only obtained from accumulators if the bridging accumulator is full. This is the additional free time obtained during blocking and starvation. Machine 6's free time is calculated as follows:

$$FT_{M_{(3,1)}} = MAX(X_1 + X_2 + X_3 + X_4 + X_5, X_6 + X_7 + X_8, 0) \qquad ...(9.6)$$

where

$$X_1 = \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} + Y_2$$

$$X_2 = \frac{PQ_{A_{(2,1)}} - AL_{A_{(2,1)}}}{RTR_{M_{(2,1)}}} + Y_3, if\ X_2 < 0, then\ Y_2 = X_2\ and\ then\ X_2 = 0, else\ X_2 = X_2\ and\ Y_2 = 0$$

$$X_3 = \frac{PQ_{A_{(2,2)}} - AL_{A_{(2,2)}}}{RTR_{M_{(2,2)}}} + Y_4, if\ X_3 < 0, then\ Y_3 = X_3\ and\ then\ X_3 = 0, else\ X_3 = X_3\ and\ Y_3 = 0$$

$$X_4 = \frac{PQ_{A_{(2,3)}} - AL_{A_{(2,3)}}}{RTR_{M_{(2,3)}}} + Y_5, if\ X_4 < 0, then\ Y_4 = X_4\ and\ then\ X_4 = 0, else\ X_4 = X_4\ and\ Y_4 = 0$$

$$X_5 = \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,4)}}}, if\ X_5 < 0, then\ Y_5 = X_5\ and\ then\ X_5 = 0, else\ X_5 = X_5\ and\ Y_5 = 0$$

$$X_6 = \frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}}, if\ X_6 < 0, then\ Y_6 = X_6 and\ then\ X_6 = 0, else\ X_6 = X_6 and\ Y_6 = 0$$

$$X_7 = \frac{AL_{A_{(4,1)}} - CQ_{A_{(4,1)}}}{RTR_{M_{(4,2)}}} + Y_6, if\ X_7 < 0, then\ Y_7 = X_7 and\ then\ X_7 = 0, else\ X_7 = X_7 and\ Y_7 = 0$$

$$X_8 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_7, if\ X_8 < 0, then\ X_8 = 0, else\ X_8 = X_8$$

9.9.7 Machine 7

Machine 7 is a type-4 machine. The formula that was developed in Chapter 5 for machine type-4 is:

$$FT_{M_{(4,j)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \ldots (a) + \sum_{n=1}^{k-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \ldots (c) + \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,k)}}} \ldots (d)\ or$$

$$\frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}} \ldots (e) + \sum_{n=1}^{j-1} \frac{CQ_{A_{(4,n)}} - AL_{A_{(4,n)}}}{RTR_{M_{(4,n)}}} \ldots (f) + \frac{CQ_{A_{(5,1)}} - AL_{A_{(5,1)}}}{RTR_{M_{(4,l)}}} \ldots (h)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \ldots (m) + \sum_{n=j}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \ldots (o) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \ldots (p) \qquad \ldots(5.17)$$

Equations a, c and d represent free time where the prime quantities are subtracted from the accumulator levels (type-1 free time) for type (1,1), (2,j) and (3,1) accumulators. Equations e, f and h represent free time where the accumulator levels are subtracted from the prime quantities (type-2 free time) for type (3,2), (4,j) and (5,1) accumulators Equations m, n and p represent free time where the accumulator levels are subtracted from the clear quantities (type-4 free time) for type (3,2), (4,j) and (5,1) accumulators.

Figure 9.19 illustrates the way these formulae calculate the free time of the machine in position (4,1) in the machine matrix. Machine 7 (or 4,1) receives free time from each accumulator on the production line. Note how the focus has shifted from machine 6 in Figure 9.18 to machine 7 in Figure 9.19.

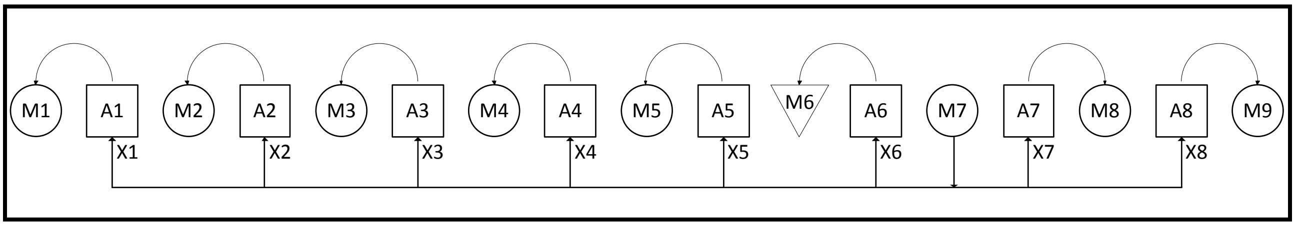


Figure 9.19: Machine 7's free time calculation

The Y terms in the equations below is used as logical operators in the software to ensure free time is only obtained from accumulators if the bridging accumulator is full. This is the additional free time obtained during blocking and starvation. Machine 7's free time is calculated as follows:

$$FT_{M_{(4,1)}} = MAX(X_1 + X_2 + X_3 + X_4 + X_5, X_6, X_7 + X_8, 0) \quad ...(9.7)$$

where

$$X_1 = \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} + Y_2$$

$$X_2 = \frac{PQ_{A_{(2,1)}} - AL_{A_{(2,1)}}}{RTR_{M_{(2,1)}}} + Y_3, if\ X_2 < 0, then\ Y_2 = X_2\ and\ then\ X_2 = 0, else\ X_2 = X_2\ and\ Y_2 = 0$$

$$X_3 = \frac{PQ_{A_{(2,2)}} - AL_{A_{(2,2)}}}{RTR_{M_{(2,2)}}} + Y_4, if\ X_3 < 0, then\ Y_3 = X_3\ and\ then\ X_3 = 0, else\ X_3 = X_3\ and\ Y_3 = 0$$

$$X_4 = \frac{PQ_{A_{(2,3)}} - AL_{A_{(2,3)}}}{RTR_{M_{(2,3)}}} + Y_5, if\ X_4 < 0, then\ Y_4 = X_4\ and\ then\ X_4 = 0, else\ X_4 = X_4\ and\ Y_4 = 0$$

$$X_5 = \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,4)}}}, if\ X_5 < 0, then\ Y_5 = X_5\ and\ then\ X_5 = 0, else\ X_5 = X_5\ and\ Y_5 = 0$$

$$X_6 = \frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}}, if\ X_6 < 0, then\ X_6 = 0, else\ X_6 = X_6$$

$$X_7 = \frac{AL_{A_{(4,1)}} - CQ_{A_{(4,1)}}}{RTR_{M_{(4,2)}}} + Y_6, if\ X_7 < 0, then\ Y_7 = X_7 and\ then\ X_7 = 0, else\ X_7 = X_7 and\ Y_7 = 0$$

$$X_8 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_7, if\ X_8 < 0, then\ X_8 = 0, else\ X_8 = X_8$$

9.9.8 Machine 8

Machine 8 is a type-4 machine. The formula that was developed in Chapter 5 for machine type-4 is:

$$FT_{M_{(4,j)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \ldots (a) + \sum_{n=1}^{k-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \ldots (c) + \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,k)}}} \ldots (d)\ or$$

$$\frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}} \ldots (e) + \sum_{n=1}^{j-1} \frac{CQ_{A_{(4,n)}} - AL_{A_{(4,n)}}}{RTR_{M_{(4,n)}}} \ldots (f) + \frac{CQ_{A_{(5,1)}} - AL_{A_{(5,1)}}}{RTR_{M_{(4,l)}}} \ldots (h)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \ldots (m) + \sum_{n=j}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \ldots (o) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \ldots (p) \qquad \ldots(5.17)$$

Equations a, c and d represent free time where the prime quantities are subtracted from the accumulator levels (type-1 free time) for type (1,1), (2,j) and (3,1) accumulators. Equations e, f and h represent free time where the accumulator levels are subtracted from the prime quantities (type-2 free time) for type (3,2), (4,j) and (5,1) accumulators Equations m, n and p represent free time where the accumulator levels are subtracted from the clear quantities (type-4 free time) for type (3,2), (4,j) and (5,1) accumulators.

Figure 9.20 illustrates the way these formulae calculate the free time of the machine in position (4,2) in the machine matrix. Machine 8 (or 4,2) receives free time from each accumulator on the production line. Note how the focus has shifted from machine 7 in Figure 9.19 to machine 8 in Figure 9.20.

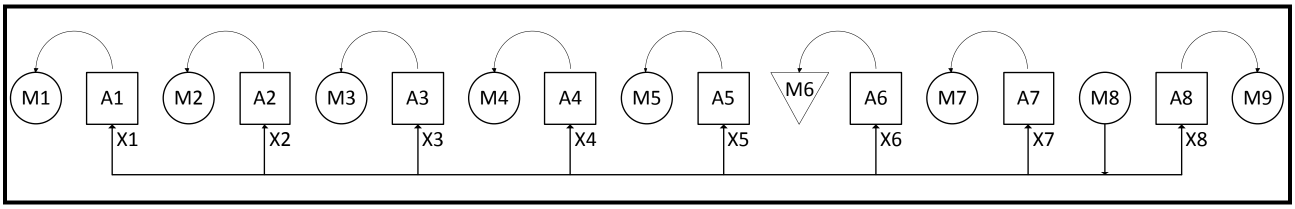


Figure 9.20: Machine 8's free time calculation

The Y terms in the equations below is used as logical operators in the software to ensure free time is only obtained from accumulators if the bridging accumulator is full. This is the additional free time obtained during blocking and starvation. Machine 8's free time is calculated as follows:

$$FT_{M_{(4,2)}} = MAX(X_1 + X_2 + X_3 + X_4 + X_5, X_6 + X_7, X_8, 0) \qquad \ldots(9.8)$$

where

$$X_1 = \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} + Y_2$$

$$X_2 = \frac{PQ_{A_{(2,1)}} - AL_{A_{(2,1)}}}{RTR_{M_{(2,1)}}} + Y_3, if\ X_2 < 0, then\ Y_2 = X_2\ and\ then\ X_2 = 0, else\ X_2 = X_2\ and\ Y_2 = 0$$

$$X_3 = \frac{PQ_{A_{(2,2)}} - AL_{A_{(2,2)}}}{RTR_{M_{(2,2)}}} + Y_4, if\ X_3 < 0, then\ Y_3 = X_3\ and\ then\ X_3 = 0, else\ X_3 = X_3\ and\ Y_3 = 0$$

$$X_4 = \frac{PQ_{A_{(2,3)}} - AL_{A_{(2,3)}}}{RTR_{M_{(2,3)}}} + Y_5, if\ X_4 < 0, then\ Y_4 = X_4\ and\ then\ X_4 = 0, else\ X_4 = X_4\ and\ Y_4 = 0$$

$$X_5 = \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,4)}}}, if\ X_5 < 0, then\ Y_5 = X_5\ and\ then\ X_5 = 0, else\ X_5 = X_5\ and\ Y_5 = 0$$

$$X_6 = \frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}}, if\ X_6 < 0, then\ X_6 = 0, else\ X_6 = X_6$$

$$X_7 = \frac{CQ_{A_{(4,1)}} - AL_{A_{(4,1)}}}{RTR_{M_{(4,1)}}}, if\ X_7 < 0, then\ X_7 = 0, else\ X_7 = X_7$$

$$X_8 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}}, if\ X_8 < 0, then\ X_8 = 0, else\ X_8 = X_8$$

9.9.9 Machine 9

Machine 9 is a type-5 machine. The formula that was developed in Chapter 5 for machine type-5 is:

$$FT_{M_{(5,1)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \ldots (a) + \sum_{n=1}^{k-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \ldots (c) + \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,k)}}} \ldots (d)\ or$$

$$\frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}} \ldots (e) + \sum_{n=1}^{l-1} \frac{CQ_{A_{(4,n)}} - AL_{A_{(4,n)}}}{RTR_{M_{(4,n)}}} \ldots (g) + \frac{CQ_{A_{(5,1)}} - AL_{A_{(5,1)}}}{RTR_{M_{(4,l)}}} \ldots (h) \qquad \ldots(5.19)$$

Equations a, c and d represent free time where the prime quantities are subtracted from the accumulator levels (type-1 free time) for type (1,1), (2,j) and (3,1) accumulators. Equations e, g and h represent free time where the accumulator levels are subtracted from the prime quantities (type-2 free time) for type (3,2), (4,j) and (5,1) accumulators.

Figure 9.21 illustrates the way these formulae calculate the free time of the machine in position (5,1) in the machine matrix. Machine 9 (or 5,1) receives free time from each accumulator on the production line. Note how the focus has shifted from machine 8 in Figure 9.20 to machine 9 in Figure 9.21.

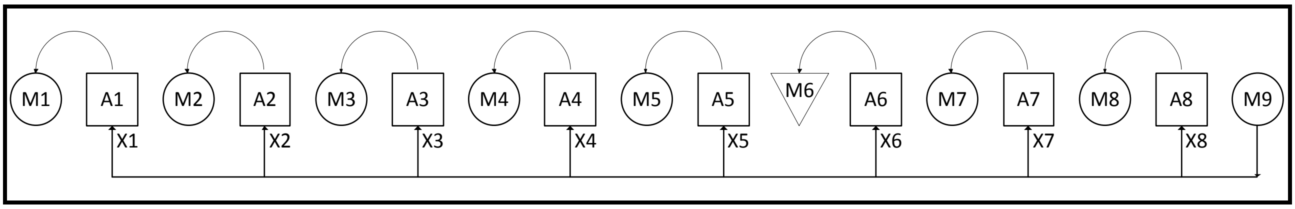


Figure 9.21: Machine 9's free time calculation

The Y terms in the equations below is used as logical operators in the software to ensure free time is only obtained from accumulators if the bridging accumulator is full. This is the additional free time obtained during blocking and starvation. Machine 9's free time is calculated as follows:

$$FT_{M_{(5,1)}} = MAX(X_1 + X_2 + X_3 + X_4 + X_5, X_6 + X_7 + X_8, 0) \quad \text{...(9.9)}$$

where

$$X_1 = \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} + Y_2$$

$$X_2 = \frac{PQ_{A_{(2,1)}} - AL_{A_{(2,1)}}}{RTR_{M_{(2,1)}}} + Y_3, if\ X_2 < 0, then\ Y_2 = X_2\ and\ then\ X_2 = 0, else\ X_2 = X_2\ and\ Y_2 = 0$$

$$X_3 = \frac{PQ_{A_{(2,2)}} - AL_{A_{(2,2)}}}{RTR_{M_{(2,2)}}} + Y_4, if\ X_3 < 0, then\ Y_3 = X_3\ and\ then\ X_3 = 0, else\ X_3 = X_3\ and\ Y_3 = 0$$

$$X_4 = \frac{PQ_{A_{(2,3)}} - AL_{A_{(2,3)}}}{RTR_{M_{(2,3)}}} + Y_5, if\ X_4 < 0, then\ Y_4 = X_4\ and\ then\ X_4 = 0, else\ X_4 = X_4\ and\ Y_4 = 0$$

$$X_5 = \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,4)}}}, if\ X_5 < 0, then\ Y_5 = X_5\ and\ then\ X_5 = 0, else\ X_5 = X_5\ and\ Y_5 = 0$$

$$X_6 = \frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}}, if\ X_6 < 0, then\ X_6 = 0, else\ X_6 = X_6$$

$$X_7 = \frac{CQ_{A_{(4,1)}} - AL_{A_{(4,1)}}}{RTR_{M_{(4,1)}}}, if\ X_7 < 0, then\ X_7 = 0, else\ X_7 = X_7$$

$$X_8 = \frac{CQ_{A_{(5,1)}} - AL_{A_{(5,1)}}}{RTR_{M_{(4,2)}}}, if\ X_8 < 0, then\ X_8 = 0, else\ X_8 = X_8$$

Appendix J presents the colour-coded free-time calculation details for the Parow production line, with blocking and starvation logic.

9.10 FINDINGS

The free-time calculations for the Peninsula Beverage production process in Parow were tested by simulation in Excel for accuracy. A speadsheet was developed with the free-time calculations automated. This was done to select and test different scenarios and to confirm that a double bottleneck condition is not possible. The Parow process is different from the Valpré installation, because the designed constraint is in the middle of the production process, where in the Valpré production process experiment, the designed constraint was at the start of the process.

9.11 SUMMARY

In this chapter, the production process at Parow with a full set of all possible machine types were described. The V-profile was plotted and illustrated a production process with nine machines where each machine type is represented. The machine and accumulator matrices for the production process were developed and the specific free-time solution was derived from the general solution. To test the accuracy of the calculations, a simulation spreadsheet tested the formulae for conflicts. The introduction of the prime quantity and the presence of machine type-1 and 2 posed no problem and proved that the general solution developed in Chapter 5 could be used to describe the real-life production process in Parow.

The prime quantity and clear quantity were tested together in the calculations of free time. The simulation spreadsheet also tested the calculations for a potential double bottleneck condition. A double bottleneck would have been problematic as the BDFT can only be entered into a single constraint machine. However, no conflicts were observed and even though free time was present on either side of the key machine, there was always a single bottleneck machine.

In order to prepare for the experiment at the Valpré production plant, detailed in Chapter 11 and Chapter 12, hardware was especially configured to deal with the challenge of the production environment. In the next chapter, the hardware for the experiment is discussed in detail.

CHAPTER 10: THE HARDWARE SOLUTION

10.1 INTRODUCTION

In order the meet the challenge of sensing the throughput rate at all workstations and tracking the current location of all the product in the coupled process in real time, unique hardware needed to be designed from scratch. Two previous attempts at proving the concept failed due to shortcomings in the hardware solution.

The hardware needed to connect wirelessly to the field instruments in an environment with high noise levels in the transmission spectrum, due to the production process itself. Signals had to be obtained from the production process instruments without interfering with the existing hardware on the production line.

Some computing had to be done in the field and some in the main computer to minimise the data sent via the wireless link. Unreliable communication was another reason why previous experiments failed.

The main computer also communicates wirelessly to the free-time display tables. The tables present live free time to the operators with the ability to input BDFT as and when necessary.

Only in the last decade, affordable data processing technology has reached the point where central processing unit (CPU) clock speeds have reached speeds greater than three Gigahertz (3 GHz) (Intel, 2014a). This now makes the number of calculations necessary to compute free time possible.

Figure 10.1 presents the schematic diagram for the free-time hardware system. The detail of the system is described in the chapter. The solid arrows indicate physical connections, while the dashed lines represent wireless network connections.

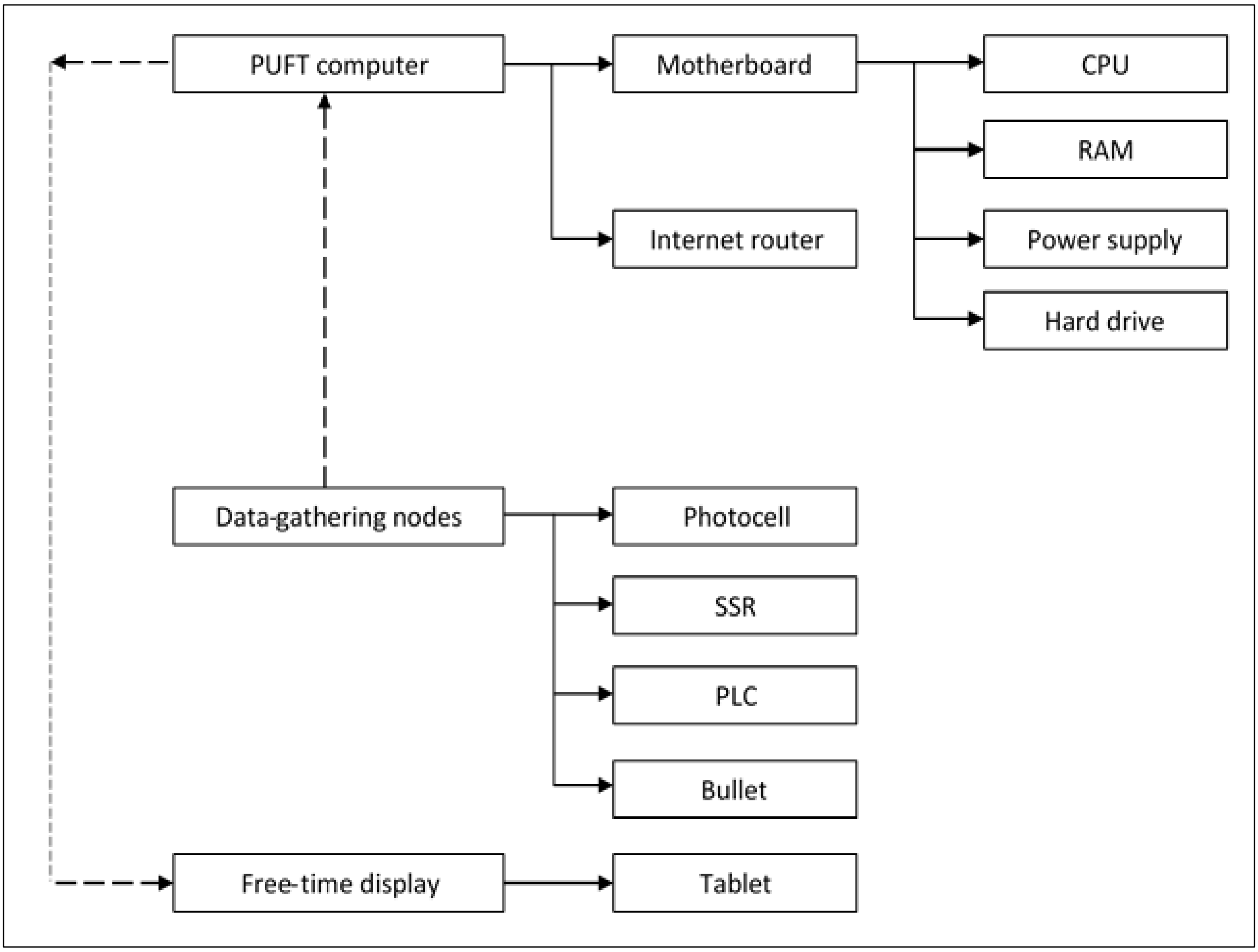


Figure 10.1: Free-time concept hardware schematic

The approach to the software development is outlined in Appendix H and an extract of the software developed for the solution of the Valpré experiment is presented in Appendix G.

10.2 THE FREE-TIME COMPUTER

Information from the field devices, also called data-gathering nodes, is processed in a central location and then redistributed to the various machines in the coupled process. The free-time computer is located at the central location and consists of the following components: central processing unit (CPU), random-access memory (RAM), hard-disk drive (HDD) and the printed circuit board (PCB). The free-time computer has no keyboard or mouse interface and has no display. The computer is dedicated to free-time calculations only.

10.2.1 Central processing unit

The CPU is tasked, with calculating free time at every production station every five seconds. The Celeron Intel G1820M was identified as a suitable processor, small enough and operating at a clock speed of 2.7 GHz (Intel, 2014b).

As mentioned before, no user interface, such as a graphical display or other human interface device is served from the processor. The processor is accessed via the Wi-Fi network only. Figure 10.2 shows the top view of the processor.

Figure 10.2: The Intel Celeron G1820

Source: Intel, 2014b.

The G1820 processor can handle two calculations or actions simultaneously as it has two cores and two threads. These two cores also allow for the receiving and processing of data simultaneously. The full specifications are detailed in Table 10.1.

Table 10.1: Specifications of the Intel Celeron G1820

Essentials	
Number of cores	2
Number of threads	2
Clock speed	2.7 GHz
Cache	2 MB
Memory specifications	
Memory type	DDR3-1333
Number of memory channels	2
Max memory bandwidth	21.3 GB/s

Source: Intel, 2014b.

10.2.2 Random-access memory

The RAM is used by the CPU to store programme states and variable values, on a temporary basis, while the CPU is busy with free-time calculations. The processor needs to access these values and states instantly to deliver the results of the free-time calculations in time for live sharing to the operators.

The memory type is compatible with the CPU memory type. Table 10.1 shows the G1820 is only compatible with DDR3-1333 memory modules. Free-time calculations do not require large amounts of memory normally reserved for graphics processing. 2 GB on a single module was enough RAM for the Valpré experiment.

The RAM that was selected for the free time computer was the Corsair 2 GB DDR3-1333 (Corsair, 2014). Figure 10.3 shows a photo of the Corsair RAM and Table 10.2 gives the technical details.

Figure 10.3: Corsair 2 GB DDR3-1333 RAM

Source: Corsair, 2014.

Table 10.2: Relevant technical details of the Corsair 2 GB DDR3-1333 RAM

Memory size	2 GB
Latency	9-9-9-24
Speed	1333 MHz
Voltage	1.5 V

Source: Corsair, 2014.

10.2.3 Permanent storage system

There are two main types of compact permanent storage systems available, i.e. a hard-disk drive (HDD) or a solid-state drive (SSD). The older and less compact of the two systems is the HDD, which composes a rapidly rotating disk coated by a magnetic field representing 1s and 0s. The more recent and more compact option is the SSD; this system stores data on an integrated circuit. The SSD is similar to a memory bank (multiple memory devices connected to one module) except that it stores data on a permanent basis and is up to four times faster than a HDD.

Although free-time calculations are relatively undemanding, they are numerous and all the data must to be stored for long-term performance reporting. A set of real-time data is stored every five (5) seconds. If consolidated for a month, the free-time database will contain 535 680 entries.

The solid-state drive was selected to store data for the free-time experiment at the Valpré plant. The model selected based on physical features and capacity was the Corsair Force LS SSD SCSI Disk Device. Figure 10.4 shows a photo of the SSD and Table 10.3 shows the specifications of the Corsair Force SSD.

Figure 10.4: The Corsair Force LS SSD SCSI disk device

Source: Corsair, 2014.

Table 10.3: Specifications of the Corsair Force LS SSD SCSI disk device

Performance	**Up to:**
Capacity	240 GB
Sequential read	560 MB/s
Sequential write	535 MB/s
Random 4K read	76K IOPs
Random 4K write	72K IOPs

Source: Corsair, 2014.

10.2.4 Motherboard

A motherboard (sometimes alternatively known as the main board, system board, planar board or logic board) is the main printed circuit board (PCB) found in computers and other expandable systems. The motherboard holds the previously discussed components, the CPU, RAM and SSD. The motherboard carries the data between the respective components. The motherboard selected for the Valpré experiment is the Gigabyte G1.Sniper Z87.

10.3 INTERNET ROUTER

Given the remote location of the Valpré plant, Internet conductivity could only be achieved via 3G. The free-time computer needed to be accessed remotely to solve software problems without having to be at the installation. The router that provides internet to the free-time network needed to have 3G capabilities. The most suitable option was a router with Universal Serial Bus (USB) dongle support and a 3G dongle attached. The model that was selected is the Huawei HG532s, which has a USB port to support a stock 3G dongle from MTN (Manual Owl, 2014). Figure 10.5 shows the front view of the Huawei router and Table 10.4 lists its technical detail.

Figure 10.5: Front view of the Huawei HG532s

Source: Manual Owl, 2014.

Table 10.4: Relevant technical detail of the Huawei HG532s

Wireless technology	802.11
USB dongle support	Yes

Source: Manual Owl, 2014.

10.4 DATA-GATHERING NODES

The data-gathering nodes on the production line consist of four key hardware components: (i) a photocell; (ii) solid-state relay (SSR); (iii) programmable logic controller (PLC); and (iv) a Wi-Fi bullet.

10.4.1 Photocell

Photoelectric cells are commonly referred to as photocells. Photocells are photovoltaic meters. Photocells are used to measure the light from a light source; if the light is broken, it means that a unit has passed the photocell blocking the light source momentarily. Photocells are built into a typical production line to count passing units or to indicate the build back or blocking state of a single machine. Data gathering for the free-time system starts at the photocell. Figure 10.6 shows a typical photocell on the Valpré production line and Table 10.5 shows the technical details of the NIR-50 (EMX Industries Inc, 2014).

Figure 10.6: The NIR-50, an example of a photocell used at the Valpré plant

Source: EMX Industries Inc, 2014.

Table 10.5: Technical details of the NIR-50

Relay type	SPDT 2A @ 24 VDC 0.6A @ 220VAC
Response time	Max 10ms
Range	0.3 – 50 ft.

Source: EMX Industries Inc, 2014.

When the photocell is triggered, it sends a signal to the nearby machine. The free-time system copies this signal using a solid-state relay (SSR) without interfering with the signal sent to the nearby machine. The solid-state relay therefore acts non-intrusively.

10.4.2 Solid-state relay (SSR)

In order to intercept the signal from the photocell in a non-intrusive manner, a special piece of hardware is required. A solid-state relay is an electronic switch that is triggered when a small external voltage is applied along its n-type and p-type junctions (All About Circuits, 2014). The working of a SSR is similar to an electromechanical relay, except that it does not have any moving parts.

The MasterBASIC coupling relay with optocoupler output series 39.10 gives the required performance and was chosen as SSR to be installed for the Valpré experiment. The relay is shown in Figure 10.7 and the technical specifications are listed in Table 10.6.

Figure 10.7: The MasterBasic SSR

Source: All About Circuits, 2014.

Table 10.6: Technical details of the The MasterBasic SSR

Type	39.10.7.024.9024
Output	Optocoupler
Nominal voltage	24 Vdc
Switching voltage	24 Vdc
Switching surrent	2 A
Temperature range	-20, +50 °C
Protection type	IP20

Source: All About Circuits, 2014.

10.4.3 Programmable logic controller (PLC)

A PLC is a digital computer used for automation of typically industrial-electromechanical processes. The function of the PLC used in the free-time hardware system was to interpret the signal from the SSR and translate the signal into a throughput rate and a useful count. The count was then sent to the Wi-Fi bullet, which in turn sent it wirelessly to the free-time computer.

The PLC selected for the Valpré experiment was the Jazz Series: Micro PLC with Text-Based HMI (Unitronics, 2014). The Jazz PLC supports two inputs, allowing two photocell signals to be sent to one PLC. The Jazz PLC was located in the field in close proximity to the photocell and SSR. This avoided the need for long field wiring, which was one of the reasons why the first experiment in Nigel failed. Figure 10.8 shows the front view of the Jazz PLC unit and Table 10.7 lists its relevant technical details.

Figure 10.8: The Jazz Series: Micro PLC

Source: Unitronics, 2014.

Table 10.7: Technical details of the Jazz PLC

Number of inputs	Two groups
Response time	20ms typical
Input cable length	Maximum 100m unshielded
Output type	SPST-NO (Form A)
Ladder code memory	48K Virtual
Programme execution time	1.5 µs

Source: Unitronics, 2014.

10.4.4 Wi-Fi bullet

The final step in data gathering is the transmission of the data from the PLC to the free-time computer. As discussed before, field wiring is prone to damage and proved to be an unsustainable option already during the Nigel experiment. The first wireless solution was attempted in the Cape Town experiment and proved the best option. The Wi-Fi bullet was selected as the field wireless solution for the free-time installation for the Valpré experiment.

Given the long distance between the field devices and the free-time computer, a high-powered Wi-Fi device was selected. The effective functioning of this device is key to maintaining a good machine enthalpic certainty. There is rotating machinery in the production line, which can interfere with the Wi-Fi signal. For these reasons, the high-powered Wi-Fi Ubiquiti Bullet M2 was selected for the Valpré experiment. This long-distance, high-powered Wi-Fi device is designed to have a maximum range of fifty (50) kilometres and signal strength of 28 dBm. Figure 10.9 shows the Bullet M2 and Table 10.8 describes its relevant technical details (Ubiquiti Networks, 2011).

Figure 10.9: Wi-Fi bullet M2

Source: Ubiquiti Networks, 2011.

Table 10.8: Technical details of the bullet M2

Operating system	AirOS
Processor	Atheros MIPS 24KC, 400 MHz
Memory	32 MB SDRAM, 8 MB Flash
Output power	28 dBm
Outdoor range	Over 50 km

Source: Ubiquiti Networks, 2011.

The Wi-Fi bullet, the Jazz PLC, connector points and a power supply were then encased together in a robust stainless steel unit (see Figure 10.10).

Figure 10.10: Robust stainless steel unit

Source: Researcher's own creation.

10.5 FREE-TIME DISPLAY

The free-time display tablet acts as the human interface with the free-time system. This interface allows for the communication of live free time to the operator and the option of inputting BDFT when his or her workstation becomes the CCM.

Touch-screen technology was selected for its reliability and flexibility to screen changes as and when required. The touch-screen does not require the user to physically press the screen. Capacitive touch-screens only work if the user touches with bare skin (gloves will not work). The operators at the Valpré plant do not wear gloves and therefore capacitive touch-screens were a workable solution.

The software written to display free time is HyperText Mark-up Language-based (HTML-based) and thus required internet browser support. The bespoke software also acts as final manipulation of the free time presented to the operator. The logic in this software prevents discontinuities in the free-time equations, the input of BDFT and communication errors to negatively influence the free time presented to the operator. The free time displayed to the operator is smoothed and always presents a realistic number and a realistic rate at which the free time changes. The device connects to the fee-time computer via a Wi-Fi-enabled module. For these reasons, a smart tablet was selected as the chosen interface for the Valpré experiment.

The free-time display was mounted on a stainless steel bracket on the respective machine at a visible position for the operator. The power supply for the tablet was built into the stainless steel bracket with the power source from the plant grid.

The specific tablet choice for the Valpré plant experiment was the Proline-7 Tablet Android 4.0. It supports the newest version of android and the latest web browser. Figure 10.11 shows the tablet when its home screen is open and Table 10.9 lists its relevant technical information (Mitabyte, 2014).

Figure 10.11: Proline-7 Tablet

Source: Mitabyte, 2014

Table 10.9: Technical details of the Proline-7 Tablet

Operating system	Android 4.0 (Ice Cream Sandwich)
Processor	Cortex A8 1.2 GHz
Memory	512 MB
Display	800 x 480 Capacitive Display
Wireless technology	/g/n

Source: Mitabyte, 2014.

Appendix I explains the operator's interface with the display, in using the free time and presents a flow chart.

10.6 THE COMMUNICATION NETWORK

A wireless network was set up to handle all communication from the field to the free-time computer and back to the operator displays. All the hardware selected was specified to operate on Wi-Fi with 802.11, 300 MB/s as standard. Table 10.10 lists the hardware equipment and their Internet protocol (IP) addresses in the network and Figure 10.12 shows a schematic representation of the free-time network.

Table 10.10: Free-time network elements and their IP addresses

	Network element	IP address
	Internet router	192.168.0.1
	PUFT computer	192.168.0.10
Filler	Tablet	192.168.0.2
	PLC	192.168.0.120
	Bullet	192.168.0.130
Labeller	Tablet	192.168.0.3
	PLC	192.168.0.121
	Bullet	192.168.0.131
Variopack	Tablet	192.168.0.4
	PLC	192.168.0.123
	Bullet	192.168.0.133
Wrapapac	Tablet	192.168.0.5
	PLC	192.168.0.124
	Bullet	192.168.0.134
Palletiser	Tablet	192.168.0.6
	PLC	192.168.0.125
	Bullet	192.168.0.135
Stretch-wrapper	Tablet	192.168.0.7
	PLC	192.168.0.126
	Bullet	192.168.0.136
Forklift	Tablet	192.168.0.8
	PLC	192.168.0.126
	Bullet	192.168.0.136

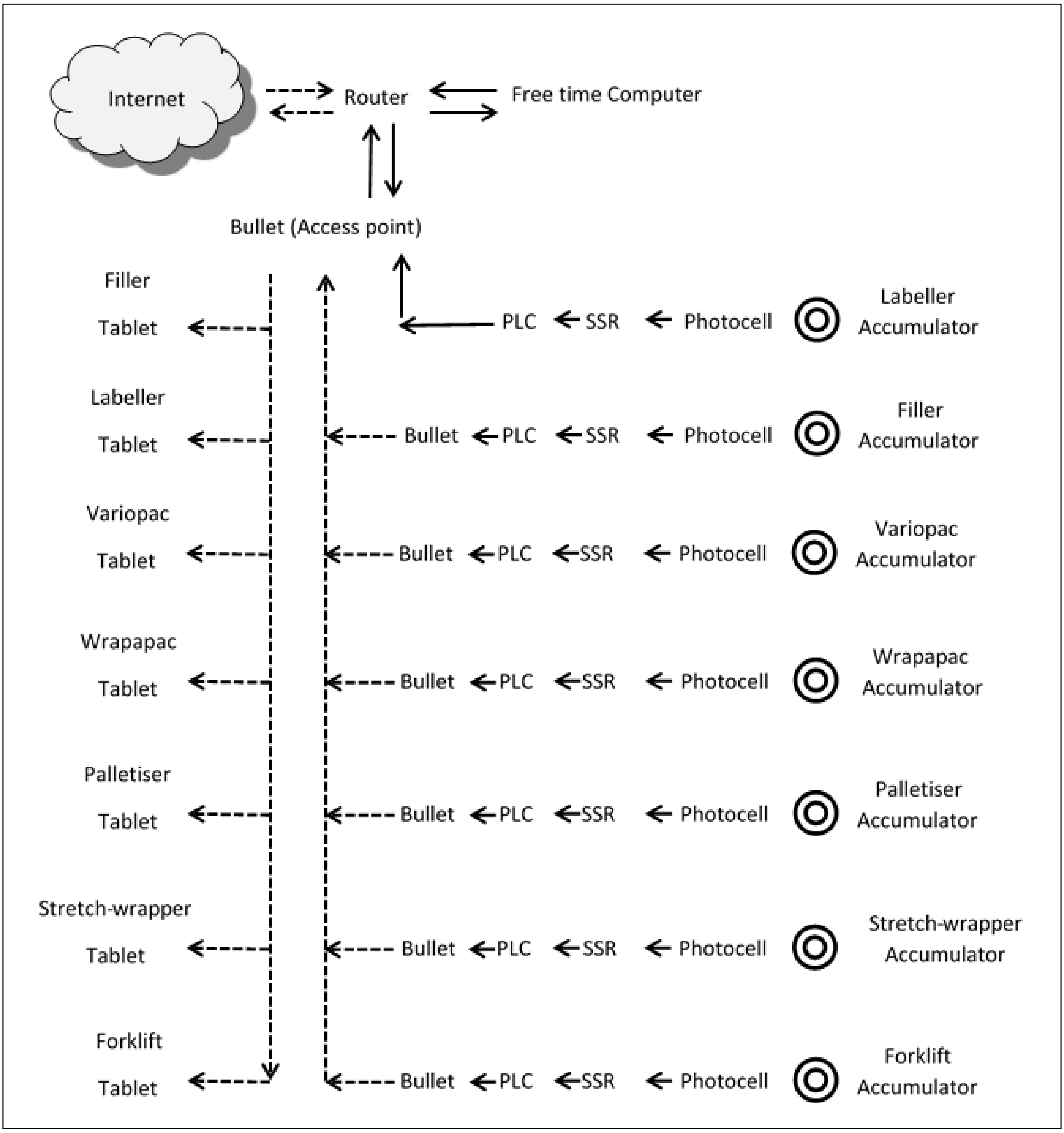


Figure 10.12: The free-time network diagram

10.7 SUMMARY

The hardware for the Valpré plant experiment had to be specifically designed and set up to cater for the challenges in managing the free-time concept. Recent advances in hardware have made high-speed counting, processing, storage and wireless communication of live data in a production environment possible.

The main challenges solved by the hardware solution were:

- Capturing the field signal for counting purposes without interference;
- Converting counts with the Jazz PLC to useable data before transmission;
- Building a single compact field device;
- Configuring a robust industrial-proof Wi-Fi transmitter;
- Configuring the free-time computer for optimum performance and relevance; and
- Presenting free time to the operators on a familiar platform with flexible display options.

In the next chapter, the eight-week Valpré experiment is described. The Jazz PLC, the free-time computer and the tablets were programmed with software code that was specifically developed to run the experiment. An extraction of the software code is presented in Appendix G. The code was written in a format that will allow for any number of machines and thus is fit for general free-time solutions and any number of machines.

CHAPTER 11:
THE VALPRÉ PLANT EXPERIMENT

11.1 BACKGROUND

The Valpré spring water bottling plant is situated eight (8) kilometres from the town of Heidelberg in Gauteng, South Africa. In 2012, the plant was awarded a gold certificate in Leadership in Environmental Design (LEED) by the United States Green Building Council (USGBC) (2012).

The plant is well known for its sound environmental design and operational practices and boasts the very best in automation technology available in the world today. It has two production lines; one for glass bottles; and the other for filling Polyethylene Terephthalate (PET) bottles, i.e. plastic water bottles. The production process produces the plastic bottle from a preform to finished product in one continuous process. The close proximity of the plant to the operational base of the hardware development team made this location ideal for the final experiment.

11.2 PRODUCTION MACHINES

The production process at the Valpré plant has seven production machines connected in series. Production starts with the filler and blow moulder blocked into a single machine. The bottles then move through an accumulator to the labeller where roll-on labels are attached. A shrink-wrapper, the Variopac, then wraps the bottles into packs of six. The Wrapapac over-wraps the multipacks to form cases. The palletiser then stacks the cases to form a pallet. The pallet is then stretch-wrapped for stability during storage and transport. The pallets are then removed from the production line by the last machine in the coupled process, the full pallet forklift.

In Figure 11.1 the unique V-profile of the Valpré production plant is plotted. The vertical axis indicates the rated speed of the machines and on the horizontal axis; the machines are plotted in product flow sequence. The production line has seven machines. There are no type-1, no type-2, one type-3, five type-4 and one type-5 machine in the production process.

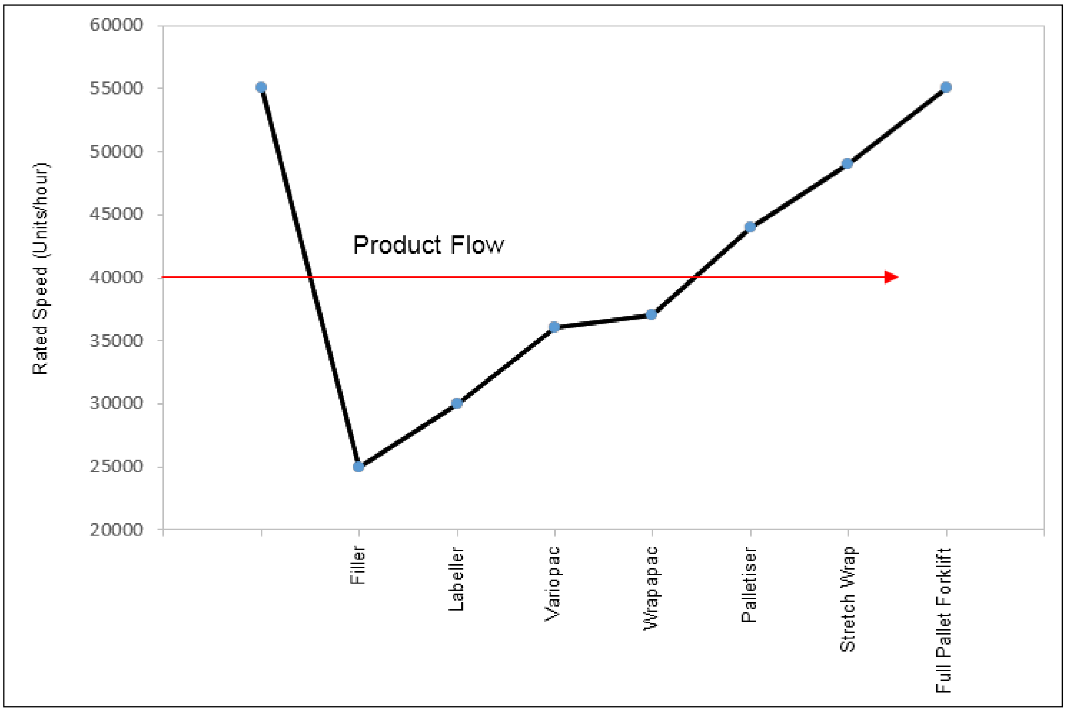


Figure 11.1: V-profile for the Valpré production line

The machines' names and types in the downstream sequence are detailed in Table 11.1.

Table 11.1: Machine names and type justification for the Valpré line

Machine	Names	Type	Type justification
1	Filler	3	It is the designed bottleneck of the production process and the key machine. Its discharge machine has a higher throughput capacity.
2	Labeller	4	Its in-feed machine, the filler, is slower than the labeller and its discharge machine is faster than its rated speed
3	Variopac	4	Its in-feed machine, the labeller, is slower than the variopak and its discharge machine is faster than its rated speed
4	Wrapapac	4	Its in-feed machine, the Variopac, is slower than the Wrapapac and its discharge machine is faster than its rated speed
5	Palletiser	4	Its in-feed machine, the Wrapapac, is slower than the palletiser and its discharge machine is faster than its rated speed
6	Stretch-wrapper	4	Its in-feed machine, the palletiser, is slower than the stretch-wrapper and its discharge machine is faster than its rated speed
7	Full pallet forklift	5	It is the last machine in the process. It has an infinite buffer on its discharge and is faster than its in-feed machine.

11.2.1 The filler

The Valpré filling machine is blocked together with the blow moulder and operates as a single machine. After the blow moulding/filling process, the capper seals the bottle. The filler can fill still or sparking water on the same filling machine. For sparkling water, the carbonator simply injects carbon dioxide (CO_2) gas into the water prior to filling. The throughput speed of the filler is reduced by ten (10) per cent when the sparkling version is bottled to prevent product loss due to foaming. Figure 11.2 shows the Krones blow moulder/filler.

Figure 11.2: The Krones bottle filler

With adjustment, the filler can fill water in four pack sizes. For each pack size, the filler runs at a different throughput rate. The free-time software automatically identified the pack size by linking the throughput rate to a specific pack size. Each pack size has different accumulator capacities (AC) and different clear quantities (CQ). The various throughput rates for the different pack sizes are given in Table 11.2.

Table 11.2: Pack sizes and their rated speeds for the filler

Pack size	Rated speed (bph)
330 ml	30 000
500 ml	20 000
1000 ml	10 000
1500 ml	6 667

11.2.2 The labeller

The labeller applies the label of the respective packs with a food grade adhesive on the bottles at a rate of 14 bottles per second. The Contiroll labeller type rotates the bottle while applying the label. Figure 11.3 shows the Krones labeller and the position of the free-time display.

Figure 11.3: Labeller and the position of the free-time display

11.2.3 The six-pack shrink-wrapper: Variopac

The Variopac wraps the bottles coming from the labeller into packs of six. The printed plastic wrap is then shrunken in a heat tunnel to form a six-pack. The Variopac has a rated speed of 16 bps. Figure 11.4 shows the Krones Variopac.

Figure 11.4: Variopac

11.2.4 The case shrink over-wrapper: Wrapapac

The six-packs from the shrink-wrapper are joined to form cases of 24 bottles per case when bottling 330 ml and 500 ml product. The over-wrap is then shrunken in a heat tunnel to form cases of product ready to be palletised. The Wrapapac has a rated speed of 18 bps. Figure 11.5 shows the Krones Wrapapac.

Figure 11.5: Wrapapac

11.2.5 The case palletiser

Cases from the Wrapapac are orientated on a moving robot table and layered. The layers are then stacked into pallets in a machine called the palletiser. The palletiser has a rated speed of 20 bps. Figure 11.6 shows the Krones palletiser on the Valpré production line.

Figure 11.6: Krones palletiser

11.2.6 The pallet stretch-wrapper

Pallets are then stabilised for transport and stacking by wrapping the pallet with a stretched film. The film is tensioned and released to bind the pallet into a solid unit. The stretch-wrapper has a rated speed of 24 bps. Figure 11.7 shows the Krones palletiser on the Valpré production line.

Figure 11.7: Stretch-wrapper

11.2.7 The full pallet forklift

The last machine on the production line at the Valpré plant is the full pallet forklift. Product leaves the coupled process at this point and the free-time concept no longer applies. The full pallet forklift on this line can lift and transport two pallets at the same time. Figure 11.8 shows the plant's full pallet forklift as it is off-loading two pallets from the production line.

Figure 11.8: Full pallet forklift

11.3 FREE-TIME FORMULAE

In Chapter 5 the five general solutions for each machine type during start-up and normal running free-time calculations were developed. In the case of the Valpré experiment machine types 3, 4 and 5 were used due to the configuration of the line and are expressed as follows:

Type-3

$$FT_{M_{(3,1)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \ldots (a) + \sum_{n=1}^{k-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \ldots (c) + \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,k)}}} \ldots (d)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \ldots (m) + \sum_{n=1}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \ldots (n) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \ldots (p) \quad \ldots(5.15)$$

Type-4

$$FT_{M_{(4,j)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \ldots (a) + \sum_{n=1}^{k-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \ldots (c) + \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,k)}}} \ldots (d)\ or$$

$$\frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}} \ldots (e) + \sum_{n=1}^{j-1} \frac{CQ_{A_{(4,n)}} - AL_{A_{(4,n)}}}{RTR_{M_{(4,n)}}} \ldots (f) + \frac{CQ_{A_{(5,1)}} - AL_{A_{(5,1)}}}{RTR_{M_{(4,l)}}} \ldots (h)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \ldots (m) + \sum_{n=j}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \ldots (o) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \ldots (p) \qquad \ldots(5.17)$$

Type-5

$$FT_{M_{(5,1)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \ldots (a) + \sum_{n=1}^{k-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \ldots (c) + \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,k)}}} \ldots (d)\ or$$

$$\frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}} \ldots (e) + \sum_{n=1}^{l-1} \frac{CQ_{A_{(4,n)}} - AL_{A_{(4,n)}}}{RTR_{M_{(4,n)}}} \ldots (g) + \frac{CQ_{A_{(5,1)}} - AL_{A_{(5,1)}}}{RTR_{M_{(4,l)}}} \ldots (h) \qquad \ldots(5.19)$$

11.4 VALPRÉ MACHINE MATRIX

In the matrix in Figure 11.9, i represents the number of machine positions. Valpré has three machine position types. The Valpré production line is designed with the first machine on the production line being the key machine. In the matrix, j represents the number of machines in each machine position. The Valpré line has the following number of machines for each machine position:

if i = 3 then j = 1

if i = 4 then j = 5

if i = 5 then j = 1

$FT_{i,j}$

j = number of machines in each machine position

i = number of types of machine positions

$$\begin{bmatrix} 0 & & & & \\ 0 & & & & \\ M_{(3,1)} & & & & \\ M_{(4,1)} & M_{(4,2)} & M_{(4,3)} & M_{(4,4)} & M_{(4,5)} \\ M_{(5,1)} & & & & \end{bmatrix}$$

Figure 11.9: Machine matrix diagram for the Valpré process

11.5 VALPRÉ ACCUMULATOR MATRIX

In the matrix in Figure 11.10, i represents the number of accumulator's positions. Valpré has three generic accumulator position types. In the matrix, j represents the number of accumulators associated with each accumulator type. The Valpré line has the following number of accumulators associated with each accumulator position:

If i = 3 then j = 1

If i = 4 then j = 4

If i = 5 then j = 1

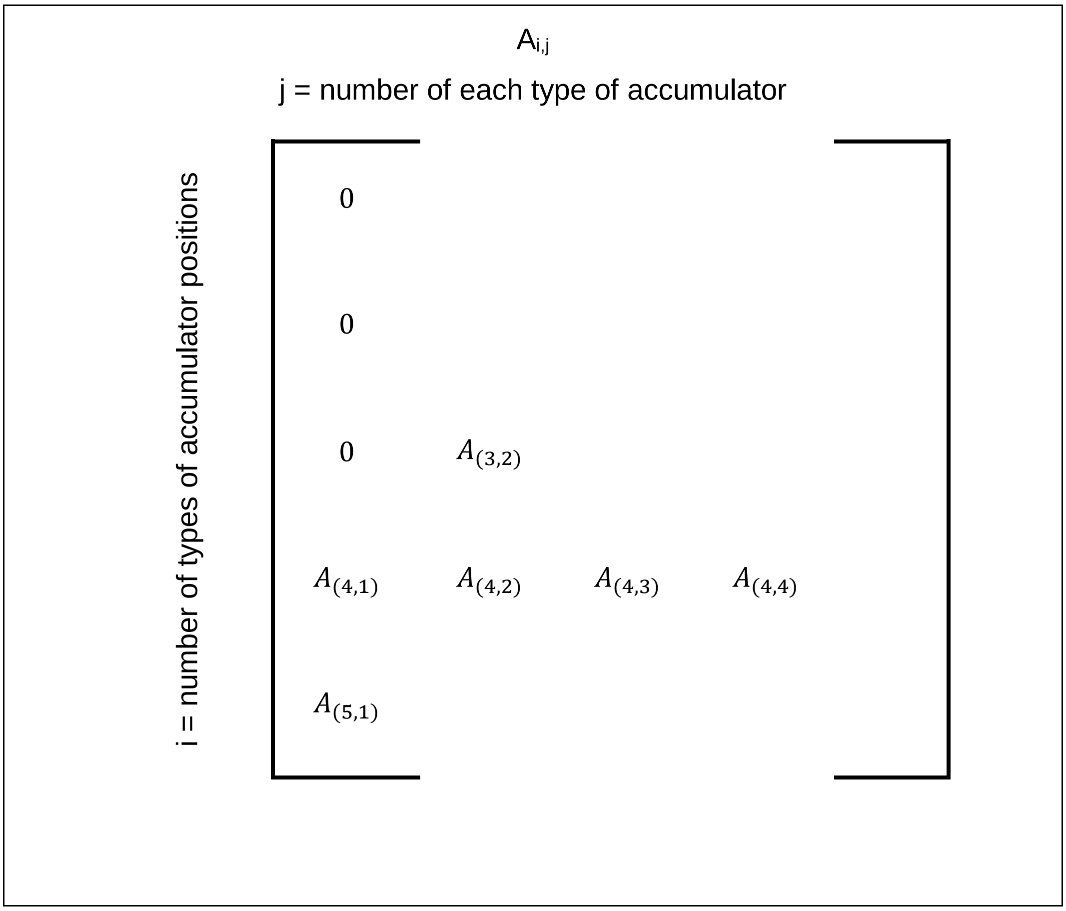


Figure 11.10: Accumulator matrix diagram for the Valpré process

11.6 VALPRÉ FREE-TIME CALCULATIONS

The following formulae describe the free time calculations at each machine on the Valpré plant:

11.6.1 Machine 1

Machine 1 is a type-3 machine. The formula that was developed in Chapter 5 for machine type-3 is:

$$FT_{M_{(3,1)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \ldots (a) + \sum_{n=1}^{k-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \ldots (c) + \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,k)}}} \ldots (d)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \ldots (m) + \sum_{n=1}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \ldots (n) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \ldots (p) \qquad \ldots(5.15)$$

Equations a, c and d represent free time where the accumulator levels are subtracted from the prime quantities (type-1 free time) for type (1,1), (2,j) and (3,1) accumulators. Equations m, n and p represent free time where the clear quantities are subtracted from the accumulator levels (type-4 free time) for type (3,2), (4,j) and (5,1) accumulators. Figure 11.11 illustrates the way these formulae calculate the free time of the machine in position (3,1) in the machine matrix. Machine 1 (or 3,1) receives free time from each accumulator on the production line. Each accumulator is 'linked' to a machine's throughput rate, but an accumulator cannot be linked to the machine of which the free time is being calculated. For clarification purposes, each accumulator's contribution to machine 1's free time is summarised as an X, which can only be positive, with a subscript that indicates the accumulator's position on the production line.

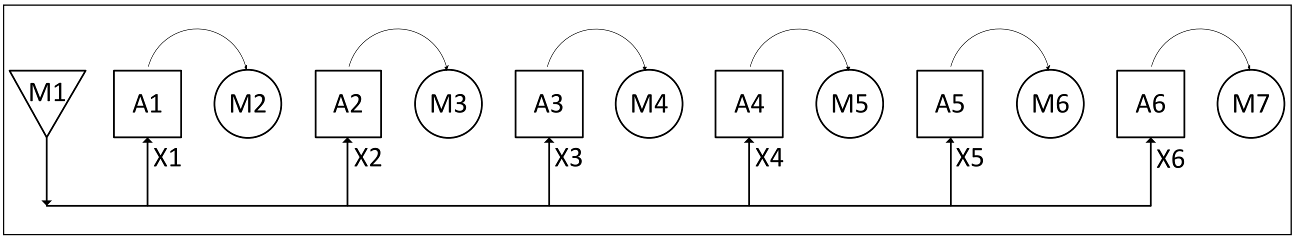


Figure 11.11: Machine 1's free-time calculation

The Y terms in the equations below serve as a logical operator to ensure free time is only obtained from accumulators if the bridging accumulator is full. This is the additional free time obtained during blocking. Note that there are no type-1 and type-2 machines or accumulators on the Valpré production line and thus equations a, c and d are not used. Machine 1's free time is then calculated as follows:

$$FT_{M_{(3,1)}} = MAX(X_1 + X_2 + X_3 + X_4 + X_5 + X_6, 0) \qquad ...(11.1)$$

where

$$X_1 = \frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}}, if\ X_1 < 0\ then\ Y_1 = X_1\ and\ then\ X_1 = 0, else\ X_1 = X_1\ and\ Y_1 = 0$$

$$X_2 = \frac{AL_{A_{(4,1)}} - CQ_{A_{(4,1)}}}{RTR_{M_{(4,2)}}} + Y_1, if\ X_2 < 0\ then\ Y_2 = X_2\ and\ then\ X_2 = 0, else\ X_2 = X_2\ and\ Y_2 = 0$$

$$X_3 = \frac{AL_{A_{(4,2)}} - CQ_{A_{(4,2)}}}{RTR_{M_{(4,3)}}} + Y_2, if\ X_3 < 0\ then\ Y_3 = X_3\ and\ then\ X_3 = 0, else\ X_3 = X_3\ and\ Y_3 = 0$$

$$X_4 = \frac{AL_{A_{(4,3)}} - CQ_{A_{(4,3)}}}{RTR_{M_{(4,4)}}} + Y_3, if\ X_4 < 0\ then\ Y_4 = X_4\ and\ then\ X_4 = 0, else\ X_4 = X_1\ and\ Y_4 = 0$$

$$X_5 = \frac{AL_{A_{(4,4)}} - CQ_{A_{(4,4)}}}{RTR_{M_{(4,5)}}} + Y_4, if\ X_5 < 0\ then\ Y_5 = X_5\ and\ then\ X_5 = 0, else\ X_5 = X_5\ and\ Y_5 = 0$$

$$X_6 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_5, if\ X_6 < 0\ then\ X_6 = 0, else\ X_6 = X_6$$

11.6.2 Machine 2

Machine 2 is a type-4 machine. The formula that was developed in Chapter 5 for machine type-4 is:

$$FT_{M_{(4,j)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \dots (a) + \sum_{n=1}^{k-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \dots (c) + \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,k)}}} \dots (d)\ or$$

$$\frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}} \dots (e) + \sum_{n=1}^{j-1} \frac{CQ_{A_{(4,n)}} - AL_{A_{(4,n)}}}{RTR_{M_{(4,n)}}} \dots (f) + \frac{CQ_{A_{(5,1)}} - AL_{A_{(5,1)}}}{RTR_{M_{(4,l)}}} \dots (h)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \dots (m) + \sum_{n=j}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \dots (o) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \dots (p) \qquad \dots(5.17)$$

Equations a, c and d represent free time where the accumulator levels are subtracted from the prime quantities (type-1 free time) for type (1,1), (2,j) and (3,1) accumulators. Equations e, f and h represent free time where the accumulator levels are subtracted from the clear quantities (type-2 free time) for type (3,2), (4,j) and (5,1) accumulators. Equations m, n and p represent free time where the clear quantities are subtracted from the accumulator levels (type-4 free time) for type (3,2), (4,j) and (5,1) accumulators.

Figure 11.12 illustrates the way these formulae calculate the free time of the machine in position (4,1) in the machine matrix. Machine 2 (or 4,1) receives free time from each accumulator on the production line. Note how the focus has shifted from machine 1 in Figure 11.11 to machine 2 in Figure 11.12.

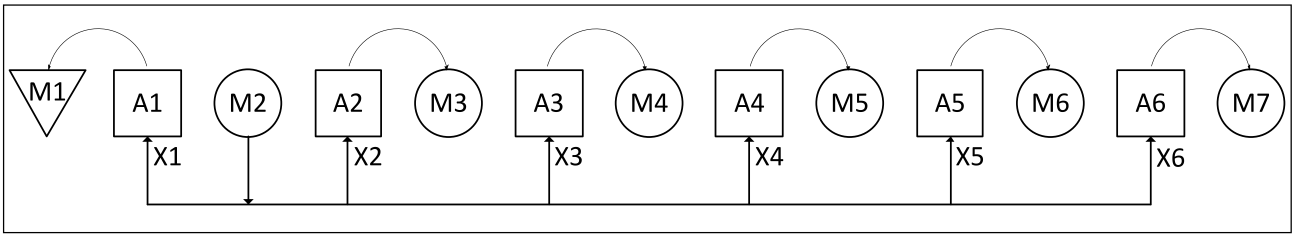


Figure 11.12: Machine 2’s free-time calculation

The Y terms in the equations below serve as logical operators to ensure free time is only obtained from accumulators if the bridging accumulator is full. This is the additional free time obtained during blocking. Machine 2's free time is calculated as follows:

$$FT_{M_{(4,1)}} = MAX(X_1, X_2 + X_3 + X_4 + X_5 + X_6, 0) \qquad ...(11.2)$$

where

$$X_1 = \frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}}, if\ X_1 < 0\ then\ X_1 = 0, else\ X_1 = X_1$$

$$X_2 = \frac{AL_{A_{(4,1)}} - CQ_{A_{(4,1)}}}{RTR_{M_{(4,2)}}}, if\ X_2 < 0\ then\ Y_2 = X_2\ and\ then\ X_2 = 0, else\ X_2 = X_2\ and\ Y_2 = 0$$

$$X_3 = \frac{AL_{A_{(4,2)}} - CQ_{A_{(4,2)}}}{RTR_{M_{(4,3)}}} + Y_2, if\ X_3 < 0\ then\ Y_3 = X_3\ and\ then\ X_3 = 0, else\ X_3 = X_3\ and\ Y_3 = 0$$

$$X_4 = \frac{AL_{A_{(4,3)}} - CQ_{A_{(4,3)}}}{RTR_{M_{(4,4)}}} + Y_3, if\ X_4 < 0\ then\ Y_4 = X_4\ and\ then\ X_4 = 0, else\ X_4 = X_1\ and\ Y_4 = 0$$

$$X_5 = \frac{AL_{A_{(4,4)}} - CQ_{A_{(4,4)}}}{RTR_{M_{(4,5)}}} + Y_4, if\ X_5 < 0\ then\ Y_5 = X_5\ and\ then\ X_5 = 0, else\ X_5 = X_5\ and\ Y_5 = 0$$

$$X_6 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_5, if\ X_6 < 0\ then\ X_6 = 0, else\ X_6 = X_6$$

11.6.3 Machine 3

Machine 3 is a type-4 machine. The formula that was developed in Chapter 5 for machine type-4 is:

$$FT_{M_{(4,j)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \dots (a) + \sum_{n=1}^{k-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \dots (c) + \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,k)}}} \dots (d)\ or$$
$$\frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}} \dots (e) + \sum_{n=1}^{j-1} \frac{CQ_{A_{(4,n)}} - AL_{A_{(4,n)}}}{RTR_{M_{(4,n)}}} \dots (f) + \frac{CQ_{A_{(5,1)}} - AL_{A_{(5,1)}}}{RTR_{M_{(4,l)}}} \dots (h)\ or$$
$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \dots (m) + \sum_{n=j}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \dots (o) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \dots (p) \qquad ...(5.17)$$

Equations a, c and d represent free time where the accumulator levels are subtracted from the prime quantities (type-1 free time) for type (1,1), (2,j) and (3,1) accumulators. Equations e, f and h represent free time where the accumulator levels are subtracted from the clear quantities (type-2 free time) for type (3,2), (4,j) and (5,1) accumulators Equations m, n and p represent free time where the clear quantities are subtracted from the accumulator levels (type-4 free time) for type (3,2), (4,j) and (5,1) accumulators.

Figure 11.13 illustrates the way these formulae calculate the free time of the machine in position (4,2) in the machine matrix. Machine 3 (or 4,2) receives free time from each accumulator on the production line. Note how the focus has shifted from machine 2 in Figure 11.12 to machine 3 in Figure 11.13.

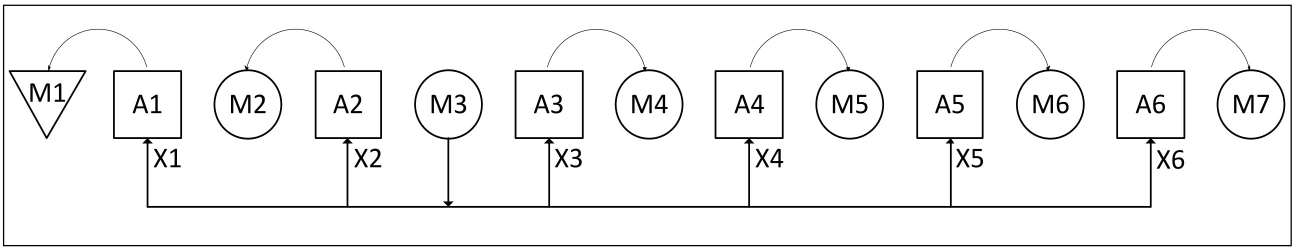


Figure 11.13: Machine 3's free-time calculation

The Y terms in the equations below serve as logical operators to ensure free time is only obtained from accumulators if the bridging accumulator is full. This is the additional free time obtained during blocking. Machine 3's free time is calculated as follows:

$$FT_{M_{(4,2)}} = MAX(X_1 + X_2, X_3 + X_4 + X_5 + X_6, 0) \quad \text{...(11.3)}$$

where

$$X_1 = \frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}}, if\ X_1 < 0\ then\ X_1 = 0, else\ X_1 = X_1$$

$$X_2 = \frac{CQ_{A_{(4,1)}} - AL_{A_{(4,1)}}}{RTR_{M_{(4,1)}}}, if\ X_2 < 0\ then\ X_2 = 0, else\ X_2 = X_2$$

$$X_3 = \frac{AL_{A_{(4,2)}} - CQ_{A_{(4,2)}}}{RTR_{M_{(4,3)}}}, if\ X_3 < 0\ then\ Y_3 = X_3\ and\ then\ X_3 = 0, else\ X_3 = X_3\ and\ Y_3 = 0$$

$$X_4 = \frac{AL_{A_{(4,3)}} - CQ_{A_{(4,3)}}}{RTR_{M_{(4,4)}}} + Y_3, if\ X_4 < 0\ then\ Y_4 = X_4\ and\ then\ X_4 = 0, else\ X_4 = X_1\ and\ Y_4 = 0$$

$$X_5 = \frac{AL_{A_{(4,4)}} - CQ_{A_{(4,4)}}}{RTR_{M_{(4,5)}}} + Y_4, if\ X_5 < 0\ then\ Y_5 = X_5\ and\ then\ X_5 = 0, else\ X_5 = X_5\ and\ Y_5 = 0$$

$$X_6 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_5, if\ X_6 < 0\ then\ X_6 = 0, else\ X_6 = X_6$$

11.6.4 Machine 4

Machine 4 is a type-4 machine. The formula that was developed in Chapter 5 for machine type-4 is:

$$FT_{M_{(4,j)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \dots (a) + \sum_{n=1}^{k-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \dots (c) + \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,k)}}} \dots (d)\ or$$

$$\frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}} \dots (e) + \sum_{n=1}^{j-1} \frac{CQ_{A_{(4,n)}} - AL_{A_{(4,n)}}}{RTR_{M_{(4,n)}}} \dots (f) + \frac{CQ_{A_{(5,1)}} - AL_{A_{(5,1)}}}{RTR_{M_{(4,l)}}} \dots (h)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \dots (m) + \sum_{n=j}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \dots (o) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \dots (p) \qquad \dots(5.17)$$

Equations a, c and d represent free time where the accumulator levels are subtracted from the prime quantities (type-1 free time) for type (1,1), (2,j) and (3,1) accumulators. Equations e, f and h represent free time where the accumulator levels are subtracted from the clear quantities (type-2 free time) for type (3,2), (4,j) and (5,1) accumulators Equations m, n and p represent free time where the clear quantities are subtracted from the accumulator levels (type-4 free time) for type (3,2), (4,j) and (5,1) accumulators.

Figure 11.14 illustrates the way these formulae calculate the free time of the machine in position (4,3) in the machine matrix. Machine 4 (or 4,3) receives free time from each accumulator on the production line. Note how the focus has shifted from machine 3 in Figure 11.13 to machine 4 in Figure 11.14.

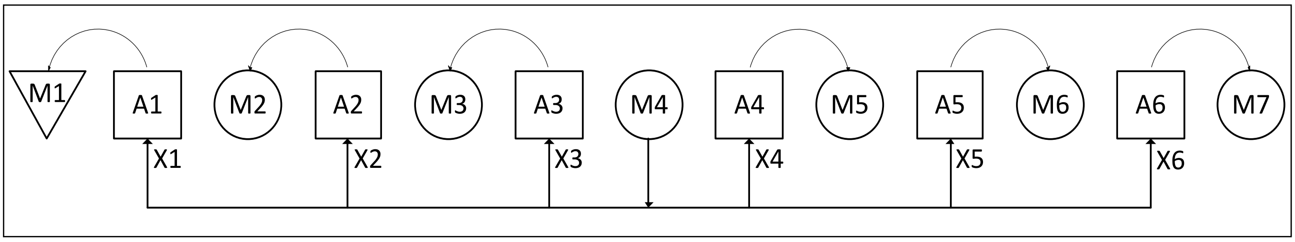


Figure 11.14: Machine 4's free-time calculation

The Y terms in the equations below serve as logical operators to ensure free time is only obtained from accumulators if the bridging accumulator is full. This is the additional free time obtained during blocking. Machine 4's free time is calculated as follows:

$$FT_{M_{(4,3)}} = MAX(X_1 + X_2 + X_3, X_4 + X_5 + X_6, 0) \quad ...(11.4)$$

where

$$X_1 = \frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}}, if\ X_1 < 0\ then\ X_1 = 0, else\ X_1 = X_1$$

$$X_2 = \frac{CQ_{A_{(4,1)}} - AL_{A_{(4,1)}}}{RTR_{M_{(4,1)}}}, if\ X_2 < 0\ then\ X_2 = 0, else\ X_2 = X_2$$

$$X_3 = \frac{CQ_{A_{(4,2)}} - AL_{A_{(4,2)}}}{RTR_{M_{(4,2)}}}, if\ X_3 < 0\ then\ X_3 = 0, else\ X_3 = X_3$$

$$X_4 = \frac{AL_{A_{(4,3)}} - CQ_{A_{(4,3)}}}{RTR_{M_{(4,4)}}}, if\ X_4 < 0\ then\ Y_4 = X_4\ and\ then\ X_4 = 0, else\ X_4 = X_1\ and\ Y_4 = 0$$

$$X_5 = \frac{AL_{A_{(4,4)}} - CQ_{A_{(4,4)}}}{RTR_{M_{(4,5)}}} + Y_4, if\ X_5 < 0\ then\ Y_5 = X_5\ and\ then\ X_5 = 0, else\ X_5 = X_5\ and\ Y_5 = 0$$

$$X_6 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_5, if\ X_6 < 0\ then\ X_6 = 0, else\ X_6 = X_6$$

11.6.5 Machine 5

Machine 5 is a type-4 machine. The formula that was developed in Chapter 5 for machine type-4 is:

$$FT_{M_{(4,j)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} ...(a) + \sum_{n=1}^{k-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} ...(c) + \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,k)}}} ...(d)\ or$$

$$\frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}} ...(e) + \sum_{n=1}^{j-1} \frac{CQ_{A_{(4,n)}} - AL_{A_{(4,n)}}}{RTR_{M_{(4,n)}}} ...(f) + \frac{CQ_{A_{(5,1)}} - AL_{A_{(5,1)}}}{RTR_{M_{(4,l)}}} ...(h)\ or$$

$$\frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} ...(m) + \sum_{n=j}^{l-1} \frac{AL_{A_{(4,n)}} - CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} ...(o) + \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} ...(p) \quad ...(5.17)$$

Equations a, c and d represent free time where the accumulator levels are subtracted from the prime quantities (type-1 free time) for type (1,1), (2,j) and (3,1) accumulators. Equations e, f and h represent free time where the accumulator levels are subtracted from the clear quantities (type-2 free time) for type (3,2), (4,j) and (5,1) accumulators Equations m, n and p represent free time where the clear quantities are subtracted from the accumulator levels (type-4 free time) for type (3,2), (4,j) and (5,1) accumulators.

Figure 11.15 illustrates the way these formulae calculate the free time of the machine in position (4,4) in the machine matrix. Machine 5 (or 4,4) receives free time from each accumulator on the production line. Note how the focus has shifted from machine 4 in Figure 11.14 to machine 5 in Figure 11.15.

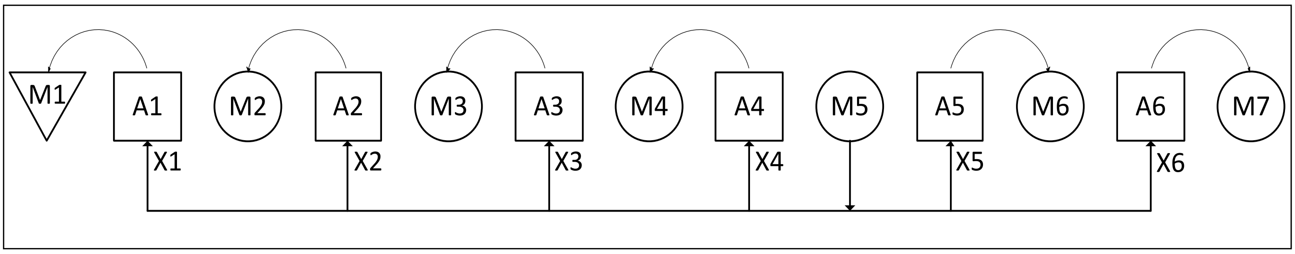


Figure 11.15: Machine 5's free-time calculation

The Y terms in the equations below serve as logical operators to ensure free time is only obtained from accumulators if the bridging accumulator is full. This is the additional free time obtained during blocking. Machine 5's free time is calculated as follows:

$$FT_{M_{(4,4)}} = MAX(X_1 + X_2 + X_3 + X_4, X_5 + X_6, 0) \quad \text{...(11.5)}$$

where

$$X_1 = \frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}}, if\ X_1 < 0\ then\ X_1 = 0, else\ X_1 = X_1$$

$$X_2 = \frac{CQ_{A_{(4,1)}} - AL_{A_{(4,1)}}}{RTR_{M_{(4,1)}}}, if\ X_2 < 0\ then\ X_2 = 0, else\ X_2 = X_2$$

$$X_3 = \frac{CQ_{A_{(4,2)}} - AL_{A_{(4,2)}}}{RTR_{M_{(4,2)}}}, if\ X_3 < 0\ then\ X_3 = 0, else\ X_3 = X_3$$

$$X_4 = \frac{CQ_{A_{(4,3)}} - AL_{A_{(4,3)}}}{RTR_{M_{(4,3)}}}, if\ X_4 < 0\ then\ X_4 = 0, else\ X_4 = X_4$$

$$X_5 = \frac{AL_{A_{(4,4)}} - CQ_{A_{(4,4)}}}{RTR_{M_{(4,5)}}}, if\ X_5 < 0\ then\ Y_5 = X_5\ and\ then\ X_5 = 0, else\ X_5 = X_5\ and\ Y_5 = 0$$

$$X_6 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_5, if\ X_6 < 0\ then\ X_6 = 0, else\ X_6 = X_6$$

11.6.6 Machine 6

Machine 6 is a type-4 machine. The formula that was developed in Chapter 5 for machine type-4 is:

$$FT_{M_{(4,j)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}}-AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \ldots(a) + \sum_{n=1}^{k-1}\frac{PQ_{A_{(2,n)}}-AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \ldots(c) + \frac{PQ_{A_{(3,1)}}-AL_{A_{(3,1)}}}{RTR_{M_{(2,k)}}} \ldots(d)\ or$$

$$\frac{CQ_{A_{(3,2)}}-AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}} \ldots(e) + \sum_{n=1}^{j-1}\frac{CQ_{A_{(4,n)}}-AL_{A_{(4,n)}}}{RTR_{M_{(4,n)}}} \ldots(f) + \frac{CQ_{A_{(5,1)}}-AL_{A_{(5,1)}}}{RTR_{M_{(4,l)}}} \ldots(h)\ or$$

$$\frac{AL_{A_{(3,2)}}-CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}} \ldots(m) + \sum_{n=j}^{l-1}\frac{AL_{A_{(4,n)}}-CQ_{A_{(4,n)}}}{RTR_{M_{(4,n+1)}}} \ldots(o) + \frac{AL_{A_{(5,1)}}-CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} \ldots(p) \qquad \ldots(5.17)$$

Equations a, c and d represent free time where the accumulator levels are subtracted from the prime quantities (type-1 free time) for type (1,1), (2,j) and (3,1) accumulators. Equations e, f and h represent free time where the accumulator levels are subtracted from the clear quantities (type-2 free time) for type (3,2), (4,j) and (5,1) accumulators. Equations m, n and p represent free time where the clear quantities are subtracted from the accumulator levels (type-4 free time) for type (3,2), (4,j) and (5,1) accumulators.

Figure 11.16 illustrates the way these formulae calculate the free time of the machine in position (4,5) in the machine matrix. Machine 6 (or 4,5) receives free time from each accumulator on the production line. Note how the focus has shifted from machine 5 in Figure 11.15 to machine 6 in Figure 11.16.

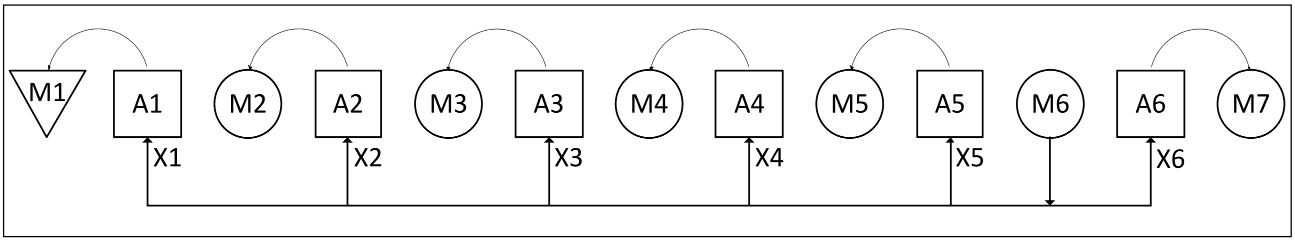


Figure 11.16: Machine 6's free-time calculation

Machine 6's free time is calculated as follows:

$$FT_{M_{(4,5)}} = MAX(X_1 + X_2 + X_3 + X_4 + X_5, X_6, 0) \quad ...(11.6)$$

where

$$X_1 = \frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}}, if\ X_1 < 0\ then\ X_1 = 0, else\ X_1 = X_1$$

$$X_2 = \frac{CQ_{A_{(4,1)}} - AL_{A_{(4,1)}}}{RTR_{M_{(4,1)}}}, if\ X_2 < 0\ then\ X_2 = 0, else\ X_2 = X_2$$

$$X_3 = \frac{CQ_{A_{(4,2)}} - AL_{A_{(4,2)}}}{RTR_{M_{(4,2)}}}, if\ X_3 < 0\ then\ X_3 = 0, else\ X_3 = X_3$$

$$X_4 = \frac{CQ_{A_{(4,3)}} - AL_{A_{(4,3)}}}{RTR_{M_{(4,3)}}}, if\ X_4 < 0\ then\ X_4 = 0, else\ X_4 = X_4$$

$$X_5 = \frac{CQ_{A_{(4,4)}} - AL_{A_{(4,4)}}}{RTR_{M_{(4,4)}}}, if\ X_5 < 0\ then\ X_5 = 0, else\ X_5 = X_5$$

$$X_6 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}}, if\ X_6 < 0\ then\ X_6 = 0, else\ X_6 = X_6$$

11.6.7 Machine 7

Machine 7 is a type-5 machine. The formula that was developed in Chapter 5 for machine type-5 is:

$$FT_{M_{(5,1)}} = MAX\ of\ CD\ or\ \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} \ldots (a) + \sum_{n=1}^{k-1} \frac{PQ_{A_{(2,n)}} - AL_{A_{(2,n)}}}{RTR_{M_{(2,n)}}} \ldots (c) + \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,k)}}} \ldots (d)\ or$$

$$\frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}} \ldots (e) + \sum_{n=1}^{l-1} \frac{CQ_{A_{(4,n)}} - AL_{A_{(4,n)}}}{RTR_{M_{(4,n)}}} \ldots (g) + \frac{CQ_{A_{(5,1)}} - AL_{A_{(5,1)}}}{RTR_{M_{(4,l)}}} \ldots (h) \quad ...(5.19)$$

Equations a, c and d represent free time where the accumulator levels are subtracted from the prime quantities (type-1 free time) for type (1,1), (2,j) and (3,1) accumulators. Equations e, f and h represent free time where the accumulator levels are subtracted from the clear quantities (type-2 free time) for type (3,2), (4,j) and (5,1) accumulators Equations m, n and p represent free time where the clear quantities are subtracted from the accumulator levels (type-4 free time) for type (3,2), (4,j) and (5,1) accumulators.

Figure 11.17 illustrates the way these formulae calculate the free time of the machine in position (5,1) in the machine matrix. Machine 7 (or 5,1) receives free time from each accumulator on the production line. Note how the focus has shifted from machine 6 in Figure 11.16 to machine 7 in Figure 11.17.

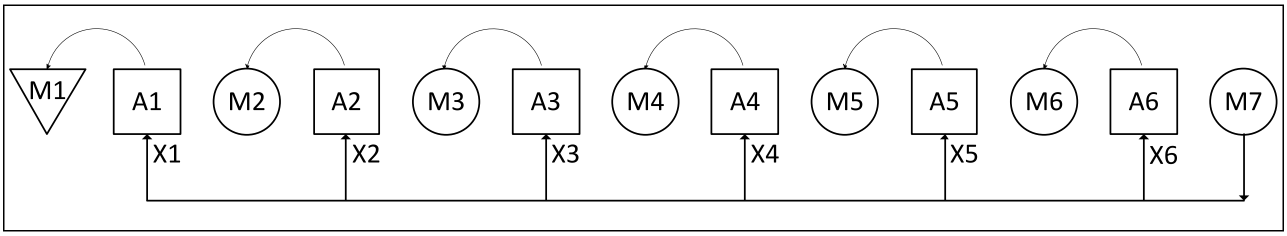


Figure 11.17: Machine 7's free-time calculation

Machine 7's free time is calculated as follows:

$$FT_{M_{(5,1)}} = MAX(X_1 + X_2 + X_3 + X_4 + X_5 + X_6, 0) \qquad ...(11.7)$$

where

$$X_1 = \frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}}, if\ X_1 < 0\ then\ X_1 = 0, else\ X_1 = X_1$$

$$X_2 = \frac{CQ_{A_{(4,1)}} - AL_{A_{(4,1)}}}{RTR_{M_{(4,1)}}}, if\ X_2 < 0\ then\ X_2 = 0, else\ X_2 = X_2$$

$$X_3 = \frac{CQ_{A_{(4,2)}} - AL_{A_{(4,2)}}}{RTR_{M_{(4,2)}}}, if\ X_3 < 0\ then\ X_3 = 0, else\ X_3 = X_3$$

$$X_4 = \frac{CQ_{A_{(4,3)}} - AL_{A_{(4,3)}}}{RTR_{M_{(4,3)}}}, if\ X_4 < 0\ then\ X_4 = 0, else\ X_4 = X_4$$

$$X_5 = \frac{CQ_{A_{(4,4)}} - AL_{A_{(4,4)}}}{RTR_{M_{(4,4)}}}, if\ X_5 < 0\ then\ X_5 = 0, else\ X_5 = X_5$$

$$X_6 = \frac{CQ_{A_{(5,1)}} - AL_{A_{(5,1)}}}{RTR_{M_{(4,5)}}}, if\ X_6 < 0\ then\ X_6 = 0, else\ X_6 = X_6$$

Appendix J presents the colour-coded free-time calculation details for the Valpré production line, with blocking and starvation logic.

11.7 THE VALPRÉ PRODUCTION PROCESS OVERVIEW

Figure 11.11 shows an overhead view of the Valpré production coupled process. From the bottom right anticlockwise, the product enters the process from the filler (out of the picture) and follows the accumulation conveyors to the labeller then to the Variopac, the Wrapapac, the palletiser and on to the wrapper and forklift (out of the picture).

Figure 11.18: The Valpré production process overview

11.8 DATA CAPTURING AND FREE-TIME DISPLAY

Real-time data was captured and processed over a period of eight weeks from 5 May 2014 to 29 June 2014. Data was collected from the seven field devices. The field devices consist of a photocell, a solid-state relay and a Jazz PLC box with a Wi-Fi bullet. The field devices transmited a clean count value every five seconds through the Wi-Fi bullet to the free-time computer. The computer processed the data from the field and calculated the free time for each machine. This free time was then displayed on eight Android tablets; one at each machine and one (called the 'drone') in the control room. The operators can interact with the tablets and they are prompted for an estimated downtime time when their machine breaks down while it is the constraint.

11.9 SUMMARY

In this chapter, the Valpré experiment at the Lagerspoort plant near Heidelberg, South Africa, was described in detail. The Valpré plant was selected for the eight-week experiment because of its proximity to the researcher and technicians. First, the various production machines at the Valpré plant were described in detail. The V-profile for the plant was plotted showing the machines in product flow sequence together with their throughput rates. The machine types were tabled and justified. With the aid of matrix mathematics, specific machine and accumulator matrices were developed from the general case developed in Chapter 5. The specific-solution free-time formulae were formulated from the general solutions developed in Chapter 5 in preparation for the experiment.

The Valpré production process overview was discussed. Data gathering and the free-time display process was explained. An extract of the data (representing 2 hours and 52 minutes of data) gathered from the experiment at the Valpré plant is presented in Appendix D.

The findings of the tests and the experiment are detailed in the next chapter.

CHAPTER 12:
FINDINGS OF THE VALPRé EXPERIMENT

12.1 INTRODUCTION

In this chapter, the quantitative and qualitative results obtained from the Valpré experiment are discussed. First, the performance of the hardware solution is reported, presenting the enthalpic certainty performance per machine in table format. Next, the results of the three test criteria developed to prove the proposition are presented. Finally, the qualitative results from the operator questionnaire are reported.

The quantitative data of the experiment was tested in the following four distinct progressive steps:

i) The enthalpic certainty performance; this ensured the reliability of the data captured.

ii) The acid test; this test gauged the accuracy of the free-time calculations. The acid test results were optimised by adjusting the CQ levels in the accumulators of the Valpré experiment.

iii) The start-up test; this test proved that the start-up sequence can improve give free-time information.

iv) The judicious use of free time test.

Operators completed a questionnaire after being introduced to the free-time concept, before the experiment and the findings of this data was discussed.

12.2 QUANTITATIVE DATA RESULTS

12.2.1 The enthalpic certainty results

Enthalpic certainty (h), described in Section 6.4, is a measure of the Wi-Fi performance at a specific machine. If the Wi-Fi performance is poor, the results of the free-time calculations are unreliable. It was demonstrated in Section 6.4, how free time is reduced due to poor Wi-Fi performance and how to maintain a conservative estimation of free time. For the month of May 2014, the average enthalpic certainty, number of observation where the enthalpic certainty was < 100 % and the number of observations where the enthalpic certainty was 100% are tabled in Table 12.1 below:

Table 12.1: Enthalpic certainty results for the seven machines for the month of May 2014

	Machine 1	Machine 2	Machine 3	Machine 4	Machine 5	Machine 6	Machine 7
Ave (h)	95.5%	98.3%	84.2%	98.2%	98.1%	98.3%	98.3%
No. < 100	17 905	6 839	63 089	7 072	7 514	6 814	6 795
No. = 100	382 628	393 694	337 444	393 461	393 019	393 719	393 738

The low enthalpy certainty for Machine 3 indicates a period during May where the communication from Machine 3 was not as good as the other 6 machines. Free time was scaled down and the experiment continued to perform, proving that a low enthalpy certainty does not stop the process.

12.2.2 The acid test results

The acid test is described in Chapter 6. Initially, a manual acid test was performed and thereafter the test was automated to ensure accuracy and to test the population rather than a sample. The percentage of successful acid tests was calculated. The Valpré production process data was recorded for eight weeks. During this time, a total of 8 417 acid tests were conducted. Of these tests, on average 8 305 passed and 112 failed, resulting in a pass rate of 98.67 per cent (see Table 12.2).

Table 12.2: Acid test results from the test carried out on the eight-week data set

	Machine 2	Machine 3	Machine 4	Machine 5	Machine 6	Machine 7	Average
Ave h	98.5%	98.6%	99.0%	98.7%	98.3%	98.9%	98.67%
Failed	126	118	84	109	143	93	112
Passed	8 091	8 299	8 333	8 308	8 274	8 324	8 305

This results proved that the calculated free times were accurate. The clear quantity can be adjusted to increase the accuracy of the results even further, but would potentially lead to free-time reduction.

12.2.3 The variation in start-up accuracy results

The start-up test is described in Chapter 8. The free-time computer calculated the theoretical best moment for the production machine to be started. The results of the start-up tests for the Valpre experiment are presented in Appendix E.

In the experiment, the operator’s start-up moment was matched to the theoretical best moment as calculated by the system. The operators were trained and presented with a free-time display on the 22 May 2014. The experiment was repeated but now the operators were requested to prepare their production machines in time to be ready for the indicated start-up moment.

The difference between these two moments was plotted in Figure 12.1 over a period of eight weeks, three weeks before the intervention and five weeks thereafter. The average time difference improved from 38 minutes and 48 seconds to 22 minutes and 47 seconds. This represented a 16 minute improvement. The standard deviation for this experiment was 47 minutes 38 seconds before the operators were trained and the deviation was reduced to 47 min and 24 seconds after the operators were trained. Breakdowns during start-up is commonplace in coupled production processes and effects the standard deviation of the results. Removing these breakdown’s effecs from the data in the next section, will show the true effect the improved start-up practice has on the standard deviation.

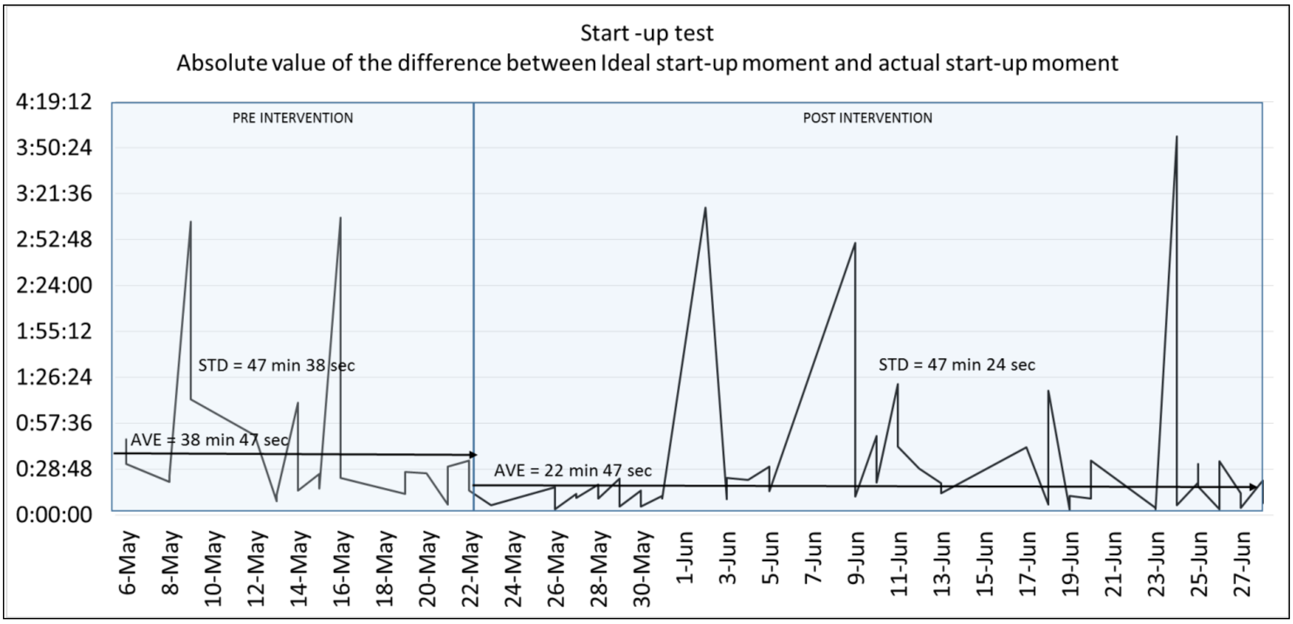


Figure 12.1: Daily start-up test values and averages for the eight-week period

In nine instances, the machine being monitored broke down during start-up. The breakdowns are listed in Table 12.3.

Table 12.3: Breakdowns and other causes for poor performance during start-up measurement

Incident no.	Date	Shift	Description
1	9 May	Morning	Labeller breakdown. Glue roller failure.
2	9 May	Afternoon	Labeller breakdown. Operator absent.
3	14 May	Morning	Labeller breakdown. Operator absent.
4	2 June	Afternoon shift	Variopac breakdown. No film.
5	9 June	Morning	Wrapapac breakdown. Tray magazine damaged.
6	11 June	Morning	Wrapapac breakdown. Operator absent.
7	11 June	Afternoon	Wrapapac breakdown. Machine timing went out.
8	18 June	Afternoon	Variopac breakdown. Static film.
9	20 June	Morning	Wrapapac breakdown. Operator absent.

These incidents were removed from the data. The adjusted start-up results were calculated excluding these outliers and are displayed in Figure 12.2.

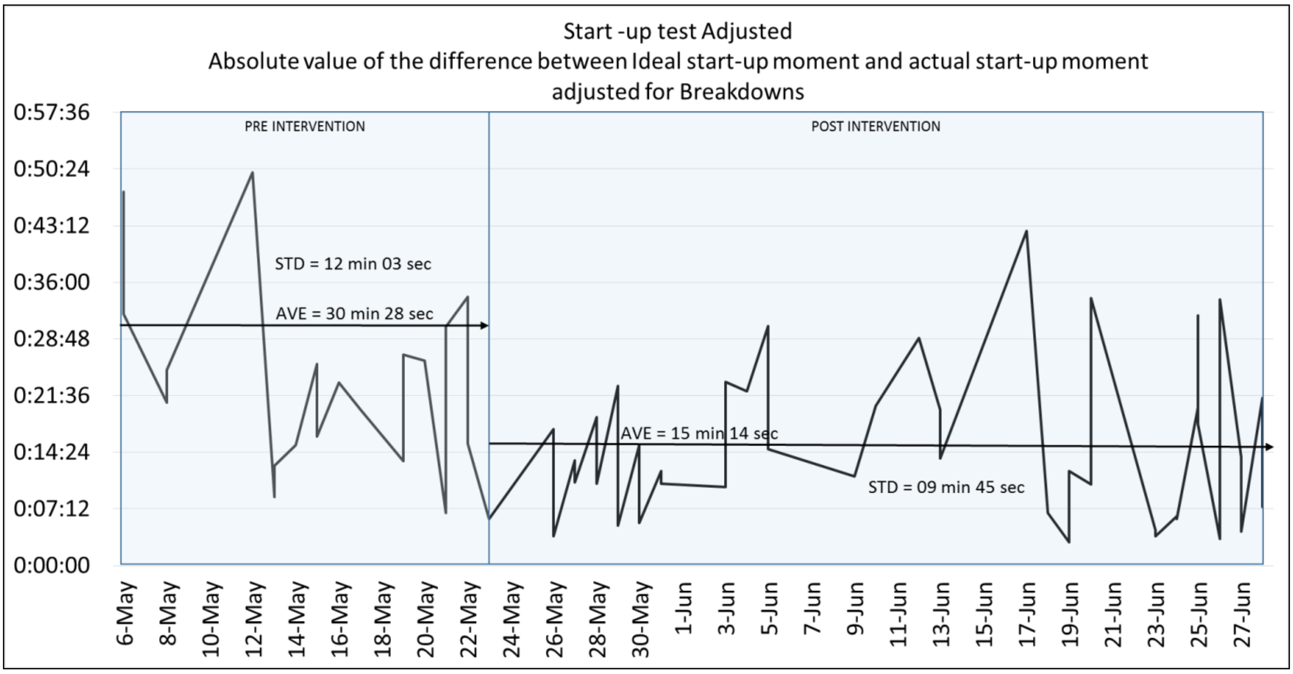


Figure 12.2: Adjusted daily start-up test values and averages for the eight-week period (*ceteris paribus*)

The average time difference improved from 30 minutes and 28 seconds to 15 minutes and 14 seconds. This represented a fifteen (15) minute and 14 second improvement. The standard deviation for this experiment before training was 12 minutes and three (3) seconds and nine (9) minutes and 45 seconds thereafter. This constitutes a significant reduction in variability. The free-time tool has improved the way the process starts up. Less time was wasted waiting for slow-starting machines and less shunting of the production process resulted in less idle time.

12.2.4 The judicious use of free-time results

This experiment is described in Chapter 9 and was designed to measure operator behaviour during normal production before and after the free-time intervention. This test addressed the research sub-question: ‘How can free-time utilisation be measured?’

The extent to which free time was used judiciously was recorded at the filler, labeller and at the shrink-wrapper. See the free-time use efficiency table in Appendix E.

The average free-time use efficiency was 80 per cent in the three weeks prior to the intervention. The free-time use efficiency increased by ten per cent to almost 90 per cent in the eight weeks after the intervention. This improvement clearly indicates the improved free-time use by production operators after the intervention. See graph in Figure 12.3.

The standard deviation before the intervention was calculated at 13.3 per cent and reduced to 6.2 per cent after the intervention. This shows that the variability in the results improved substantially.

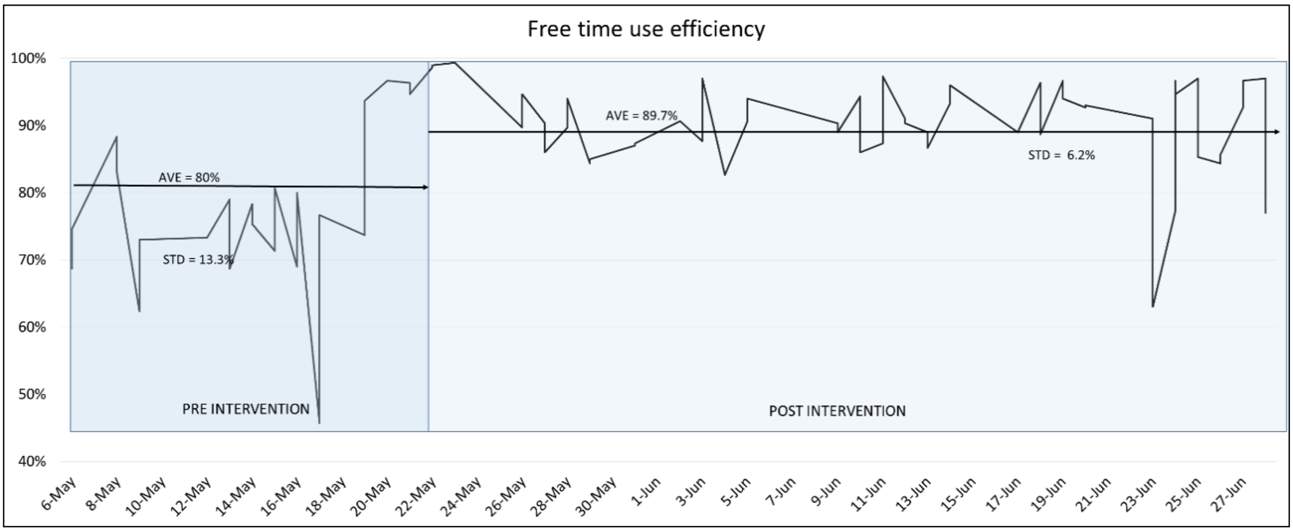


Figure 12.3: Efficiency of free time use

This improvement in variability suggests a more controlled use of free time and fewer outliers. Operators have embraced the use of free time during normal operation.

The ultimate measure of improved performance on a production line is to produce more units in the same production hours. Overall line efficiency is the measure used for production performance. This measure also directly translates into financial value.

12.2.5 The overall production line efficiency results

The overall efficiency of the production process was monitored throughout the experiment and reported in Annexure E. The efficiency is calculated by dividing the earned hours by paid hours for each shift. The term ‘earned hours’ is the number of actual cases produced in the shift, divided by the throughput rate for the key machine. ‘Paid hours’ in the case of the Valpré plant are represented by an eight-hour shift as seen in Appendix E The Daily Operational Report.

Production efficiency = Earned hours / paid hours. ...(12.1)

The average efficiency was 43 per cent in the three weeks prior to the intervention. The efficiency increased by 11 per cent to a 54 per cent average in the five weeks after the intervention (see Figure 12.4).

However, the variation was found to be excessive due to uncontrollable breakdowns and scheduled pack changes. The standard deviation was calculated at 19.5 per cent before the intervention and 20.5 per cent after the intervention.

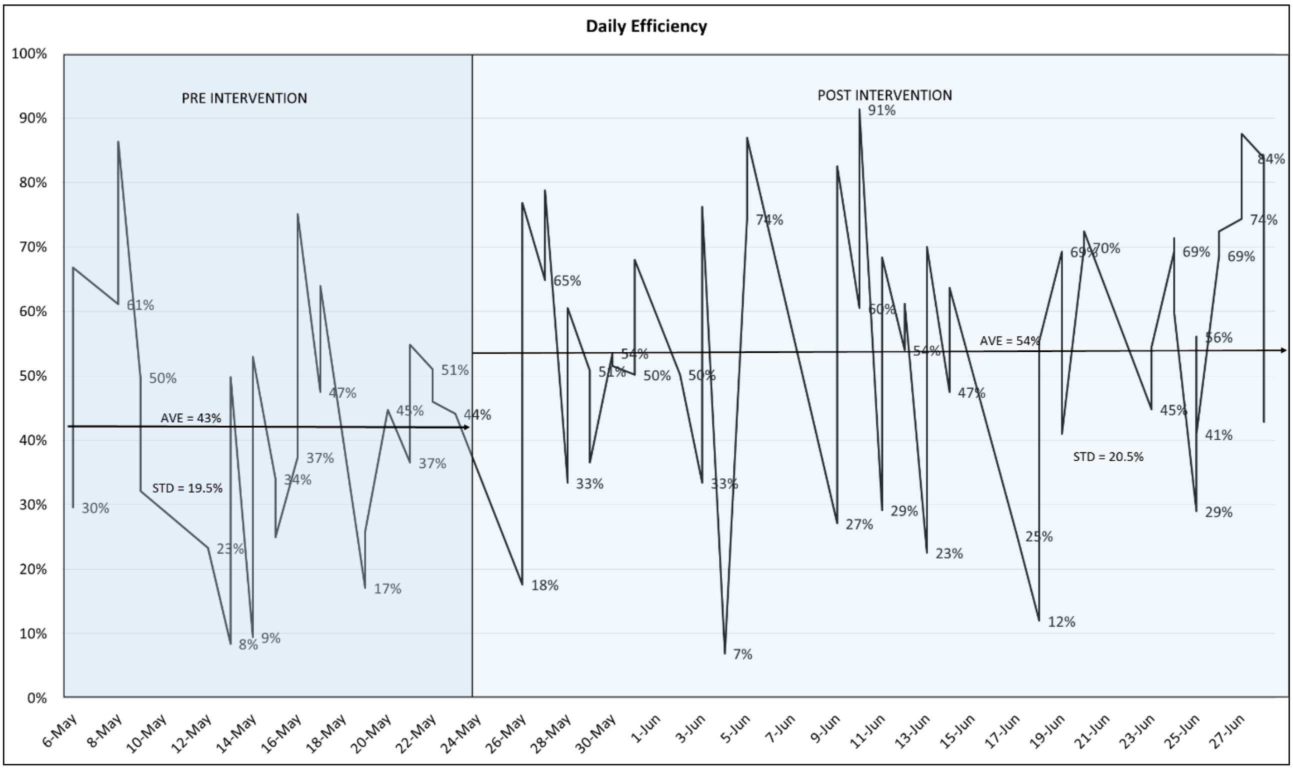


Figure 12.4: Daily efficiency and averages for the eight-week period

Factors that affected the efficiency were identified and excluded in order to create a *ceteris paribus* situation. The two main factors that affected the efficiency significantly are pack changes and major breakdowns. See Appendix E for the efficiency summary table. The breakdowns and pack changes identified on the low efficiency shifts were recorded in the shift logbook at the Valpré plant as shown in Table 12.4.

With the pack size changes and mayor breakdowns excluded, the efficiencies were re-calculated and are presented in Figure 12.5.

The average efficiency improvement was then calculated at nine (9) per cent with the average efficiency before the intervention at 53 per cent and after the intervention at 62 per cent. The standard deviation improved to 15 per cent after the intervention from around 20 per cent prior to removal of major breakdowns and pack changes. No improvement in the variation was observed from before the intervention to after the intervention.

Table 12.4: Breakdowns and pack change incidents during the experiment

Incident no.	Date	Breakdown or pack change description
1	13 May	Underfills at the filler. Production had to be stopped to prevent mayor raw material losses. Problem with warm product foaming from the bottles.
2	19 May	Breakdown of the servo motor inverter at the filler and malfunction of the screw capper.
3	4 June	The lifting cylinders broke down at the filler.
4	9 June	Screw capper breakdown. Caps not transferred to the filler and inspection plate malfunction. Preforms were jammed.
5	9 May	During the afternoon shift, a pack change from 500 ml to 1000 ml.
6	12 May	During the afternoon shift, a pack change from 500 ml to 1000 ml.
7	13 May	During the afternoon shift, a pack change from 1000 ml to 500 ml.
8	14 May	During the morning shift, a pack change from 1000 ml to 500 ml.
9	15 May	During the morning shift, a pack change from 500 ml to 1500 ml.
10	15 May	During the afternoon shift, a pack change from 500 ml to 1500 ml.
11	19 May	A pack change to 330 ml.
12	19 May	During the afternoon shift, a pack change from 330 ml to 500 ml.
13	29 May	During the afternoon shift, a pack change from 500 ml to 1500 ml.
14	3 June	A pack change from 1000 ml to 500 ml.
15	11 June	A pack change from 500 ml to 330 ml.
16	13 June	During the morning shift, a pack change from 330 ml to 1500 ml.
17	17 June	During the afternoon shift, a pack change from 1500 ml to 330 ml.
18	18 June	During the morning shift, a pack change from 330 ml to 500 ml.
19	25 June	During the morning shift, a pack change from 1500 ml to 500 ml.

The financial value of nine (9) per cent production efficiency improvement can be expressed in hours' saving per month to achieve the same production quantity. The plant normally operates six days per week and 16 hours per day. The plant therefore runs on average 25.2 days at 16 hours or 453.6 hours per month. The nine per cent savings on 453.6 hours result in a 40.8 hours saving per month. The shift labour running cost was calculated as R2 314.00 per hour. The total saving per month therefore equates to R94 466.70.

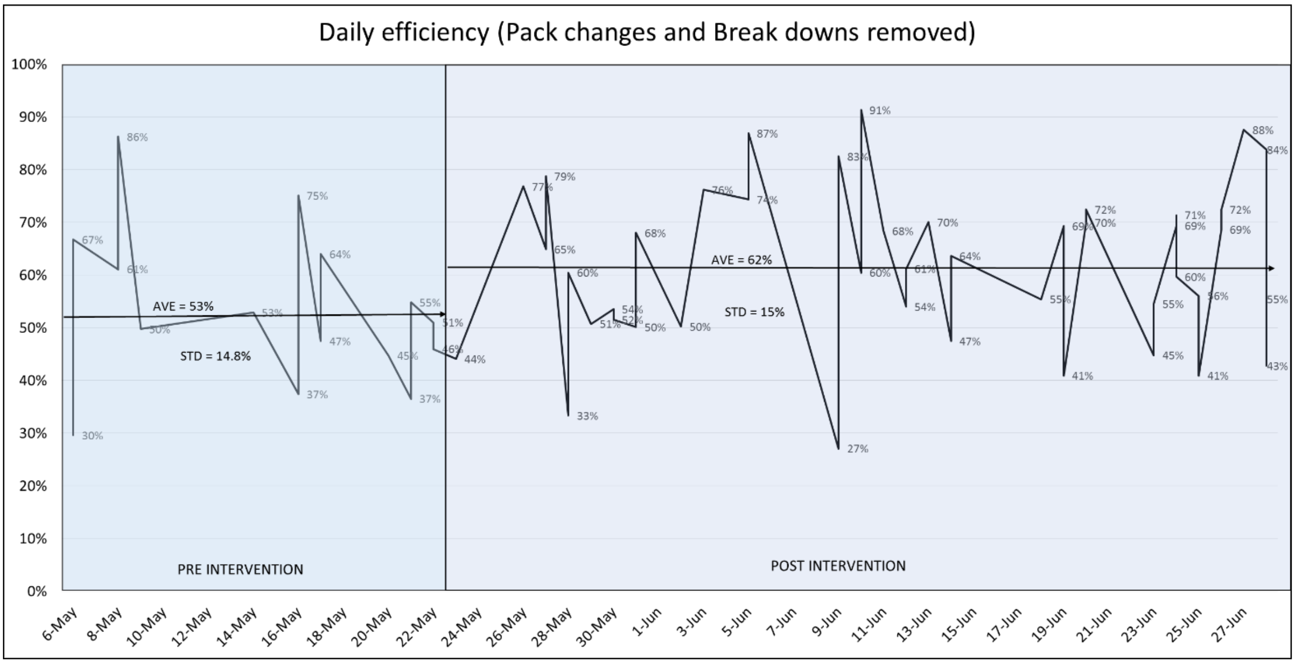


Figure 12.5: Daily efficiency and averages for the eight-week period with pack changes and breakdowns removed (*ceteris paribus*)

12.3 QUALITATIVE DATA RESULTS

Only operators and staff members who were exposed to the free-time tool were surveyed. From the qualitative data, it was found that the gender-balanced, relatively young workforce with few years' service responded well to the request to complete the questionnaire. Only two operators did not complete the questionnaire, as one was on leave and the other was attending to a breakdown in the plant at the time of the survey. Sixteen questions were put to the seventeen respondents. The questionnaire was completed in small groups of one to three operators at a time as and when they had free time available.

12.3.1 Demographics

There were 17 operators; eight were male and nine were female. Of the respondents, 41 per cent had less than two years' service, while 53 per cent have between two and five years' service. Only one respondent had more than ten years' service. This respondent disagreed with the statement that the tool is new and he has not seen it before. This is probably due to the respondent being present at the plant when the previous failed attempt was made. Of the respondents, 59 per cent were between the ages of 20 and 30 years old, while only one respondent was older than 40 years and only one was younger than 20 years old. Two respondents were between the ages of 30 and 40 years old. Only one respondent did not have matric. This respondent was not a permanent employee as the plant has a policy to employ only workers with a matric qualification or equivalent. Of the respondents, 47 per cent have a diploma or college qualification, while 29 per cent have degrees. Figure 12.6 to Figure 12.9 show the demographic details of the respondents.

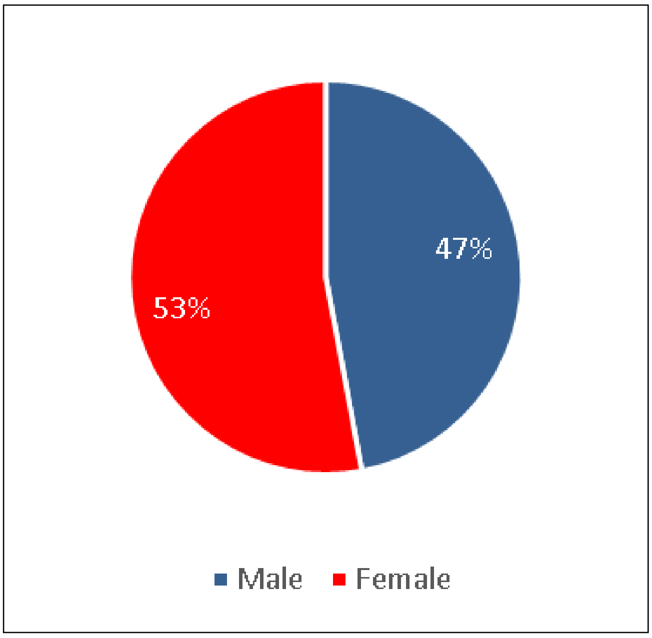


Figure 12.6: Demographics of the respondents: Gender

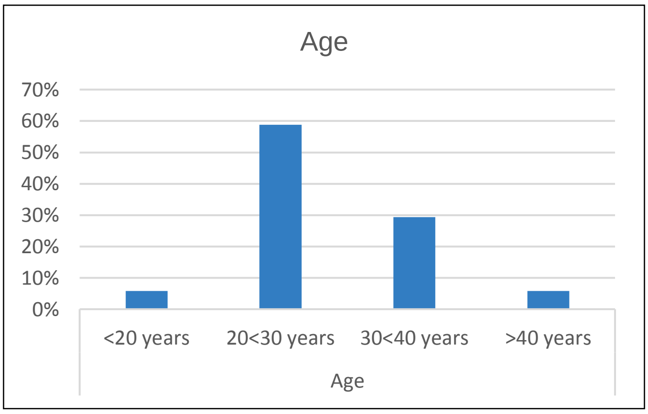


Figure 12.7: Demographics of the respondents: Age

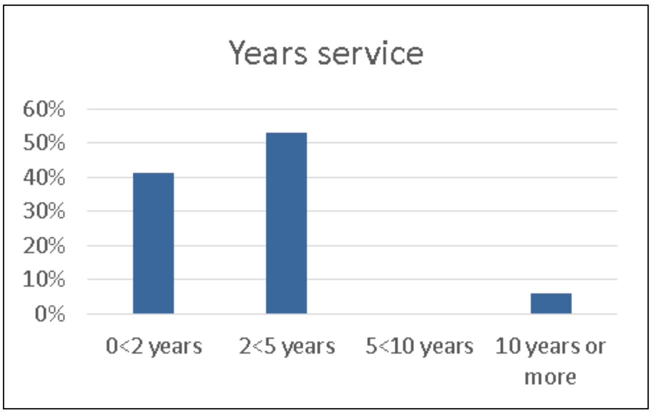


Figure 12.8: Demographics of the respondents: Years service

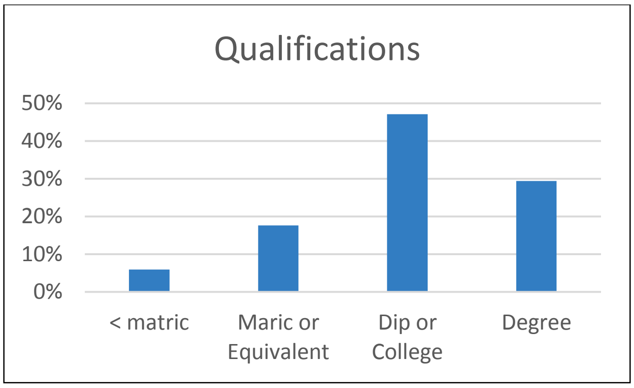


Figure 12.9: Demographics of the respondents: Qualifications

The workforce is well balanced as far as gender is concerned as the company has strong policies to promote women in the workplace. The Valpré plant started with only female operators as part of the '5 by 20' initiative. This international drive by the Coca-Cola Company has a vision to empower five million women worldwide by the year 2020 (Coca-Cola, 2014). The high level of automation in the plant requires that operators have the ability to problem solve and do minor maintenance and inspection tasks. This level of qualification makes the Valpré plant an ideal environment for the PUFT experiment.

12.3.2 Usefulness

Of the respondents, 59 per cent indicated that the tool is definitely useful; 41 per cent indicated the tool is probably useful; and none of the respondents indicated that the tool is not useful.

As shown in Figure 12.10, the results clearly indicate that there is no doubt that the operators and line staff surveyed believe that the tool is useful. This is a positive attribute and creates a conducive environment for the experiment. Operators believing in the usefulness of the tool improve the chances of the experiment being a success.

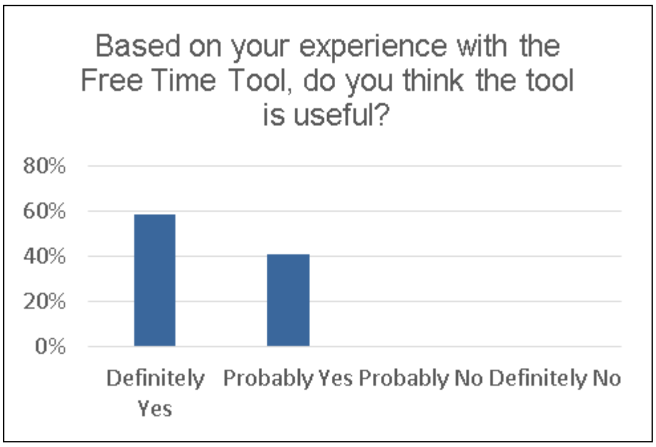


Figure 12.10: Survey results on tool usefulness

12.3.3 Improvement in production efficiency

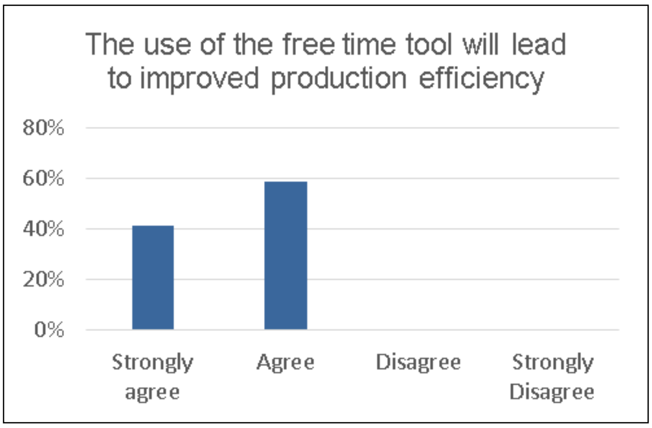


Figure 12.11: Survey results on tool efficiency

As shown in Figure 12.11, 59 per cent of the respondents indicated that they agree with the statement that the tool will lead to improved production efficiency; 41 per cent of the respondents indicated that they strongly agree with the statement, whereas no respondents indicated that they do not agree with the statement.

These responses are a direct indication of the benefits, which this study can have on production processes. Improving efficiency is ultimately the reason for using free time productively. All the respondents believe that efficiency can be improved if free time is used productively.

12.3.4 Time management

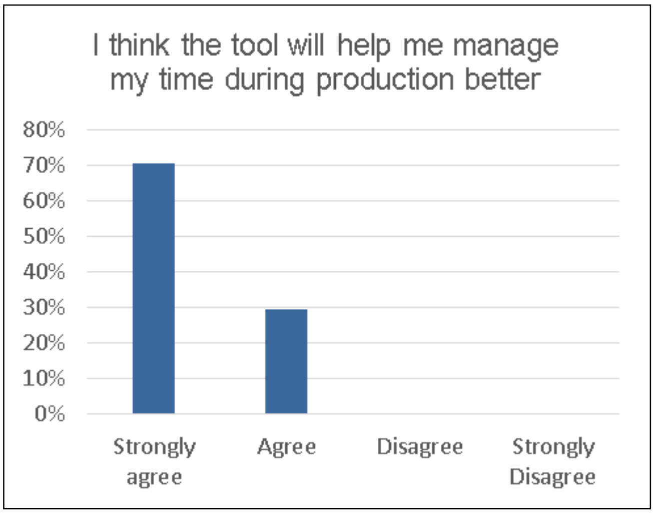


Figure 12.12: Survey results on managing time

As shown in Figure 12.12, all the respondents indicated that they strongly agree or at least agree with the statement that the tool will help them manage their time during production better; 71 per cent of the operators indicated that they strongly agree with the statement, while 29 per cent indicated they agree with the statement.

The tool was specifically designed to indicate free time to operators. Time management is a key success factor in the running of an efficient production processes. Time management during production is more difficult than prior to or after the production process commences. With the real-time display of free time at every production station, a new time management tool can be very useful.

12.3.5 Uniqueness of the tool

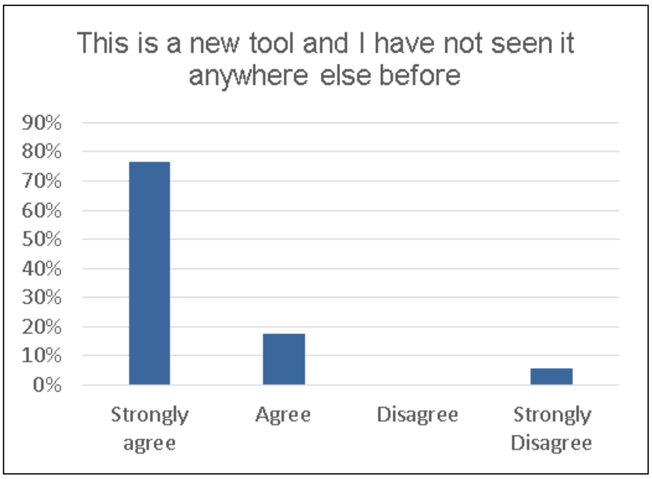


Figure 12.13: Survey results on the uniqueness of the tool

Figure 12.13 indicates that this question was met with the highest score of 'Strongly agree', i.e. 76 per cent. These respondents strongly agreed with the statement that the tool is a new tool and they have not seen it anywhere else before; 18 per cent of the respondents indicated that they agree with the statement; one respondent indicated that he strongly disagrees with the statement. This respondent also has more than ten years of service. As indicated before, an unsuccessful attempt at proving the concept in the same plant in the past might be the reason for this response.

Production support systems are widely used. This question regarding the uniqueness was asked to establish if the operators and staff have seen a free-time tool before. It was also to ascertain whether this is a unique tool not present in any other plant they have worked in before. From the responses, it is clear that the tool is unique.

12.3.6 Payback of time and money invested

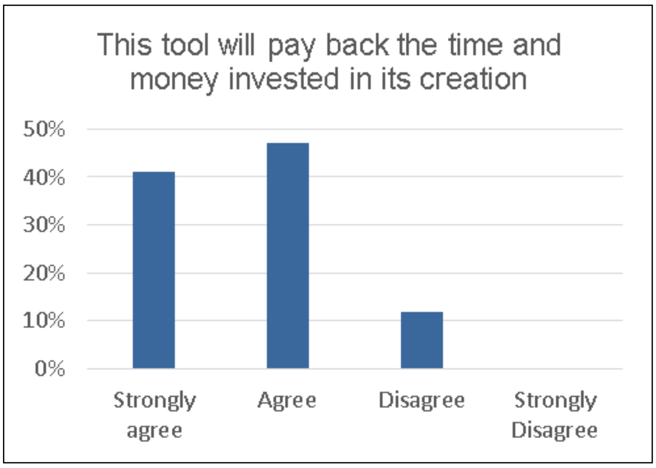


Figure 12.14: Survey results on payback of time and money invested

As shown in Figure 12.14, 41 per cent of the respondents indicated that they strongly agree with the statement that the tool will pay back the time and money invested in its creation; 47 per cent of respondents indicated that they agree with the statement; and two respondents (12%) stated that they disagree with the statement. None of the respondents strongly disagreed with the statement.

Significant time and resources were used in the development of the tool. The majority of the respondents indicated that they believed the tool would provide a ‘payback’ but two respondents believed that the tool would not. This could be due to the track record of previous failed attempts that did not provide a ‘payback’ on the investment made at the plant.

12.3.7 Must be shared / rolled out

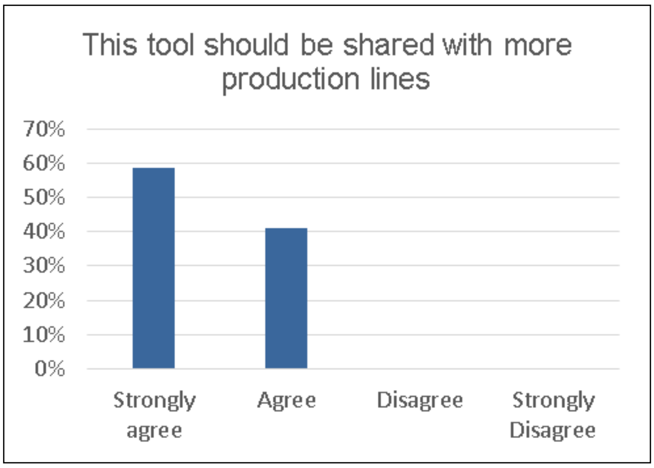


Figure 12.15: Survey results on sharing the tool

Figure 12.15 shows that 59% of respondents indicated that they strongly agree with the statement that the tool should be shared with more production processes; 41 per cent indicated that they agree with the statement; and none of the respondents disagreed with the statement.

The study was done on one of two production lines in the production hall at the Valpré plant. There are eight more production plants in the group owned by The Coca-Cola Company and 71 more production lines owned by the bottling system in South Africa. Rolling out the solution to other production lines can make a significant contribution to the productivity of the system as a whole.

12.3.8 Training

As indicated in Figure 12.16, only 24 per cent of the respondents indicated that they strongly agree with the statement that they have been trained and know what is expected of them. Another 52 per cent of the respondents indicated that they agree with the statement. Some 24 per cent recorded that they disagree with the statement; and none of the respondents strongly disagreed with the statement.

Four operators indicated that they were not trained. In order to use free time productively, operators must be trained to input breakdown free time, stop their machines when free time is available and know when they are the cause of the constraint. The middle- and senior management at the plant have been trained formally. Ongoing informal on-the-job training was done before and after the survey was done. On-the-job training ensured that all staff was at least trained during the running of the experiment and the improvement in the judicious use of free time reflected this change in working behaviour.

Figure 12.16: Survey results on the effectiveness of training

12.3.9 Continuation of the programme

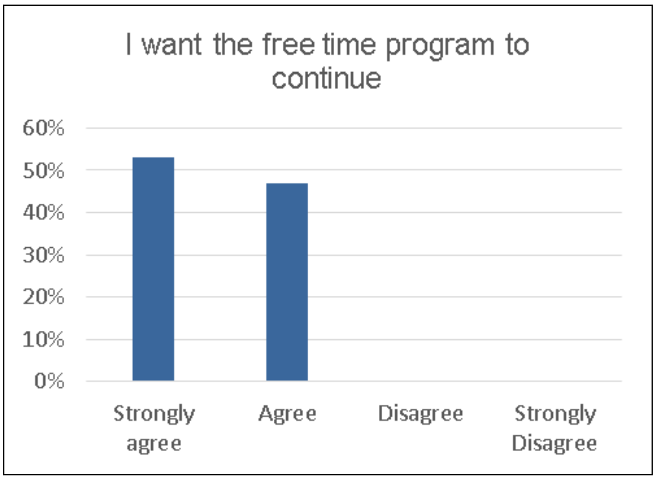


Figure 12.17: Survey results on the continuation of the programme

As illustrated in Figure 12.17, 53 per cent of the respondents indicated that they strongly agree with the statement that they want the free-time programme to continue; 47 per cent indicated that they agree with the statement; none of the respondents remarked that they disagreed with the statement. It is therefore confirmed that the staff want to continue with the programme.

12.3.10 The tool's effect on the efficiency of the process

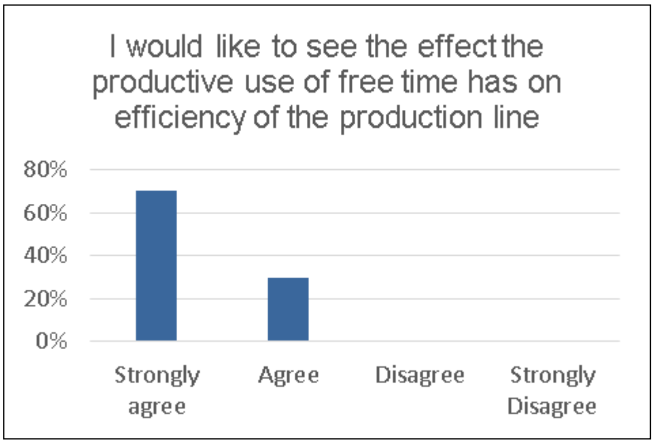


Figure 12.18: Survey results on the efficiency of the process

Figure 12.18 shows that all the respondents indicated that they would like to see the effect the productive use of free time has on the efficiency of the production process; 71 per cent indicated they strongly agree with the statement; 29 per cent indicated that they agree with the statement; and none of the respondents disagreed with the statement.

Visual management is key to the sustainable success of new initiatives. Because of this overwhelming response in favour of feedback on the efficiency of the production process, efficiency indicators have been placed on the free-time screens at every production station. Efficiency of the production shift is displayed in real time and reports are generated to show efficiency to middle- and senior management on a weekly report.

12.3.11 Frequency of usage of the free-time tool

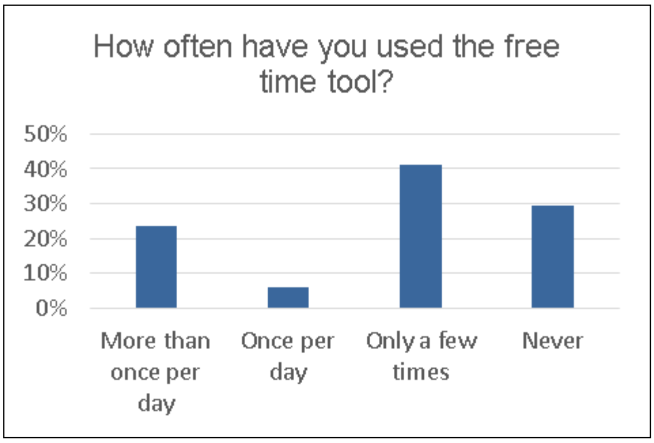


Figure 12.19: Survey results on the frequency of usage

Figure 12.19 shows that 24 per cent of the respondents indicated that they used the tool more than once per day; six (6) per cent of respondents used the tool every day; 41 per cent of respondents used the tool a few times; and 29 per cent of respondents indicated they have never used the tool.

These results are not surprising, as only a few operators were involved in the testing of the free-time tool before the experiment started. Using the free-time tool is essential for the success of the experiment. The judicious use of free time is a direct measurement of the use of free time. Quantitative data demonstrates that the judicious use of the free time improved during the duration of the experiment.

12.3.12 The availability of free-time tasks

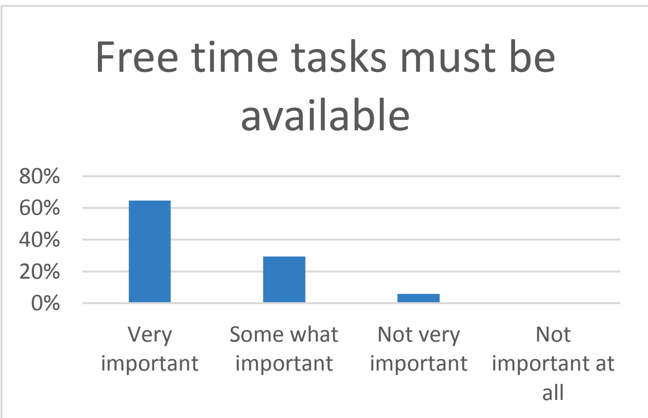


Figure 12.20: Survey results on the availability of free time tasks

As Figure 12.20 shows, 65 per cent of all respondents indicated that they believed that the availability of free-time tasks is very important; 29 per cent of the respondents indicated it to be somewhat important; six (6) per cent indicated that it is not very important and none of the respondents indicated it as not important at all.

No free-time tasks were developed for the experiment. Operators were left to make use of free time as they saw fit. Having planned free-time tasks available will probably make operators more productive. The respondents were mostly in favour of free-time tasks being available. The maintenance manager and team leaders started developing free-time tasks during the experiment.

12.3.13 Management must measure the free time used

Figure 12.21 shows that 53 per cent of the respondents indicated that they believed that the measurement of free time by management to be very important; 35 per cent indicated it to be somewhat important; six (6) per cent as not very important; and six (6) per cent as not important at all.

It is clear that respondents want free time to be measured and that management must be in a position to view the free time used. What management does with the information is very important: if management uses this indicator to reward production operators, it could have a positive effect; whereas if the information is used in a punitive way, the tool could fall into disuse.

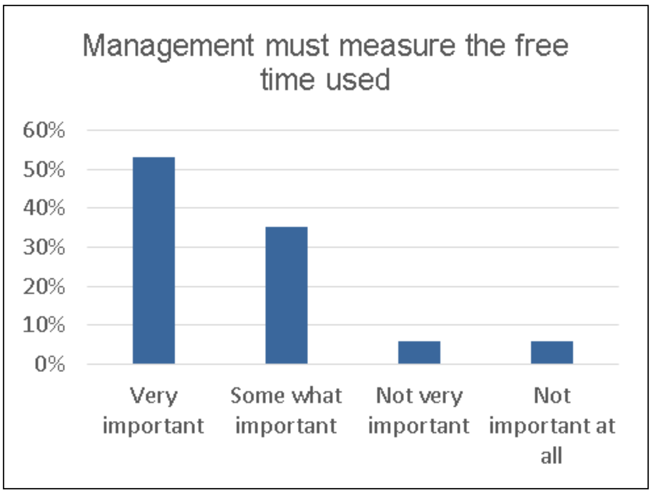


Figure 12.21: Survey results on management measuring free time used

12.3.14 Free time displayed on private communication devices

Of the respondents, 65 per cent indicated that being able to see their production machine's free time on their Smartphone or tablet is very important; 23 per cent indicated it as somewhat important; 12 per cent as not very important; and none of the respondents indicated this as not important at all. Refer to Figure 12.22.

Free time is displayed at every production station. The display is big enough so that the time can be observed from some distance away. However, should the operator move away in the time that he/she is using the free time; the operator would lose sight of the remaining free time. This under normal countdown is not a problem, but if additional free time is added or a free-time correction is made by the constraint, the operator might be away from his workstation and not get the update. This could be the main reason operators want to see free time on their personal communication devices. An example of such situation would be where an operator is in the canteen when an update for additional free time comes through. He/she would then be able to plan another free-time activity before returning to the production station.

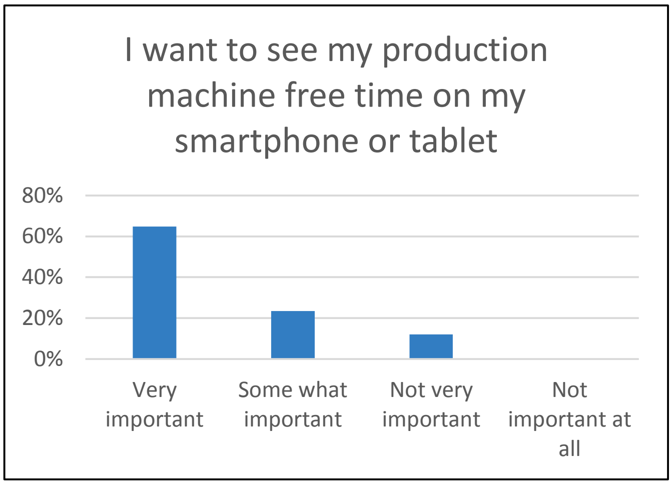


Figure 12.22: Survey results on the free-time display options

12.3.15 Rewarding operators for using free time productively

Figure 12.23: Survey results on rewarding for free time used

Figure 12.23 shows that 29 per cent of the respondents indicated that management rewarding them for using free time is very important; 41 per cent indicated it as somewhat important; 12 per cent as not very important; and 18 per cent as not important at all.

Pay for performance is practiced in the form of performance management at the plant. Connecting pay to a metric is normally only practiced by staff in middle- and senior management roles. The survey did not split the respondents by operation level in the business. This could potentially be the reason for the big disparity found here. However, the topic of pay for performance falls outside the ambit of this study.

12.3.16 Future use of free time

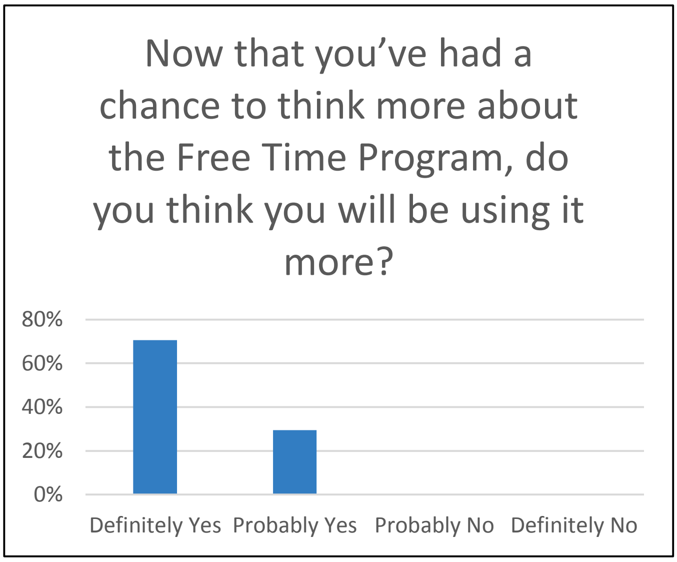


Figure 12.24: Survey results on using free time more regularly

It is clear from Figure 12.24 that 70 per cent of the respondents indicated that, since they had the opportunity to ponder the free-time programme, they will definitely be using it more and 30 per cent indicated that they would probably be using it more.

This is again a positive result and clearly indicates that most of the respondents intend to use the free time more. The questionnaire also raised topics not previously considered by the operators, such as personal device access, being rewarded for using free time, the effect on efficiency and managing time better.

12.3.17 Recommend the use of free time to other production centres

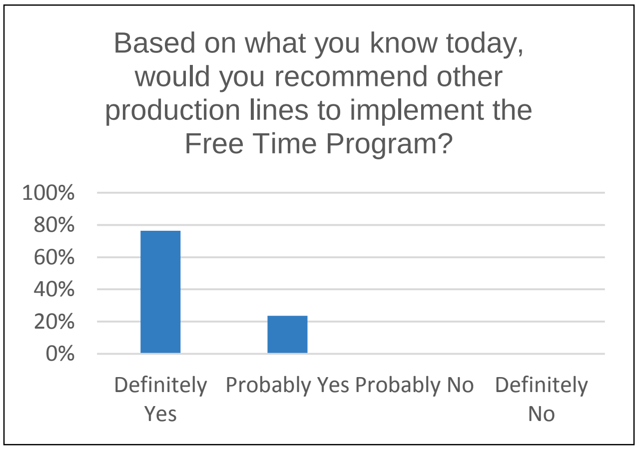


Figure 12.25: Survey results on recommendation to other production centres

As shown in Figure 12.25, an overwhelming 76 per cent of the respondents indicated that based on what they know today, they would definitely recommend the free-time programme to other production lines; 24 per cent indicated that they would probably be recommending the programme to other production processes, while none of the respondents indicated that they would not be recommending the programme to other processes.

These results show that all the respondents believed the programme is worthy of being shared with other production centres.

12.4 SUMMARY

The acid test results demonstrate an accurate free-time calculation in 98.7 per cent of the test cases during the experiment. This to the researcher is a significant result given the context and the available free time. The start-up test results were also positive, with the average time difference improving from 38 minutes and 48 seconds to 22 minutes and 47 seconds. This represented a 16 minute improvement prior to adjusting the data for breakdowns. The average time difference improved from 30 minutes and 28 seconds to 15 minutes and 14 seconds after adjustment for breakdowns. This represented a fifteen (15) minute 14 second improvement. The standard deviation for the start-up experiment before training was 12 minutes and three (3) seconds and nine (9) minutes and 45 seconds after the training. This demonstrates a reduction in variability indicating more control over the process.

The results for the judicious use of free time were further positive. The average free-time use efficiency was 80 per cent in the three weeks prior to the intervention. The free-time use efficiency increased by ten per cent to almost 90 per cent in the eight weeks after the intervention. The standard deviation before the intervention was calculated at 13.3 per cent and reduced to 6.2 per cent after the intervention.

It follows that, if the free time is used judiciously by operators and the start-up of machines are co-ordinated, better; the overall efficiency of the production line will improve. The average efficiency was 43 per cent in the three weeks prior to the intervention. The efficiency increased by 11 per cent to 54 per cent in the eight weeks after the training and deployment intervention.

Breakdowns and pack changes caused significant variation and to obtain a position of *ceteris paribus*, these events were removed from the data. The average efficiency improvement was then calculated at nine (9) per cent with the average efficiency before the intervention at 53 per cent and after the intervention at 62 per cent. The standard deviation improved to 15 per cent after the intervention from around 20 per cent prior to removing major breakdowns and pack changes. Variability has thus improved with the removal of the breakdowns and pack changes.

The financial value of nine (9) per cent production efficiency improvement was calculated to constitute a saving of R94 466.70 per month.

From the qualitative data, it was found that the gender-balanced, relatively young workforce with few years' service, responded well to the request to complete the questionnaire. Only two operators did not complete the questionnaire, as one was on leave and the other was attending to a serious breakdown in the plant at the time of the survey. Sixteen questions were put to the seventeen respondents. The questionnaire was completed in small groups of one to three operators at a time as and when they had free time available.

The survey demonstrated undoubtedly that the operators believe in the usefulness of the programme; it will in their opinion improve production efficiency and help them to manage their time better. They believe the tool is new and should be shared with other production processes. The operators were somewhat divided on the view whether the tool will be paying back the investment made. Not all the operators were trained at the time the survey was conducted and on-the-job training was continued during the experiment. The operators were all keen to see the effect the programme has on performance and efficiency indicators were added to their free-time displays. At the time of the survey, not all the operators had used the tool. The on-the-job training was to address this shortcoming.

All the operators wanted free-time tasks to be available, but not all operators wanted management to measure them on, or reward them for, free time used. All the operators wanted to view their free time on a mobile device when away from their production stations. On completion of the questionnaire, all the operators indicated that they would be using it more because of the additional insight gained by completing the questionnaire. Operators also indicated that they would recommend the programme to other production processes.

The next chapter offers a conclusion and recommendations.

CHAPTER 13: CONCLUSION

13.1 INTRODUCTION

A literature study identified various methods of improving the design and optimisation of production processes. Finding transient methods to use idle time productively proved unsuccessful as the literature either focused on the constraint in a process, or developed techniques for designing optimal production systems. Research conducted therefore had to be exploratory in nature and an engineering method to problem solving was used.

First, the problem was defined, followed by background research. Requirements and test criteria were specified and a solution was chosen after brainstorming sessions. The prototype solution was developed and then tested. Design changes were made where the solution did not meet the requirements. This part of the process was repeated until the test solution met all the requirements. Only then could results be communicated. The contribution of the free-time concept to science and the generalisation of the results are also discussed in this chapter.

13.2 THE PROBLEM STATEMENT

Coupled production lines with finite buffers are prone to machines being idle due to blocking or starvation. Excess capacity is designed into these closed systems due to over-engineering and make-fit solutions. Improving overall efficiency using lean manufacturing techniques, like Kanban or Just in Time, are limited in their application when it comes to modern coupled production processes with finite inter-stage buffers. The efficient use of idle time during the normal course of production, to do opportunistic maintenance tasks, could improve overall efficiency. However, proving the existence of useful free time available on a coupled production line and calculating the free time in a transient state of production could be difficult. Using the free time judiciously, measuring the productive use of free time and improving efficiency would solve this engineering problem.

13.3 ENGINEERING METHODOLOGY APPLIED TO SOLVE THE FREE-TIME PROBLEM

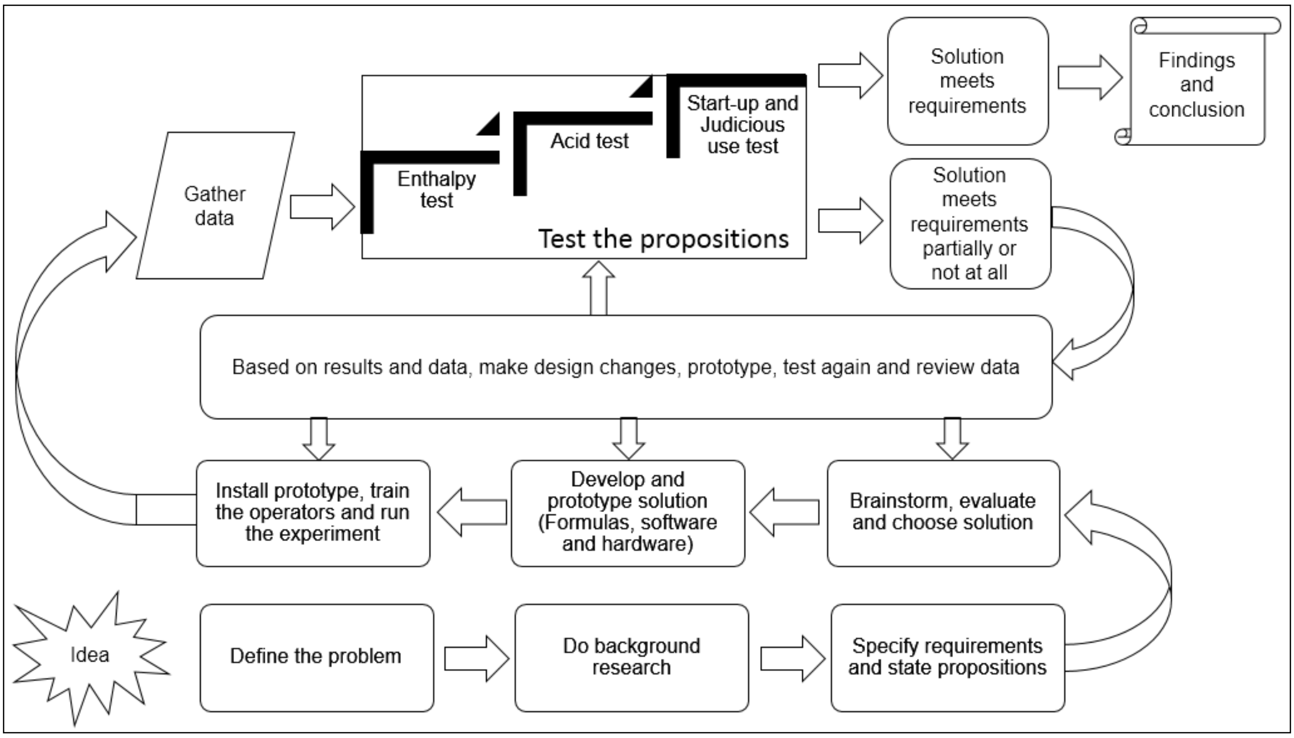


Figure 13.1: The free-time concept development method (Engineering methodology)

Source: Researchers own adaptation from the general engineering proess.

Figure 13.1 shows a diagram of the engineering methodology followed to develop the free-time concept.

The **idea** of using idle time, caused by starvation and blocking conditions, productively on a coupled production line emanated from observing operators working on a bottling line. The **Problem statement was defined** after analysing this phenomenon and read as follows:

Coupled production lines with finite buffers are prone to machines being idle due to blocking or starvation. Excess capacity is designed into these closed systems due to over-engineering and make-fit solutions. Improving overall efficiency using lean manufacturing techniques, like Kanban or Just in Time, are limited in their application when it comes to coupled processes with finite inter-stage buffers. The efficient use of idle time during the normal course of production, to do opportunistic preventative maintenance tasks, could improve overall efficiency. However, proving the existence of useful free time available on a coupled production line and calculating the free time in a transient state of production could be difficult. Using the free time judiciously, measuring the productive use of free time and an improvement in efficiency could further result from solving this engineering problem.

Background research indicated that studies have mainly focused on developing solutions in optimising processes during design stage. The overdesign of machines leading into and drawing from the key machine in a coupled production process is referred to as the bowl phenomenon.

The **requirements for solving the problem were specified** by defining and conceptualising three propositions.

i) Demonstrate that free time can be calculated accurately in real time.

ii) Demonstrate that operators can start production processes better given free-time start-up information.

iii) Demonstrate that operators can stop production processes judiciously given accurate free-time information.

Brainstorming and evaluation lead to the development of a pump and water tank model, mimicking the key characteristics of the coupled production line. Key aspects of the theory, buffer limits, characteristics of the coupled production process and information needed to calculate free time during a transient state were then contemplated. The production process states were defined as either stationary or transient.

With the basic theory in place, a matrix mathematical structure was put in place to represent the machines and the accumulator types in the coupled process. Calculations for free time given any number of machines on a production line were then formulated. With the solution now developed, it needed to be **prototyped**.

Purpose-specific hardware was built to sense the throughput of product at all points of interest. This information was finally communicated wirelessly to the free-time computer. An initial wired solution did not meet the requirements. The free-time computer consolidated the data and processed live free-time calculations. The results were sent back to the field where it was displayed on the user interface. Unique (bespoke) software was written and controlled by the hardware. Each type of field device and the free-time computer had its own software dedicated to its specific task.

Once the hardware was **installed** and programmed with software, data gathering started. First data was gathered without the operators' knowledge. **Data gathered** during this period represented the current practice. Thereafter, operators were trained and given access to free-time information.

Testing of the solution followed. First, a self-diagnosis test monitoring the wireless communication network's reliability was performed. Enthalpic certainty was defined as an analogy for poor communication and used in calculations to ensure that free time presented, was accurate during good wireless performance conditions or conservative during poor wireless performance conditions, resulting from signal interference. In this way, free time was never overstated.

The implementation of the model was done by developing and testing three test criteria, each one building on the previous test. These tests were formulated to test the propositions and address the research problem. First, the accuracy of free-time results was tested. Only once accurate free time was demonstrated, two further tests tested the start-up performance improvement of the system and the ability to use free time judiciously.

Based on results, the **solution failed** to meet requirements and design and prototype changes needed to be made four times.

Data for the **successful experiment** at the Valpré production plant was gathered in the period 5 May to 29 June 2014. The relevant test information was extracted from the data and comparisons were made in performance before and after the free-time intervention. The following **findings** were made:

i) Free time can be calculated accurately.

ii) Production operators can start the production line better using free-time start-up information.

iii) Operators can stop machines judiciously given free-time information during the transient state.

In **conclusion**, the experiment has proven the solution has met the requirements specified to solve the problem of using free time productively.

13.4 THE PROBLEM SOLUTION AND THE TESTS CONDUCTED

To solve the problem, requirements were specified. These requirements were first defined by three propositions. Specific tests were then developed to demonstrate that the requirements could be met. In the first case, free time's existence in a coupled system needed to be proven and the accuracy of the calculated free time determined. The acid test was developed in Chapter 6. This test tested the existence of free time during normal production and the accuracy of the free time calculated. It was indeed possible to calculate the free time, stop a machine during normal running for the free time, and then restart the machine without affecting the key machine.

The start-up test, developed in Chapter 7, built on the acid test. Now that it had been determined that free time was accurate, this new information was put to good use in proving that after training, operators could improve their start-up efficiency every time the process is started. To further test the usefulness of the free-time information, the judicious use test was developed in Chapter 8. This test demonstrated that operators could use free-time opportunities during normal running judiciously after they had been trained.

These three tests tested the requirements developed and proved that the problem can be solved by applying the free-time concept to a coupled production line, thereby eliminating idle time and transforming it into useful free time.

13.5 CRITERIA USED FOR EVALUATION

For the acid test, the criterion developed to gauge the test as being successful or not, was determined by the impact the test had on the key machine. The test was a success if the key machine did not stop and the test was a failure if the machine stopped. The test was applied to a transient process and therefore the result could only be observed long after the forced machine stoppage had been discontinued.

Criteria set for the start-up test and the judicious use test were to observe a step-function (Kaikaku - a popular Japanese production improvement technique) improvement in the measured change in operator behaviour before and after the free-time concept had been introduced and the operators had been trained. Table 13.1 summarises the criteria used to evaluate the test done during the experiment.

Table 13.1: Criteria used to evaluate the test done during the experiment

Proposition	Statement	Test	Criteria
1	Demonstrate that free time can be calculated accurately in real time.	Acid test	No impact or effect on the key machine, resulting from the forced machine stoppage for the free-time period.
2	Demonstrate that operators can start production processes better given free-time start-up information.	Start-up test	A step function improvement in the start-up test results, indicating a marked change in behaviour of the operator.
3	Demonstrate that operators can stop production processes judiciously given accurate free-time information.	Judicious use test	A step function improvement in the judicious use test results, indicating a marked change in behaviour of the operator.

13.6 CONTRIBUTION TO KNOWLEDGE

Many coupled process design practitioners focus on the process constraint to improved efficiency. Techniques such as the TOC, JIT and Kanban were developed to exploit the constraint, improve lead times and lower inventory in a production system. However, these theories do not always apply to modern automated coupled manufacturing production processes with large fixed accumulation quantities.

The productive use of idle time, developed in this document, was inspired from the Just-in-Time (JIT) principle from Toyota, developed in the late 1970s and Kanban (*kan* – card; *ban* – signal), also of Japanese origin, into a derivative of these concepts for coupled processes such as manufacturing lines. For the purpose of this research, the concept has been termed as the 'Productive Use of Free Time' (PUFT). It can be used as management tool along with the other concepts illustrated in Figure 13.2.

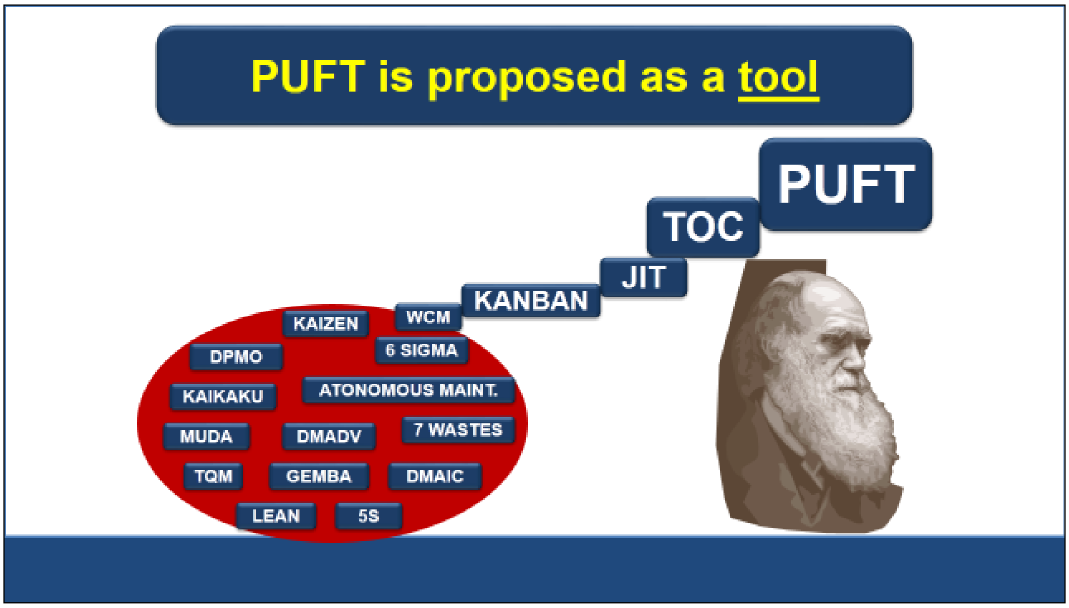


Figure 13.2: PUFT is proposed as a tool together with other popular production improvement techniques.

Source: Researcher's own illustration.

An opportunity exists within these closed systems to improve overall system performance by calculating first and then productively using, the available free time. The concept of deterministic free-time calculation adds to the existing theory of using MOWs in a meaningful way.

The free-time theory can also be applied to other supply chain problems. Demand-sensing activity can be made visible if the free-time concept is applied. If the level of inventory in the store is compared to an accumulator level and the relevant rate of current depletion is compared to the relevant throughput rate in a production process, a real-time indicator of 'free time until we run out of stock' can be calculated. This will represent the time available for the new stock to arrive and prevent an out-of-stock situation. This calculation can be done for every step of any continuous supply chain.

13.7 THE FINANCIAL AND OTHER BENEFITS OF IMPLEMENTING THE SOLUTION

The Valpré experiment has proven a sustained improvement in efficiency of almost ten (10) per cent after the introduction of the free-time concept and training of the operators. This efficiency improvement translated into a productivity improvement with a saving of R94 466.70 per month in direct fixed labour costs. This saving resulted from less overtime hours worked due to the increased output of the production line. The knowledge of free time has other benefits, such as operators being able to use the free time to perform opportunistic maintenance and other activities such as training, meetings and taking meals during free time. This productive use will also potentially translate into a better quality work environment with motivated workers.

Another potential benefit can be derived from certain systems where processes or machines can be occupied and made productive during free time. These systems must be designed such that they can be temporarily decoupled to do other work and be recoupled to the original system once the free time has expired.

13.8 GENERALISING THE FREE-TIME CONCEPT

An inductive approach was used to generalise the free-time concept. Results from this approach were developed through logical reasoning and expert debate. Some basic requirements need to be in place for the free-time concept to be transferred and applied in a different process, field or technology.

The basic requirements were identified as the following:

- Serial activity/process;
- Minimum of two finite buffers;
- Coupled with connectors/conveyors.

Table 13.2 shows examples of the (i) buffers, (ii) connections and (iii) activities/processes that could use the free-time theory. The following are examples of potentially transferrable processes:

i) Buffers include: a tank, reservoir, warehouse, capacitor, RAM, hard drive, air receiver, battery, silo, magazine, accumulator, container depot and cylinder.

ii) Connections for the buffers include: pipe, conveyor, wire, rail, road and ship.

iii) Activities/processes include: liquid flow, electricity, goods transport, gas distribution, pallets movement, containers transfer, bottles transfer and boxes/pallets transfer.

Table 13.2: Examples of transferable mediums, technologies and fields

Finite buffer	Connection	Medium	Activity / Process
Tank	Pipe	Liquid	Pump
Capacitor	Wire conductor	Electricity	Resistor
Warehouse	Rail	Pallet	Packing
Cylinder	Pipe	Gas	Compression / Liquefaction
RAM	Wire	Electricity	Processing
Container depot	Ship	Container	Packing

Figure 13.2 depicts the minimum requirement for the transfer of the PUFT theory. A minimum of two finite buffers connected in series, three activity/process/measurement points and a medium that can be measured, either through counting at the measurement station or by detecting the level in the buffer, are required for the concept to apply.

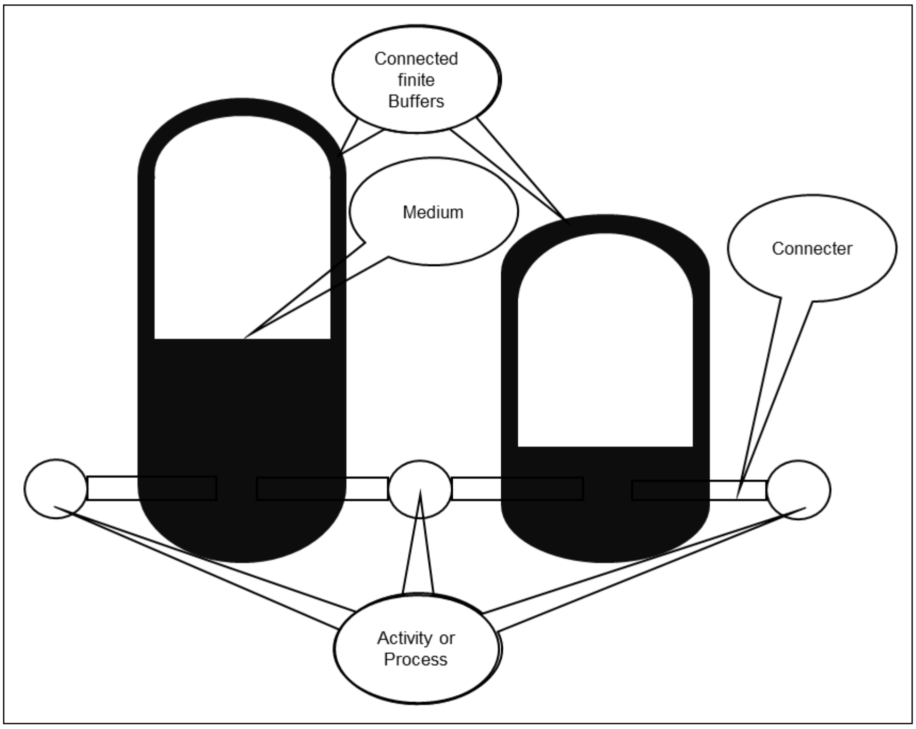


Figure 13.3: Minimum requirement to transfer the PUFT theory

Buffers are used because activities have different speeds for many practical reasons. Buffers have different sizes to accommodate physical requirements. Thus, some processes will sometimes have to wait for others, which will lead to free time.

Some examples include: Start-up and running of large complex processes, such as power stations, refineries, glass production plants, fibre-spinning factories, assembly plants and packaging lines. Micro applications, such as processing and storage of data, downloading and storage of files, generation and storage of electricity in capacitors, etc.

13.9 LIMITATIONS OF THE THEORY

The research was conducted on coupled and serial beverage production lines. The solution provided for this problem can be applicable to any other serial process with finite buffer capacity and steady throughput rates. The following three conditions are not suitable for the theory to apply:

i) Unstable throughput speeds. Any serial process where the machines can run at any speed and the V-profile design method was not applied.

ii) Infinite buffer capacity. When two machines are connected with an infinite inter-stage buffer.

iii) Uncoupled machines. A serial process where machines are not connected by a conveyor/buffer.

Downloading files from the internet is an example of a process not ideal for the PUFT solution. Even though the file size to be loaded is well known, the variation in download speed causes the free-time estimation to be very inaccurate at first and only improves as the average download speed averages out.

Serial processes with infinite buffer capacity can also not benefit from the solution as the free-time calculations are based on the accumulator or buffer levels in relation to its total capacity. Ocean shipping is an example of an infinite buffer represented by the sea. The buffer capacity (the number of ships that can be in the ocean) is for all practical purposes infinite.

The free-time concept can also not be applied to uncoupled processes as the calculations rely on a continuous flow of product in which the position of all product in the process is known at all times. Uncoupled processes are not prone to blocking and starvation and additional inventory can accumulate in the process at anytime.

There is a further limitation inherent to the free-time system. Free time available, is limited to the idle time designed into the system. If all the machines in the coupled process have the same throughput speed, there is no idle time and no free time, whereas if the process is designed with 50 per cent excess capacity in the machine bordering the key machine, the benefit is limited to 50 per cent extra time at this machine.

13.10 FURTHER RESEARCH

The success of the free-time concept very much depends on the extent to which the operator uses the free time productively. Once the free time on each workstation becomes known, a new metric for operator productivity ‘free time utilisation’ can be introduced. Tasks can be identified for each machine and can be tracked by the free-time computer to ensure maintenance and cleaning tasks are not missed. The human factor, on this empirical study opened the door for significantly more research on how operators will perform and how they should be rewarded for such improved performance. Now operators can be measured using free time and do value-added activities. Operators can be scored and remunerated on their free-time utilisation. Normally, all operators are penalised for poor production; free-time utilisation can ensure that operators are remunerated based on the outcomes they can control.

Given the practical nature of the problem and the impact of how people react to this new information, significant opportunity exists to do further study in the management of the information. Operators’ behaviour and attitude is the final key to improving the efficiency of the production process. Research needs to be conducted on the best approach to maximise the opportunity presented by this new information. The productive use of free time is ultimately in the hands of the operator. If the operator simply ignores the opportunity, free time will become idle time and the productive use opportunity will be lost.

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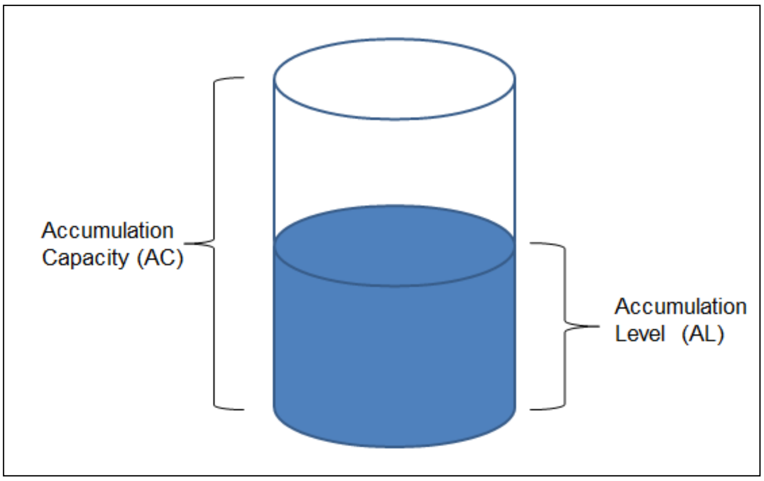
APPENDIX A:
DEFINITIONS

Accumulation capacity or buffer capacity

The accumulator capacity of a buffer is the maximum fixed number of units that can occupy the accumulator or buffer.



Accumulation level or level in the buffer

The number of units in the accumulator determines the level in the accumulator. The level is calculated in real time by subtracting the units leaving the accumulator and adding the units entering the accumulator from the current number of units in the accumulator.

Accumulator reset

There are three main reasons why the theoretical accumulator or buffer level in the software programme does not match the actual level of the accumulator in the production process. The first is product loss or gain in the accumulator. The second is inaccuracies by the counters and the hardware transmission; and the third is false signals caused by mainly human intervention.

The following factors are typical of the first reason: removing samples for quality testing, removing defective product from the process for rework or destruction, accidental spillage from the process due to machine or conveyor malfunction, pilferage and removing stagnant product from the process from a previous production run.

Inaccurate counts are the second major reason for theoretical levels not corresponding with actual levels. The following factors are typically problematic: sensor malfunction, sensor not correctly calibrated, sensor incorrectly specified and intermittent electronic interference.

Non-product triggering of the sensors are very common. Maintenance and production staff operate the process and evidently trigger the photocells, beams and proximities that are responsible for counting product.

To clear the accumulating effect of this counting problem, the buffers must be reset regularly. Five conditions present the reset opportunity:

i) *Maximum level exceeded*: The accumulator capacity is fixed for given a known buffer system. When the system counts a level higher than the known maximum level of the buffer, the accumulator must be capped and continuously be reset to maintain and not exceed the maximum level.

ii) *Minimum level reached*: When the theoretical count of the number of units in the buffer reaches zero, the count is reset to avoid negative values in the accumulator. As previously discussed, this can be the result of product removed from the production process for rework and quality resting.

iii) *The downstream machine stops and the upstream machine runs for a period that would typically fill the buffer and then stop*: It is possible to calculate the moment when the accumulator is expected to be full. When the system reaches this point, the theoretical level must be reset to the maximum buffer level. A deceleration signature of the upstream machine that is typical of a full conveyor situation can also be used to determine if the conveyor should be reset to the maximum level.

iv) The upstream machine stops and the downstream machine runs for a period that would typically drain the accumulator and then stop: When the conditions are met that calculate the buffer empty, the theoretical count must be reset to zero. A deceleration signature of the downstream machine that is typical of an empty conveyor situation can also be used to identify if the conveyor should be reset to zero.

v) *During steady state*: The steady state reset buffer level depends on the throughput difference of the two machines hugging the buffer. If the in-feed machine to the accumulator is faster than the discharge machine (left of the V-profile machine), the steady state reset will be a full accumulator. However, if the in-feed machine is slower than the discharge machine, the steady state reset level will be a level determined by the accumulator capacity, distance, travel time and type. This level is determined by experimental observation of the process condition during prolonged periods with low entropic uncertainty and high enthalpic certainty.

Accumulator reset is done without affecting other accumulators. This can be challenging, bearing in mind that the accumulator is corrected by correcting the machine count upstream or downstream from the accumulator. Machine counts are continuous and cannot be corrected on the machine. A correction number is maintained separately and all corrections are done in the software as a function of the main count. This correction must be carried through to all the machines upstream or downstream from the correction to prevent the correction from affecting other accumulator levels.

Accumulator states

In order to define production process states and to do accumulator resets, different states for accumulators have been defined. We have defined five states for an accumulator:

i) *Slow draining:* This state becomes active when the machines upstream and downstream of the accumulator are running. The relevant throughput rate of the downstream machine is smaller than the relevant throughput rate of the upstream machine.

ii) *Slow filling:* This state becomes active when the machines upstream and downstream of the accumulator are running. The relevant throughput rate of the upstream machine is smaller than the relevant throughput rate of the downstream machine.

iii) *Fast filling:* This state becomes active when the machine upstream of the accumulator is running and the downstream machine has stopped.

iv) *Fast draining:* This state becomes active when the machine upstream of the accumulator has stopped and the downstream machine is running.

v) *Neutral state:* When both the upstream and the downstream machines have stopped or are incidentally running identical speed, the accumulator is in a neutral state. In this case no reset sequence can be started.

Accumulator status

In order to define production process status and to do accumulator resets, different statuses for accumulators have been defined. The two statuses for an accumulator are defined as follows:

- Less than 50 per cent level
- More than 50 per cent level

Breakdown free time

All machines are evaluated during production to determine which machine is the current constraint machine (CCM). When the CCM stops, an alarms sounds until the relevant operator indicates how long he/she anticipates the machine will be down. This indicated time is the breakdown free time.

Breakdown free time confidence factor

Operators have different levels of experience when working in the production process. Operators are required to estimate the expected downtime for a current stoppage. This estimated time is shared with the other operators to use as free time. It is therefore important that the time estimation is accurate. If not, the use of a bad estimation can in itself be the cause for poor process efficiency if the user of the free time becomes the constraint after the originator has started production again. Therefore, for each machine operator a confidence factor is calculated for the difference between predicted breakdown free time and actual breakdown free time. For an operator who predicts the breakdown duration 100 per cent, a factor of 1 is applied. Multiplication by 1 will leave the estimation unchanged. For an operator that overestimates the downtime and always starts up 50 per cent earlier than estimated, a factor of 0.5 will be applied. Similarly, for an operator who underestimates the downtime by 50 per cent a factor of 1.5 will be applied. The factor typically ranges from 0.5 to 1.5.

$\beta = BDFTM_X$ (actual) / $BDFTM_X$ (estimated)

Blocking

Blocking is a process condition where the production process experiences a breakdown downstream from the key machine, normally at the bottom of the V-profile. Product starts backing up to the point that the key machine can no longer produce due to its discharge being blocked. This condition is known as blocking or build-back.

Countdown

When a production machine is triggered to come out of sleep mode into normal running, the sleep free time displayed is counted down from its sleep value. This process is defined as countdown and will be displayed in all cases where this value is bigger than the free time calculation for normal running.

Coupled manufacturing

This is the type of production process installation where machines are connected to each other with conveyors or other fixed transport devices, and the accumulation quantities can be determined for each type of product.

Current bottleneck machine

The current bottleneck machine (CBM) is defined as the machine that has the least free time. A yellow light on the production process identifies the CBM. The yellow light turns green when the bottleneck shifts due to minor stoppages elsewhere or due to good high throughput from the machine in question.

Current constraint machine

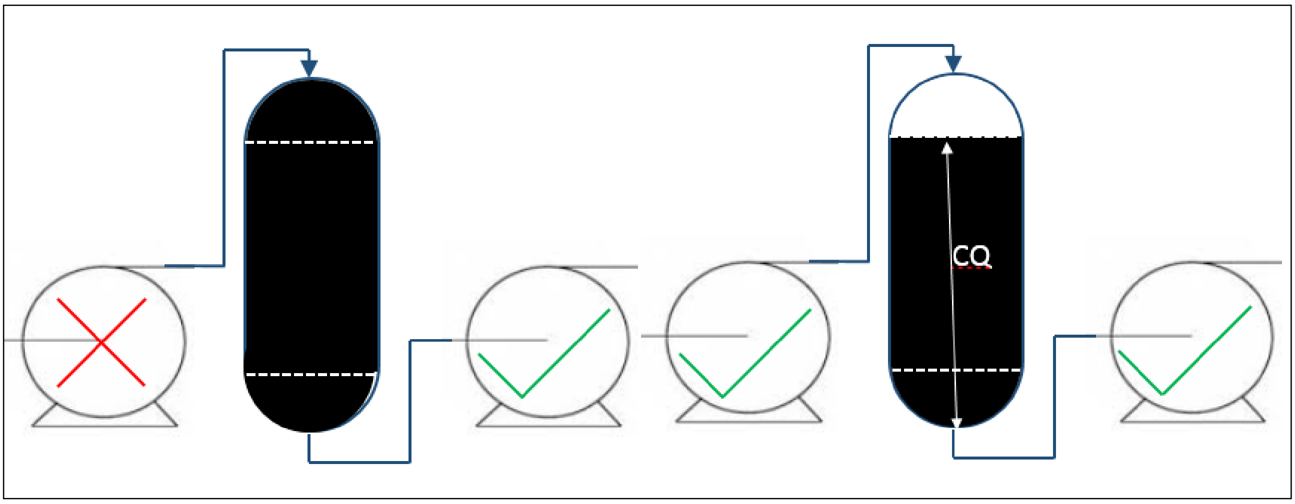
The current bottleneck machine is the machine in the production process with the least free time. When the current bottleneck machine stops, the machine is redefined as the current constraint machine (CCM).

Current throughput rate

For each machine, a current throughput rate (CTR) is detected in real time. The CTR changes in real time as the machine ramps up or down. CTR is not used for calculating free time but rather its derivative relevant throughput rate (RTR) (defined later in Appendix A).

Clear quantity

The clear quantity (CQ) is the quantity of product in the accumulator after the required product have been drained from a completely full accumulator (during blocking) to allow the upstream machine to start effectively. See diagram below.



Cycle machine

Sensors in the production process are used to calculate the current throughput rate. From the current throughput rate, many other variables and attributes are calculated. It is therefore important to ensure an accurate count. From observation there are two main types of machines in a typical production process: (i) those that have product entering on the one side in single file or in groups and exit the machine in a continuous stream; and (ii) those that operate in cycles (batches). The first type has been defined as linear machines and the second type as cycle machines. To calculate the current throughput rate for a cycle machine the number of units is known for the batch and the time period for the cycle is measured as the variable.

Drum machine

This is the machine that is designed as the slowest machine on the production line. This machine is normally the bottleneck and represents the key process that is normally protected from starvation or blocking by the bowl phenomenon design rules.

Drum machine

In the theory of Drum-buffer-rope, a key machine is protected from starvation via a feedback system. The drum machine is referred to as the main machine that sets the pace for the production process.

Earned hours

These are the number of equivalent hours eared in a shift. This is calculated by dividing the number of cases produced in a specific shift by the rated speed of the key production machine.

Enthalpic certainty (h)

Enthalpy describes total system energy in thermodynamics. In this research, this term is used to describe the level to which we have completeness of wireless communication. The production process' status is observed every five seconds. When there is a breakdown in communication from one or more of the wireless devices, the enthalpic certainty percentage for the affected device is decreased proportionally. A lower state of enthalpic certainty is applied to the free time calculated for the machine by multiplying the free time by the percentage factor of available enthalpic certainty.

Entropic uncertainty

Entropy is a measurement of disorder in thermodynamics. On a coupled and serial production process, rework and false signals accumulate over time, rendering the free-time calculations inaccurate. Machines continuously start and stop, causing the production process to shunt. Under these conditions, free-time results become increasingly inaccurate as the system becomes unstable. Free time should be stated more conservatively to correct for this condition.

Entropic uncertainty is a variable defining the state of a machine in the production process. Entropic uncertainty is a number between 0 and 1, where 1 represents a production machine with no disorder and 0 a state of maximum disorder. Entropic uncertainty governs the free-time filter by adjusting the free time displayed. At maximum entropic uncertainty, the free time predicted will be reduced to zero.

The following approach triggers heightened entropic uncertainty. We add the array of absolute values of the differences in consecutive current throughput rates for linear machines. Entropic uncertainty can then be scaled in this range, where the sum of the absolute value of the array differences is zero represents 1 entropic uncertainty and when the sum of the absolute value of the array differences are at a maximum, say 25, would then represent an entropic uncertainty of 0. This limit can be set during observation of the sum of the arrays of absolute value of the differences in consecutive current throughput rates.

Free time

Free time is defined as the time available for a production machine operator to stop his machine due to inherent spare capacity or due to a stoppage on the current process constraint, without affecting the overall performance of a coupled manufacturing production process. Free time is different to idle time as idle time is imposed on a machine due to blocking or starvation, whereas free time is a real-time calculation of future inevitable idle time.

Historic throughput rate

For each machine, a historic throughput rate (HTR) is maintained in memory for each pack configuration. This is the historic maximum running speed of the machine and remains fairly constant. The programme must do a comparison to this throughput rate during the first seconds of start-up, to determine a pack type. The pack type will drive all the constants, rates and factors in the programme. The HTR will thus change as the pack changes. The HTR is also important for calculating the free time at machines during sleep mode.

Idle time

A production machine is idle when there is either no product at its in-feed or product has built back into its finite discharge accumulator or buffer while the machine is reliable. Idle time is different from free time, as free time is predicted and can be used, whereas idle time is imposed; therefore, planned usage of this time is difficult.

Lead time

This is the time it takes for a single product to travel the complete production process from start to finish.

Just in Time

Just in Time (JIT) is a production optimisation tool used to minimise inventory in a system. Product should reach the next machine ‘just in time’ so as not to make the machine wait for product or having too much product ready for a machine to process.

Linear machine

Sensors in the production process are used to calculate the current throughput rate. From the current throughput rate, many other variables and attributes are calculated. It is therefore important to ensure an accurate count. From observation, the researcher has realised there are two main types of machines on a typical production process: (i) those that have product entering on the one side in single file or in groups and exit the machine in a continuous stream; and (ii) those that operate in cycles (batches). The first type has been defined as linear machines and the second type as cycle machines. Calculating the current throughput rate for a linear machine is done by observing the number of units passing the machine in a 5-second period. The time is therefore fixed and the number of units is varied.

CTR = Number of units in 5 seconds /5 = units per second

E.g. for 35 units passing in the 5-second period: 35/5 = 7 units per second

Machine state

A machine can be in one of five potential states and are defined as follows:

- Sleep state: The machine is off and the process is in sleep.
- Running state: The machine is off, but not the constraint.
- The machine is off and is the constraint.
- The machine is on, but not the constraint.
- The machine is on and is the constraint.

Minimum accumulator travel time

The minimum accumulator travel time (MATT) is the minimum time it takes for a unit/container to move from an upstream to a downstream machine. The time it would take to travel with no stoppages and accumulation. This is a function of the conveyor/accumulator speed, logic and distance. This time can be very short if, for example, a dynac (Hartness International patent) accumulation system is installed. This system provides short MATTs while ensuring FIFO and can have very big accumulation capacities.

Opportunistic maintenance or opportunity based preventative maintenance

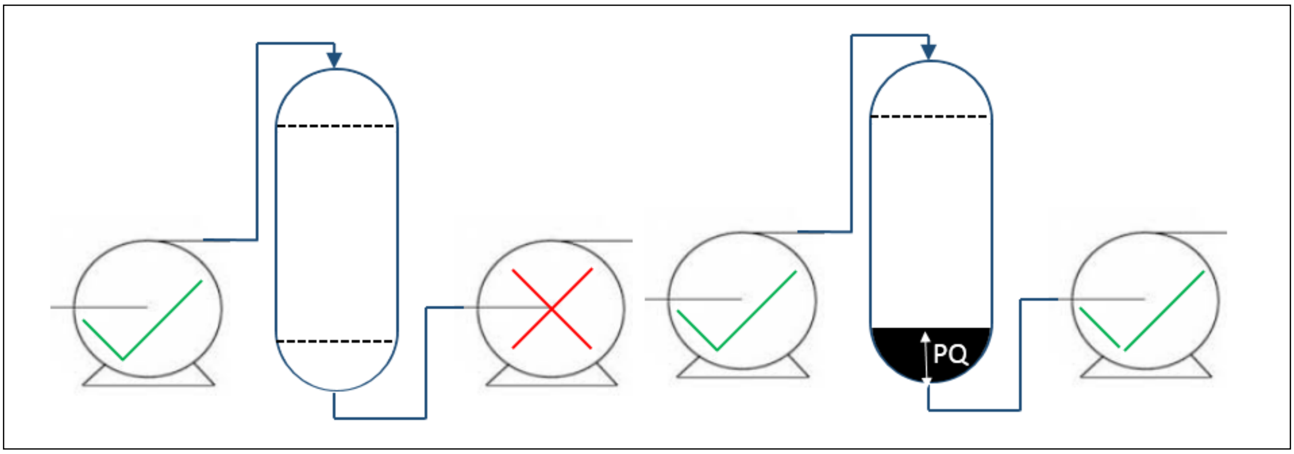
Break down free time creates a maintenance opportunity and triggers a simultaneous repair on other machines, including non-failed ones, such that potential future stoppages at other machines are reduced to certain degree.

Paid hours

Paid hours are the number of hours in a shift for which the hourly rate employees are being paid.

Prime quantity

The prime quantity (PQ) is the number of units required to sufficiently prime the in-feed of a production machine sufficiently to start production. This quantity must be counted at the in-feed of a production machine and can vary significantly from one production process to another. See diagram below.



Productive use of free time

The reason for indicating free time to a machine operator is for the timeous productive utilisation thereof. Free time is different to idle time as idle time is imposed on a machine due to blocking or starvation, whereas free time is prediction of free time now versus inevitable idle time in the future.

Product type determination

In many production processes, more than one type of product is manufactured. The system automatically identifies the type of product by observing the CTR. Smaller or less complex products are generally faster to process. A throughput range is determined for each type of product. The CTR is then compared to the known range and when there are four consecutive matches for the CTR within the required range, the pack type is determined.

Relevant throughput rate

For each machine, a relevant throughput rate (RTR) is calculated and adjusted in real time. The RTR is a key factor in calculation free time.

The prediction of accurate free time is reliant on knowing the relevant throughput rate. We all know how unreliable the estimated remaining download time of files over the Internet is. The estimated time is calculated by dividing the file size by download speed. The calculation of free time is done by dividing the accumulator level by the relevant throughput rate. Normally the download speed of files over the Internet is very unstable and the estimated time remaining subsequently fluctuates significantly. Similarly, the throughput rate created unstable free-time results. It is therefore important to stabilise the throughput rate by anchoring it in a historic throughput rate (HTR) and combining this in an array of current throughput rate readings. Care must be taken not to include deliberate stoppages by the operator to utilise free time, when calculating RTR.

The RTR is calculated by adding k number of consecutive CTRs and dividing by k to obtain a current smoothed average of CTRs and then adding y times the HTR and dividing by Y+1 to obtain an average. The result is a smoothed indicator of current throughput, anchored in the HTR.

$$RTR = ((Y\ x\ HTR + (\sum_{n=1}^{k} \mathrm{CTRn})/k))/(1+\mathrm{Y})$$

Reliable and unreliable machines

A reliable machine is one that never breaks down and is always available for production. It would therefore have 100 per cent machine efficiency. An unreliable machine would break down and influence the production process in an unpredictable manner.

Serial production

In serial production, production machines are operating in sequence and product can only flow in one direction from one machine to another. Product cannot skip a production machine and new product cannot enter the process. Parts may be added to the product, but the unit quantities must remain unaffected.

Starvation

Accumulators start to drain up to the point that the key machine can no longer produce due to its in-feed being empty. This condition is known as starvation.

Time-out period

The time-out period is the time that needs to elapse for the production line to move to the sleep state. This time is process specific and is typical bigger than the lead time to produce a complete production unit.

APPENDIX B:

CONSOLIDATED LIST OF PRESENTATONS DONE ON THE PRODUCTIVE USE OF FREE TIME

Presentation event	Audience	Venue	Date
3rd Annual Plant Reliability Management Forum	Maintenance engineers (102)	Johannesburg, South Africa	4, 5 February 2009
Doctoral Admission panel	USB admission panel (7)	University of Stellenbosch Business School (USB), Bellville campus, South Africa	1 December 2009
International Conference on Competitive Manufacturing	COMA '10 (42)	Stellenbosch, South Africa	4, 5 February 2010
International Lean & Six Sigma Conference	International delegates 6 Sigma (702)	Rosen Plaza Hotel, Orlando, Florida, USA	16,17 March 2010
Annual Maintenance Conference	Maintenance professionals (42)	Mercure Hotel, Bedfordview, South Africa	25,26,17 May 2010
USB Colloquium	PhD students (11)	USB, Bellville campus, South Africa	13 Augustus 2010
Presentation to Krones	OEM Krones (7)	Nutrabling/Germany	2010
Coca-Cola Africa Eurasia Production Conference	Technical directors, plant managers and engineers (86)	Istanbul, Turkey	4 to 6 October 2010
1st Annual Production and Plant Manager's summit	Production and plant managers (17)	Grayston Southern Sun Johannesburg, South Africa	28 October 2010
Bottler technical conference	Africa Eurasia group	Istanbul, Turkey	1 December 2010
Presented at Coca-Cola Global technology and innovation meeting	International Coca-Cola Technical Directors	Conference call	March 2012
PUFT presentation to Lineview Software company	Presentation to Andrew Giles, Ian Rowledge and David Evanson (4)	Lille, France	14 June 2012
Colloquium Presentation	PhD students (14)	USB, Bellville campus, South Africa	24 Augustus 2012
The Theory of non-constraint	Marc Katz (1)	Atlanta, USA	October 2012
PUFT Presentation to Engineering Maintenance Managers	Coca-Cola KMH David Cox and crew (3)	Dublin, Ireland	15 April 2013
PUFT Presentation to Coca-Cola Refreshments	Dr. Ioan Batran (Director Controls Engineering) and Ben Stephens (4)	Atlanta, USA	28 Oct 2013
PUFT investment presentation	Investor (Gavin Gedes) (5)	Johannesburg, South Africa	29 Nov 2013

Presentation event	Audience	Venue	Date
Propak conference	Beverage delegates (57)	Sandton, South Africa	18, 19 Feb 2014
Colloquium Presentation	PhD students (14) and USB Professors	USB, Bellville campus, South Africa	21 Feb 2014
Leadership presentation	Plant management (11)	Valpré plant, Heidelberg, South Africa	22 May 2014
Directors presentation	Canner group staff (8)	Wadeville plant	20 August 2014
Total plant management speaker	Delegates (37)	Crown plaza hotel Johannesburg, South Africa	16 September 2014
Colloquium Presentation	PhD students (10) and USB Professors	USB, Bellville campus, South Africa	7 November 2014
Introduction to the free time consept	Dr. Stan Gerswin (1)	Skype call	4 February 2015
SMMSO 2015 paper proposal discussion	Dr. Stan Gerswin (1)	Skype call	3 March 2015
SST group free time introduction	Andreas Liebl group (2)	Coca-Cola office Park Town	20 April 2015
Elettric80 and BEMA free time indroduction	Grassi Enrico and E80 leadership team (6)	Valpré plant	4 June 2015
Free time introduction presentation and discussion	Prof. Tullio Antonio Maria Tolio Prof. Marcello Colledani Prof. Eon Smit Prof. Niek du Preez	Petco office Cape Town	25 August 2015
Siemens WinnCC SCADA platform proposal	Mr. Christopher Hoemeke (Siemens)	Coca-Cola office Park Town	21 September 2015

APPENDIX C:

THE MANUAL ACID, START-UP AND JUDICIOUS USE TESTS

FREE TIME ACID TEST

DATE: ____________________ **Exact TIME:** ____________________

COMPLETED BY (NAME) : ____

MACHINE LOCATION (i.e. Labeller) : ________________________________

FREE TIME ON DISPLAY WHEN TEST STARTS: ________________________

NOW STOP THE MACHINE TO (UTILIZE) THE FREE TIME CURRENTLY ON THE MACHINE

DID THE MACHINE STOP THE FILLER BEFORE THE FREE TIME HAS LAPSED?

YES ☐ **NO** ☐

ANYTHING ELSE TO REPORT (I.E. THE MACHINE STOPPED DUE TO OTHER CAUSE RENDERING THE TEST NOT USEABLE etc.)

____

____

____

____**REV 2**

FREE TIME START-UP TEST

DATE: ____________________ **TIME:** ____________________

COMPLETED BY (NAME) : ____

TIME READING ON THE FREE TIME DEVICE IN CASE THE MACHINE STARTS BEFORE THE FREE TIME IS ZERO OR THE TIME LAPSED BETWEEN MACHINE IDEAL THEORETICAL START-UP MOMENT AND THE ACTUAL START-UP MOMENT.

Machine 2_________________________

Machine 3_________________________

Machine 4_________________________

ANYTHING ELSE TO REPORT

____

____

____

____

____

_____**REV 1**

JUDICIOUS USE OF FREE TIME TEST

DATE: ____________________ **TIME:** ____________________

COMPLETED BY (NAME): ____

MACHINE NUMBER: _____________

IN-FEED PRIMED? **YES** ☐ **NO** ☐

DISCHARGE CLEAR? **YES** ☐ **NO** ☐

FREE TIME AVAILABLE? **YES** ☐ **NO** ☐

1. MACHINE STOPPED BY THE OPERATOR AND STARTED AGAIN? YES NO

DURATION OF THE STOPPAGE: ____________________

2. MACHINE STOPPED BY THE OPERATOR AND STARTED AGAIN? YES NO

DURATION OF THE STOPPAGE: ____________________

3. MACHINE STOPPED BY THE OPERATOR AND STARTED AGAIN? YES NO

DURATION OF THE STOPPAGE: ____________________

4. MACHINE STOPPED BY THE OPERATOR AND STARTED AGAIN? YES NO

DURATION OF THE STOPPAGE: ____________________

5. MACHINE STOPPED BY THE OPERATOR AND STARTED AGAIN? YES NO

DURATION OF THE STOPPAGE: ____________________

6. MACHINE STOPPED BY THE OPERATOR AND STARTED AGAIN? YES NO

DURATION OF THE STOPPAGE: ____________________

7. MACHINE STOPPED BY THE OPERATOR AND STARTED AGAIN? YES NO

DURATION OF THE STOPPAGE: ____________________

8. MACHINE STOPPED BY THE OPERATOR AND STARTED AGAIN? YES NO

DURATION OF THE STOPPAGE: ____________________

9. MACHINE STOPPED BY THE OPERATOR AND STARTED AGAIN? YES NO

DURATION OF THE STOPPAGE: ____________________

10. MACHINE STOPPED BY THE OPERATOR AND STARTED AGAIN? YES NO

DURATION OF THE STOPPAGE: ____________________

11. MACHINE STOPPED BY THE OPERATOR AND STARTED AGAIN? YES NO

DURATION OF THE STOPPAGE: ____________________

APPENDIX D:

PRODUCTION LINE DATA – VALPRÉ EXPERIMENT

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
314108	22 May-14 16:51:07	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314109	22 May-14 16:51:12	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314110	22 May-14 16:51:17	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314111	22 May-14 16:51:22	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314112	22 May-14 16:51:27	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314113	22 May-14 16:51:32	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314114	22 May-14 16:51:37	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314115	22 May-14 16:51:42	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314116	22 May-14 16:51:47	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314117	22 May-14 16:51:52	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314118	22 May-14 16:51:57	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314119	22 May-14 16:52:02	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314120	22 May-14 16:52:07	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314121	22 May-14 16:52:12	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314122	22 May-14 16:52:17	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314123	22 May-14 16:52:22	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314124	22 May-14 16:52:27	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314125	22 May-14 16:52:32	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314126	22 May-14 16:52:37	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314127	22 May-14 16:52:42	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314128	22 May-14 16:52:47	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314129	22 May-14 16:52:52	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314130	22 May-14 16:52:57	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314131	22 May-14 16:53:02	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314132	22 May-14 16:53:07	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314133	22 May-14 16:53:12	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314134	22 May-14 16:53:17	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314135	22 May-14 16:53:22	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314136	22 May-14 16:53:27	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314137	22 May-14 16:53:32	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314138	22 May-14 16:53:37	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314139	22 May-14 16:53:42	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314140	22 May-14 16:53:47	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314141	22 May-14 16:53:52	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314142	22 May-14 16:53:58	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314143	22 May-14 16:54:03	0:00:00	2	2.1	100	41	5300	0:11:02	1	0.0	100	773	3600	0:16:05	1	0.0	100	120	2550	0:19:53	1	0.0	100	480	2803	0:23:06	1	0	100	0	4032	0:28:09	1	0	100	6048	4032	0:28:09	1	0	100
314144	22 May-14 16:54:08	0:00:00	2	3.3	100	66	5300	0:10:35	1	0.0	100	773	3600	0:15:38	1	0.0	100	120	2550	0:19:26	1	0.0	100	480	2803	0:22:39	1	0	100	0	4032	0:27:42	1	0	100	6048	4032	0:27:42	1	0	100
314145	22 May-14 16:54:13	0:00:00	1	0.0	100	66	5300	0:10:20	1	0.0	100	773	3600	0:15:23	1	0.0	100	120	2550	0:19:10	1	0.0	100	480	2803	0:22:24	1	0	100	0	4032	0:27:26	1	0	100	6048	4032	0:27:26	1	0	100
314146	22 May-14 16:54:18	0:00:00	1	0.0	100	66	5300	0:10:20	1	0.0	100	773	3600	0:15:23	1	0.0	100	120	2550	0:19:10	1	0.0	100	480	2803	0:22:24	1	0	100	0	4032	0:27:26	1	0	100	6048	4032	0:27:26	1	0	100
314147	22 May-14 16:54:23	0:00:00	1	0.0	100	66	5300	0:10:20	1	0.0	100	773	3600	0:15:23	1	0.0	100	120	2550	0:19:10	1	0.0	100	480	2803	0:22:24	1	0	100	0	4032	0:27:26	1	0	100	6048	4032	0:27:26	1	0	100
314148	22 May-14 16:54:28	0:00:00	1	0.0	100	66	5300	0:10:20	1	0.0	100	773	3600	0:15:23	1	0.0	100	120	2550	0:19:10	1	0.0	100	480	2803	0:22:24	1	0	100	0	4032	0:27:26	1	0	100	6048	4032	0:27:26	1	0	100
314149	22 May-14 16:54:33	0:00:00	1	0.0	100	66	5300	0:10:20	1	0.0	100	773	3600	0:15:23	1	0.0	100	120	2550	0:19:10	1	0.0	100	480	2803	0:22:24	1	0	100	0	4032	0:27:26	1	0	100	6048	4032	0:27:26	1	0	100
314150	22 May-14 16:54:38	0:00:00	1	0.0	100	66	5300	0:10:20	1	0.0	100	773	3600	0:15:23	1	0.0	100	120	2550	0:19:10	1	0.0	100	480	2803	0:22:24	1	0	100	0	4032	0:27:26	1	0	100	6048	4032	0:27:26	1	0	100
314151	22 May-14 16:54:43	0:00:00	1	0.0	100	66	5300	0:10:20	1	0.0	100	773	3600	0:15:23	1	0.0	100	120	2550	0:19:10	1	0.0	100	480	2803	0:22:24	1	0	100	0	4032	0:27:26	1	0	100	6048	4032	0:27:26	1	0	100
314152	22 May-14 16:54:48	0:00:00	1	0.0	100	66	5300	0:10:20	1	0.0	100	773	3600	0:15:23	1	0.0	100	120	2550	0:19:10	1	0.0	100	480	2803	0:22:24	1	0	100	0	4032	0:27:26	1	0	100	6048	4032	0:27:26	1	0	100
314153	22 May-14 16:54:53	0:00:00	1	0.0	100	66	5300	0:10:20	1	0.0	100	773	3600	0:15:23	1	0.0	100	120	2550	0:19:10	1	0.0	100	480	2803	0:22:24	1	0	100	0	4032	0:27:26	1	0	100	6048	4032	0:27:26	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
314154	22 May-14 16:54:58	0:00:00	2	2.4	100	114	5300	0:10:40	1	0.0	100	773	3600	0:15:43	1	0.0	100	120	2550	0:19:31	1	0.0	100	480	2803	0:22:45	1	0	100	0	4032	0:27:47	1	0	100	6048	4032	0:27:47	1	0	100
314155	22 May-14 16:55:03	0:00:00	2	5.2	100	170	5300	0:10:23	1	0.0	100	773	3600	0:15:26	1	0.0	100	120	2550	0:19:14	1	0.0	100	480	2803	0:22:27	1	0	100	0	4032	0:27:30	1	0	100	6048	4032	0:27:30	1	0	100
314156	22 May-14 16:55:08	0:00:00	2	8.0	100	226	5300	0:09:50	1	0.0	100	773	3600	0:14:53	1	0.0	100	120	2550	0:18:40	1	0.0	100	480	2803	0:21:54	1	0	100	0	4032	0:26:56	1	0	100	6048	4032	0:26:56	1	0	100
314157	22 May-14 16:55:13	0:00:00	2	10.8	100	281	5300	0:09:19	1	0.0	100	773	3600	0:14:22	1	0.0	100	120	2550	0:18:10	1	0.0	100	480	2803	0:21:23	1	0	100	0	4032	0:26:26	1	0	100	6048	4032	0:26:26	1	0	100
314158	22 May-14 16:55:18	0:00:00	2	11.2	100	337	5300	0:08:52	1	0.0	100	773	3600	0:13:54	1	0.0	100	120	2550	0:17:42	1	0.0	100	480	2803	0:20:56	1	0	100	0	4032	0:25:58	1	0	100	6048	4032	0:25:58	1	0	100
314159	22 May-14 16:55:23	0:00:00	2	11.2	100	393	5300	0:08:26	1	0.0	100	773	3600	0:13:28	1	0.0	100	120	2550	0:17:16	1	0.0	100	480	2803	0:20:30	1	0	100	0	4032	0:25:32	1	0	100	6048	4032	0:25:32	1	0	100
314160	22 May-14 16:55:28	0:00:00	2	11.1	100	448	5300	0:08:02	1	0.0	100	773	3600	0:13:04	1	0.0	100	120	2550	0:16:52	1	0.0	100	480	2803	0:20:06	1	0	100	0	4032	0:25:08	1	0	100	6048	4032	0:25:08	1	0	100
314161	22 May-14 16:55:33	0:00:00	2	11.2	100	504	5300	0:07:40	1	0.0	100	773	3600	0:12:42	1	0.0	100	120	2550	0:16:30	1	0.0	100	480	2803	0:19:44	1	0	100	0	4032	0:24:46	1	0	100	6048	4032	0:24:46	1	0	100
314162	22 May-14 16:55:38	0:00:00	2	11.2	100	560	5300	0:07:19	1	0.0	100	773	3600	0:12:22	1	0.0	100	120	2550	0:16:09	1	0.0	100	480	2803	0:19:23	1	0	100	0	4032	0:24:25	1	0	100	6048	4032	0:24:25	1	0	100
314163	22 May-14 16:55:43	0:00:00	2	11.1	100	615	5300	0:06:59	1	0.0	100	773	3600	0:12:02	1	0.0	100	120	2550	0:15:50	1	0.0	100	480	2803	0:19:04	1	0	100	0	4032	0:24:06	1	0	100	6048	4032	0:24:06	1	0	100
314164	22 May-14 16:55:48	0:00:00	2	11.2	100	671	5300	0:06:41	1	0.0	100	773	3600	0:11:44	1	0.0	100	120	2550	0:15:32	1	0.0	100	480	2803	0:18:46	1	0	100	0	4032	0:23:48	1	0	100	6048	4032	0:23:48	1	0	100
314165	22 May-14 16:55:53	0:00:00	2	11.1	100	726	5300	0:06:35	1	0.0	100	773	3600	0:11:38	1	0.0	100	120	2550	0:15:25	1	0.0	100	480	2803	0:18:39	1	0	100	0	4032	0:23:41	1	0	100	6048	4032	0:23:41	1	0	100
314166	22 May-14 16:55:59	0:00:00	2	11.2	100	838	5300	0:06:30	1	0.0	100	773	3600	0:11:33	1	0.0	100	120	2550	0:15:21	1	0.0	100	480	2803	0:18:35	1	0	100	0	4032	0:23:37	1	0	100	6048	4032	0:23:37	1	0	100
314167	22 May-14 16:56:05	0:00:00	2	10.9	100	899	5300	0:06:20	1	0.0	100	773	3600	0:11:23	1	0.0	100	120	2550	0:15:11	1	0.0	100	480	2803	0:18:25	1	0	100	0	4032	0:23:27	1	0	100	6048	4032	0:23:27	1	0	100
314168	22 May-14 16:56:10	0:00:00	2	10.8	100	953	5300	0:06:17	1	0.0	100	773	3600	0:11:19	1	0.0	100	120	2550	0:15:07	1	0.0	100	480	2803	0:18:21	1	0	100	0	4032	0:23:23	1	0	100	6048	4032	0:23:23	1	0	100
314169	22 May-14 16:56:15	0:00:00	2	10.7	100	1008	5300	0:06:12	1	0.0	100	773	3600	0:11:15	1	0.0	100	120	2550	0:15:03	1	0.0	100	480	2803	0:18:17	1	0	100	0	4032	0:23:19	1	0	100	6048	4032	0:23:19	1	0	100
314170	22 May-14 16:56:20	0:00:00	2	10.9	100	1066	5300	0:06:08	1	0.0	100	773	3600	0:11:10	1	0.0	100	120	2550	0:14:58	1	0.0	100	480	2803	0:18:12	1	0	100	0	4032	0:23:14	1	0	100	6048	4032	0:23:14	1	0	100
314171	22 May-14 16:56:25	0:00:00	2	11.3	100	1124	5300	0:06:02	1	0.0	100	773	3600	0:11:05	1	0.0	100	120	2550	0:14:53	1	0.0	100	480	2803	0:18:06	1	0	100	0	4032	0:23:09	1	0	100	6048	4032	0:23:09	1	0	100
314172	22 May-14 16:56:30	0:00:00	2	11.3	100	1178	5300	0:05:57	1	0.0	100	773	3600	0:11:00	1	0.0	100	120	2550	0:14:48	1	0.0	100	480	2803	0:18:01	1	0	100	0	4032	0:23:04	1	0	100	6048	4032	0:23:04	1	0	100
314173	22 May-14 16:56:35	0:00:00	2	10.4	100	1216	5300	0:05:52	1	0.0	100	773	3600	0:10:55	1	0.0	100	120	2550	0:14:43	1	0.0	100	480	2803	0:17:57	1	0	100	0	4032	0:22:59	1	0	100	6048	4032	0:22:59	1	0	100
314174	22 May-14 16:56:40	0:00:00	2	8.6	100	1237	5300	0:05:53	1	0.0	100	773	3600	0:10:56	1	0.0	100	120	2550	0:14:43	1	0.0	100	480	2803	0:17:57	1	0	100	0	4032	0:22:59	1	0	100	6048	4032	0:22:59	1	0	100
314175	22 May-14 16:56:45	0:00:00	2	8.4	100	1292	5300	0:05:58	1	0.0	100	773	3600	0:11:01	1	0.0	100	120	2550	0:14:48	1	0.0	100	480	2803	0:18:02	1	0	100	0	4032	0:23:04	1	0	100	6048	4032	0:23:04	1	0	100
314176	22 May-14 16:56:50	0:00:00	2	8.6	100	1350	5300	0:05:54	1	0.0	100	773	3600	0:10:56	1	0.0	100	120	2550	0:14:44	1	0.0	100	480	2803	0:17:58	1	0	100	0	4032	0:23:00	1	0	100	6048	4032	0:23:00	1	0	100
314177	22 May-14 16:56:55	0:00:00	2	9.4	100	1403	5300	0:05:48	1	0.0	100	773	3600	0:10:51	1	0.0	100	120	2550	0:14:38	1	0.0	100	480	2803	0:17:52	1	0	100	0	4032	0:22:54	1	0	100	6048	4032	0:22:54	1	0	100
314178	22 May-14 16:57:00	0:00:00	2	11.1	100	1459	5300	0:05:43	1	0.0	100	773	3600	0:10:45	1	0.0	100	120	2550	0:14:33	1	0.0	100	480	2803	0:17:47	1	0	100	0	4032	0:22:49	1	0	100	6048	4032	0:22:49	1	0	100
314179	22 May-14 16:57:05	0:00:00	2	11.2	100	1515	5300	0:05:37	1	0.0	100	773	3600	0:10:40	1	0.0	100	120	2550	0:14:28	1	0.0	100	480	2803	0:17:42	1	0	100	0	4032	0:22:44	1	0	100	6048	4032	0:22:44	1	0	100
314180	22 May-14 16:57:10	0:00:00	2	11.0	100	1570	5300	0:05:32	1	0.0	100	773	3600	0:10:35	1	0.0	100	120	2550	0:14:23	1	0.0	100	480	2803	0:17:36	1	0	100	0	4032	0:22:39	1	0	100	6048	4032	0:22:39	1	0	100
314181	22 May-14 16:57:15	0:00:00	2	11.2	100	1626	5300	0:05:28	1	0.0	100	773	3600	0:10:31	1	0.0	100	120	2550	0:14:19	1	0.0	100	480	2803	0:17:32	1	0	100	0	4032	0:22:35	1	0	100	6048	4032	0:22:35	1	0	100
314182	22 May-14 16:57:20	0:00:00	2	11.2	100	1682	5300	0:05:23	1	0.0	100	773	3600	0:10:26	1	0.0	100	120	2550	0:14:14	1	0.0	100	480	2803	0:17:28	1	0	100	0	4032	0:22:30	1	0	100	6048	4032	0:22:30	1	0	100
314183	22 May-14 16:57:25	0:00:00	2	11.1	100	1737	5300	0:05:18	1	0.0	100	773	3600	0:10:21	1	0.0	100	120	2550	0:14:09	1	0.0	100	480	2803	0:17:22	1	0	100	0	4032	0:22:25	1	0	100	6048	4032	0:22:25	1	0	100
314184	22 May-14 16:57:30	0:00:00	2	11.2	100	1793	5300	0:05:10	1	0.0	100	773	3600	0:10:13	1	0.0	100	120	2550	0:14:01	1	0.0	100	480	2803	0:17:14	1	0	100	0	4032	0:22:17	1	0	100	6048	4032	0:22:17	1	0	100
314185	22 May-14 16:57:35	0:00:00	2	11.2	100	1850	5300	0:04:59	1	0.0	100	773	3600	0:10:02	1	0.0	100	120	2550	0:13:50	1	0.0	100	480	2803	0:17:03	1	0	100	0	4032	0:22:06	1	0	100	6048	4032	0:22:06	1	0	100
314186	22 May-14 16:57:40	0:00:00	2	11.1	100	1904	5300	0:04:54	1	0.0	100	773	3600	0:09:57	1	0.0	100	120	2550	0:13:45	1	0.0	100	480	2803	0:16:58	1	0	100	0	4032	0:22:01	1	0	100	6048	4032	0:22:01	1	0	100
314187	22 May-14 16:57:45	0:00:00	2	11.3	100	1963	5300	0:04:50	1	0.0	100	773	3600	0:09:53	1	0.0	100	120	2550	0:13:41	1	0.0	100	480	2803	0:16:54	1	0	100	0	4032	0:21:57	1	0	100	6048	4032	0:21:57	1	0	100
314188	22 May-14 16:57:50	0:00:00	2	11.2	100	2017	5300	0:04:44	1	0.0	100	773	3600	0:09:47	1	0.0	100	120	2550	0:13:35	1	0.0	100	480	2803	0:16:48	1	0	100	0	4032	0:21:51	1	0	100	6048	4032	0:21:51	1	0	100
314189	22 May-14 16:57:55	0:00:00	2	11.1	100	2071	5300	0:04:40	1	0.0	100	773	3600	0:09:43	1	0.0	100	120	2550	0:13:30	1	0.0	100	480	2803	0:16:44	1	0	100	0	4032	0:21:46	1	0	100	6048	4032	0:21:46	1	0	100
314190	22 May-14 16:58:00	0:00:00	2	11.3	100	2129	5300	0:04:35	1	0.0	100	773	3600	0:09:38	1	0.0	100	120	2550	0:13:26	1	0.0	100	480	2803	0:16:40	1	0	100	0	4032	0:21:42	1	0	100	6048	4032	0:21:42	1	0	100
314191	22 May-14 16:58:05	0:00:00	2	11.1	100	2184	5300	0:04:30	1	0.0	100	773	3600	0:09:33	1	0.0	100	120	2550	0:13:21	1	0.0	100	480	2803	0:16:34	1	0	100	0	4032	0:21:37	1	0	100	6048	4032	0:21:37	1	0	100
314192	22 May-14 16:58:10	0:00:00	2	11.1	100	2238	5300	0:04:25	1	0.0	100	773	3600	0:09:28	1	0.0	100	120	2550	0:13:16	1	0.0	100	480	2803	0:16:30	1	0	100	0	4032	0:21:32	1	0	100	6048	4032	0:21:32	1	0	100
314193	22 May-14 16:58:15	0:00:00	2	11.1	100	2293	5300	0:04:21	1	0.0	100	773	3600	0:09:24	1	0.0	100	120	2550	0:13:12	1	0.0	100	480	2803	0:16:25	1	0	100	0	4032	0:21:28	1	0	100	6048	4032	0:21:28	1	0	100
314194	22 May-14 16:58:20	0:00:00	2	11.1	100	2351	5300	0:04:16	1	0.0	100	773	3600	0:09:19	1	0.0	100	120	2550	0:13:07	1	0.0	100	480	2803	0:16:21	1	0	100	0	4032	0:21:23	1	0	100	6048	4032	0:21:23	1	0	100
314195	22 May-14 16:58:25	0:00:00	2	11.4	100	2411	5300	0:04:11	1	0.0	100	773	3600	0:09:14	1	0.0	100	120	2550	0:13:02	1	0.0	100	480	2803	0:16:15	1	0	100	0	4032	0:21:18	1	0	100	6048	4032	0:21:18	1	0	100
314196	22 May-14 16:58:30	0:00:00	2	11.2	100	2461	5300	0:04:06	1	0.0	100	773	3600	0:09:08	1	0.0	100	120	2550	0:12:56	1	0.0	100	480	2803	0:16:10	1	0	100	0	4032	0:21:12	1	0	100	6048	4032	0:21:12	1	0	100
314197	22 May-14 16:58:35	0:00:00	2	11.3	100	2518	5300	0:04:02	1	0.0	100	773	3600	0:09:05	1	0.0	100	120	2550	0:12:53	1	0.0	100	480	2803	0:16:06	1	0	100	0	4032	0:21:09	1	0	100	6048	4032	0:21:09	1	0	100
314198	22 May-14 16:58:40	0:00:00	2	11.0	100	2571	5300	0:03:57	1	0.0	100	773	3600	0:09:00	1	0.0	100	120	2550	0:12:48	1	0.0	100	480	2803	0:16:02	1	0	100	0	4032	0:21:04	1	0	100	6048	4032	0:21:04	1	0	100
314199	22 May-14 16:58:45	0:00:00	2	10.8	100	2627	5300	0:03:53	1	0.0	100	773	3600	0:08:56	1	0.0	100	120	2550	0:12:44	1	0.0	100	480	2803	0:15:57	1	0	100	0	4032	0:21:00	1	0	100	6048	4032	0:21:00	1	0	100
314200	22 May-14 16:58:50	0:00:00	2	11.1	100	2683	5300	0:03:48	1	0.0	100	773	3600	0:08:51	1	0.0	100	120	2550	0:12:39	1	0.0	100	480	2803	0:15:52	1	0	100	0	4032	0:20:55	1	0	100	6048	4032	0:20:55	1	0	100
314201	22 May-14 16:58:55	0:00:00	2	11.1	100	2739	5300	0:03:43	1	0.0	100	773	3600	0:08:46	1	0.0	100	120	2550	0:12:34	1	0.0	100	480	2803	0:15:48	1	0	100	0	4032	0:20:50	1	0	100	6048	4032	0:20:50	1	0	100
314202	22 May-14 16:59:00	0:00:00	2	12.8	100	2827	5300	0:03:38	1	0.0	100	773	3600	0:08:41	1	0.0	100	120	2550	0:12:29	1	0.0	100	480	2803	0:15:43	1	0	100	0	4032	0:20:45	1	0	100	6048	4032	0:20:45	1	0	100
314203	22 May-14 16:59:05	0:00:00	2	11.7	100	2861	5300	0:03:27	1	0.0	100	773	3600	0:08:30	1	0.0	100	120	2550	0:12:18	1	0.0	100	480	2803	0:15:31	1	0	100	0	4032	0:20:34	1	0	100	6048	4032	0:20:34	1	0	100
314204	22 May-14 16:59:10	0:00:00	2	11.1	100	2905	5300	0:03:26	1	0.0	100	773	3600	0:08:29	1	0.0	100	120	2550	0:12:17	1	0.0	100	480	2803	0:15:31	1	0	100	0	4032	0:20:33	1	0	100	6048	4032	0:20:33	1	0	100
314205	22 May-14 16:59:15	0:00:00	2	11.2	100	2963	5300	0:03:24	1	0.0	100	773	3600	0:08:27	1	0.0	100	120	2550	0:12:15	1	0.0	100	480	2803	0:15:29	1	0	100	0	4032	0:20:31	1	0	100	6048	4032	0:20:31	1	0	100
314206	22 May-14 16:59:20	0:00:00	2	9.5	100	3017	5300	0:03:20	1	0.0	100	773	3600	0:08:22	1	0.0	100	120	2550	0:12:10	1	0.0	100	480	2803	0:15:24	1	0	100	0	4032	0:20:26	1	0	100	6048	4032	0:20:26	1	0	100
314207	22 May-14 16:59:25	0:00:00	2	10.6	100	3072	5300	0:03:15	1	0.0	100	773	3600	0:08:17	1	0.0	100	120	2550	0:12:05	1	0.0	100	480	2803	0:15:19	1	0	100	0	4032	0:20:21	1	0	100	6048	4032	0:20:21	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
314208	22 May-14 16:59:30	0:00:00	2	11.2	100	3128	5300	0:03:10	1	0.0	100	773	3600	0:08:13	1	0.0	100	120	2550	0:12:01	1	0.0	100	480	2803	0:15:14	1	0	100	0	4032	0:20:17	1	0	100	6048	4032	0:20:17	1	0	100
314209	22 May-14 16:59:35	0:00:00	2	11.1	100	3184	5300	0:03:05	1	0.0	100	773	3600	0:08:08	1	0.0	100	120	2550	0:11:56	1	0.0	100	480	2803	0:15:09	1	0	100	0	4032	0:20:12	1	0	100	6048	4032	0:20:12	1	0	100
314210	22 May-14 16:59:40	0:00:00	2	11.1	100	3184	5300	0:03:00	1	0.0	100	773	3600	0:08:03	1	0.0	100	120	2550	0:11:51	1	0.0	100	480	2803	0:15:04	1	0	100	0	4032	0:20:07	1	0	100	6048	4032	0:20:07	1	0	100
314211	22 May-14 16:59:45	0:00:00	2	10.8	100	3244	5300	0:03:00	1	0.0	100	773	3600	0:08:03	1	0.0	100	120	2550	0:11:51	1	0.0	100	480	2803	0:15:04	1	0	100	0	4032	0:20:07	1	0	100	6048	4032	0:20:07	1	0	100
314212	22 May-14 16:59:50	0:00:00	2	11.3	100	3309	5300	0:02:56	1	0.0	100	773	3600	0:07:59	1	0.0	100	120	2550	0:11:46	1	0.0	100	480	2803	0:15:00	1	0	100	0	4032	0:20:02	1	0	100	6048	4032	0:20:02	1	0	100
314213	22 May-14 16:59:55	0:00:00	2	10.8	100	3365	5300	0:02:49	1	0.0	100	773	3600	0:07:52	1	0.0	100	120	2550	0:11:40	1	0.0	100	480	2803	0:14:54	1	0	100	0	4032	0:19:56	1	0	100	6048	4032	0:19:56	1	0	100
314214	22 May-14 17:00:00	0:00:00	2	11.2	100	3430	5300	0:02:49	1	0.0	100	773	3600	0:07:51	1	0.0	100	120	2550	0:11:39	1	0.0	100	480	2803	0:14:53	1	0	100	0	4032	0:19:55	1	0	100	6048	4032	0:19:55	1	0	100
314215	22 May-14 17:00:05	0:00:00	2	11.5	100	3486	5300	0:02:40	1	0.0	100	773	3600	0:07:43	1	0.0	100	120	2550	0:11:31	1	0.0	100	480	2803	0:14:44	1	0	100	0	4032	0:19:47	1	0	100	6048	4032	0:19:47	1	0	100
314216	22 May-14 17:00:10	0:00:00	2	11.0	100	3541	5300	0:02:34	1	0.0	100	773	3600	0:07:37	1	0.0	100	120	2550	0:11:25	1	0.0	100	480	2803	0:14:39	1	0	100	0	4032	0:19:41	1	0	100	6048	4032	0:19:41	1	0	100
314217	22 May-14 17:00:15	0:00:00	2	11.6	100	3597	5300	0:02:30	1	0.0	100	773	3600	0:07:33	1	0.0	100	120	2550	0:11:20	1	0.0	100	480	2803	0:14:34	1	0	100	0	4032	0:19:36	1	0	100	6048	4032	0:19:36	1	0	100
314218	22 May-14 17:00:20	0:00:00	2	11.2	100	3653	5300	0:02:25	1	0.0	100	773	3600	0:07:28	1	0.0	100	120	2550	0:11:16	1	0.0	100	480	2803	0:14:29	1	0	100	0	4032	0:19:32	1	0	100	6048	4032	0:19:32	1	0	100
314219	22 May-14 17:00:25	0:00:00	2	11.2	100	3709	5300	0:02:20	1	0.0	100	773	3600	0:07:23	1	0.0	100	120	2550	0:11:11	1	0.0	100	480	2803	0:14:24	1	0	100	0	4032	0:19:27	1	0	100	6048	4032	0:19:27	1	0	100
314220	22 May-14 17:00:30	0:00:00	2	10.7	100	3766	5300	0:02:15	1	0.0	100	773	3600	0:07:18	1	0.0	100	120	2550	0:11:06	1	0.0	100	480	2803	0:14:19	1	0	100	0	4032	0:19:22	1	0	100	6048	4032	0:19:22	1	0	100
314221	22 May-14 17:00:35	0:00:00	2	10.6	100	3820	5300	0:02:11	1	0.0	100	773	3600	0:07:14	1	0.0	100	120	2550	0:11:02	1	0.0	100	480	2803	0:14:15	1	0	100	0	4032	0:19:18	1	0	100	6048	4032	0:19:18	1	0	100
314222	22 May-14 17:00:41	0:00:00	2	10.6	100	3875	5300	0:02:06	1	0.0	100	773	3600	0:07:09	1	0.0	100	120	2550	0:10:57	1	0.0	100	480	2803	0:14:10	1	0	100	0	4032	0:19:13	1	0	100	6048	4032	0:19:13	1	0	100
314223	22 May-14 17:00:46	0:00:00	2	10.6	100	3931	5300	0:02:02	1	0.0	100	773	3600	0:07:05	1	0.0	100	120	2550	0:10:53	1	0.0	100	480	2803	0:14:06	1	0	100	0	4032	0:19:09	1	0	100	6048	4032	0:19:09	1	0	100
314224	22 May-14 17:00:51	0:00:00	2	11.1	100	3987	5300	0:01:57	1	0.0	100	773	3600	0:06:59	1	0.0	100	120	2550	0:10:47	1	0.0	100	480	2803	0:14:01	1	0	100	0	4032	0:19:03	1	0	100	6048	4032	0:19:03	1	0	100
314225	22 May-14 17:00:56	0:00:00	2	11.2	100	4044	5300	0:01:52	1	0.0	100	773	3600	0:06:55	1	0.0	100	120	2550	0:10:43	1	0.0	100	480	2803	0:13:57	1	0	100	0	4032	0:18:59	1	0	100	6048	4032	0:18:59	1	0	100
314226	22 May-14 17:01:01	0:00:00	2	11.2	100	4099	5300	0:01:47	1	0.0	100	773	3600	0:06:50	1	0.0	100	120	2550	0:10:38	1	0.0	100	480	2803	0:13:52	1	0	100	0	4032	0:18:54	1	0	100	6048	4032	0:18:54	1	0	100
314227	22 May-14 17:01:06	0:00:00	2	11.5	100	4161	5300	0:01:43	1	0.0	100	773	3600	0:06:46	1	0.0	100	120	2550	0:10:33	1	0.0	100	480	2803	0:13:47	1	0	100	0	4032	0:18:49	1	0	100	6048	4032	0:18:49	1	0	100
314228	22 May-14 17:01:11	0:00:00	2	11.6	100	4219	5300	0:01:37	1	0.0	100	773	3600	0:06:40	1	0.0	100	120	2550	0:10:28	1	0.0	100	480	2803	0:13:41	1	0	100	0	4032	0:18:44	1	0	100	6048	4032	0:18:44	1	0	100
314229	22 May-14 17:01:17	0:00:00	2	11.6	100	4275	5300	0:01:32	1	0.0	100	773	3600	0:06:35	1	0.0	100	120	2550	0:10:23	1	0.0	100	480	2803	0:13:36	1	0	100	0	4032	0:18:39	1	0	100	6048	4032	0:18:39	1	0	100
314230	22 May-14 17:01:22	0:00:00	2	11.0	100	4331	5300	0:01:27	1	0.0	100	773	3600	0:06:30	1	0.0	100	120	2550	0:10:18	1	0.0	100	480	2803	0:13:31	1	0	100	0	4032	0:18:34	1	0	100	6048	4032	0:18:34	1	0	100
314231	22 May-14 17:01:27	0:00:00	2	10.7	100	4386	5300	0:01:22	1	0.0	100	773	3600	0:06:25	1	0.0	100	120	2550	0:10:13	1	0.0	100	480	2803	0:13:27	1	0	100	0	4032	0:18:29	1	0	100	6048	4032	0:18:29	1	0	100
314232	22 May-14 17:01:32	0:00:00	2	10.7	100	4443	5300	0:01:18	1	0.0	100	773	3600	0:06:21	1	0.0	100	120	2550	0:10:08	1	0.0	100	480	2803	0:13:22	1	0	100	0	4032	0:18:24	1	0	100	6048	4032	0:18:24	1	0	100
314233	22 May-14 17:01:37	0:00:00	2	11.1	100	4508	5300	0:01:13	1	0.0	100	773	3600	0:06:16	1	0.0	100	120	2550	0:10:03	1	0.0	100	480	2803	0:13:17	1	0	100	0	4032	0:18:19	1	0	100	6048	4032	0:18:19	1	0	100
314234	22 May-14 17:01:42	0:00:00	2	11.6	100	4563	5300	0:01:07	1	0.0	100	773	3600	0:06:10	1	0.0	100	120	2550	0:09:57	1	0.0	100	480	2803	0:13:11	1	0	100	0	4032	0:18:13	1	0	100	6048	4032	0:18:13	1	0	100
314235	22 May-14 17:01:47	0:00:00	2	11.7	100	4619	5300	0:01:02	1	0.0	100	773	3600	0:06:05	1	0.0	100	120	2550	0:09:53	1	0.0	100	480	2803	0:13:06	1	0	100	0	4032	0:18:09	1	0	100	6048	4032	0:18:09	1	0	100
314236	22 May-14 17:01:52	0:00:00	2	11.6	100	4674	5300	0:00:57	1	0.0	100	773	3600	0:06:00	1	0.0	100	120	2550	0:09:48	1	0.0	100	480	2803	0:13:02	1	0	100	0	4032	0:18:04	1	0	100	6048	4032	0:18:04	1	0	100
314237	22 May-14 17:01:57	0:00:00	2	11.1	100	4730	5300	0:00:53	1	0.0	100	773	3600	0:05:56	1	0.0	100	120	2550	0:09:43	1	0.0	100	480	2803	0:12:57	1	0	100	0	4032	0:17:59	1	0	100	6048	4032	0:17:59	1	0	100
314238	22 May-14 17:02:02	0:00:00	2	11.1	100	4785	5300	0:00:48	1	0.0	100	773	3600	0:05:51	1	0.0	100	120	2550	0:09:39	1	0.0	100	480	2803	0:12:52	1	0	100	0	4032	0:17:55	1	0	100	6048	4032	0:17:55	1	0	100
314239	22 May-14 17:02:07	0:00:00	2	11.1	100	4841	5300	0:00:44	1	0.0	100	773	3600	0:05:46	1	0.0	100	120	2550	0:09:34	1	0.0	100	480	2803	0:12:48	1	0	100	0	4032	0:17:50	1	0	100	6048	4032	0:17:50	1	0	100
314240	22 May-14 17:02:12	0:00:00	2	11.1	100	4896	5300	0:00:39	1	0.0	100	773	3600	0:05:42	1	0.0	100	120	2550	0:09:29	1	0.0	100	480	2803	0:12:43	1	0	100	0	4032	0:17:45	1	0	100	6048	4032	0:17:45	1	0	100
314241	22 May-14 17:02:17	0:00:00	2	11.1	100	4952	5300	0:00:34	1	0.0	100	773	3600	0:05:37	1	0.0	100	120	2550	0:09:25	1	0.0	100	480	2803	0:12:38	1	0	100	0	4032	0:17:41	1	0	100	6048	4032	0:17:41	1	0	100
314242	22 May-14 17:02:22	0:00:00	2	11.2	100	5008	5300	0:00:29	1	0.0	100	773	3600	0:05:32	1	0.0	100	120	2550	0:09:20	1	0.0	100	480	2803	0:12:33	1	0	100	0	4032	0:17:36	1	0	100	6048	4032	0:17:36	1	0	100
314243	22 May-14 17:02:27	0:00:00	2	10.6	100	5063	5300	0:00:24	1	0.0	100	773	3600	0:05:27	1	0.0	100	120	2550	0:09:15	1	0.0	100	480	2803	0:12:29	1	0	100	0	4032	0:17:31	1	0	100	6048	4032	0:17:31	1	0	100
314244	22 May-14 17:02:33	0:00:00	2	10.6	100	5119	5300	0:00:20	1	0.0	100	773	3600	0:05:23	1	0.0	100	120	2550	0:09:11	1	0.0	100	480	2803	0:12:24	1	0	100	0	4032	0:17:27	1	0	100	6048	4032	0:17:27	1	0	100
314245	22 May-14 17:02:38	0:00:00	2	10.6	100	5175	5300	0:00:15	1	0.0	100	773	3600	0:05:18	1	0.0	100	120	2550	0:09:06	1	0.0	100	480	2803	0:12:19	1	0	100	0	4032	0:17:22	1	0	100	6048	4032	0:17:22	1	0	100
314246	22 May-14 17:02:43	0:00:00	2	10.6	100	5230	5300	0:00:10	1	0.0	100	773	3600	0:05:13	1	0.0	100	120	2550	0:09:01	1	0.0	100	480	2803	0:12:15	1	0	100	0	4032	0:17:17	1	0	100	6048	4032	0:17:17	1	0	100
314247	22 May-14 17:02:48	0:00:00	2	11.4	100	5291	5300	0:00:06	1	0.0	100	773	3600	0:05:08	1	0.0	100	120	2550	0:08:56	1	0.0	100	480	2803	0:12:10	1	0	100	0	4032	0:17:12	1	0	100	6048	4032	0:17:12	1	0	100
314248	22 May-14 17:02:53	0:00:00	2	11.6	100	5351	5300	0:00:00	1	0.0	100	773	3600	0:05:03	1	0.0	100	120	2550	0:08:51	1	0.0	100	480	2803	0:12:05	1	0	100	0	4032	0:17:07	1	0	100	6048	4032	0:17:07	1	0	100
314249	22 May-14 17:02:58	0:00:05	2	11.6	100	5406	5300	0:00:00	1	0.0	100	773	3600	0:05:02	1	0.0	100	120	2550	0:08:50	1	0.0	100	480	2803	0:12:04	1	0	100	0	4032	0:17:06	1	0	100	6048	4032	0:17:06	1	0	100
314250	22 May-14 17:03:03	0:00:11	2	11.6	100	5462	5300	0:00:00	1	0.0	100	773	3600	0:05:02	1	0.0	100	120	2550	0:08:50	1	0.0	100	480	2803	0:12:04	1	0	100	0	4032	0:17:06	1	0	100	6048	4032	0:17:06	1	0	100
314251	22 May-14 17:03:08	0:00:17	2	11.4	100	5518	5300	0:00:00	1	0.0	100	773	3600	0:05:02	1	0.0	100	120	2550	0:08:50	1	0.0	100	480	2803	0:12:04	1	0	100	0	4032	0:17:06	1	0	100	6048	4032	0:17:06	1	0	100
314252	22 May-14 17:03:13	0:00:23	2	11.1	100	5554	5300	0:00:00	2	0.0	100	792	3600	0:05:02	1	0.0	100	120	2550	0:08:50	1	0.0	100	480	2803	0:12:04	1	0	100	0	4032	0:17:06	1	0	100	6048	4032	0:17:06	1	0	100
314253	22 May-14 17:03:18	0:00:26	2	11.2	100	5559	5300	0:00:00	2	3.5	100	843	3600	0:04:56	1	0.0	100	120	2550	0:08:44	1	0.0	100	480	2803	0:11:58	1	0	100	0	4032	0:17:00	1	0	100	6048	4032	0:17:00	1	0	100
314254	22 May-14 17:03:23	0:00:26	2	11.1	100	5563	5300	0:00:00	2	6.0	100	893	3600	0:04:41	1	0.0	100	120	2550	0:08:29	1	0.0	100	480	2803	0:11:42	1	0	100	0	4032	0:16:45	1	0	100	6048	4032	0:16:45	1	0	100
314255	22 May-14 17:03:28	0:00:25	2	11.1	100	5568	5300	0:00:00	2	8.6	100	944	3600	0:04:27	1	0.0	100	120	2550	0:08:14	1	0.0	100	480	2803	0:11:28	1	0	100	0	4032	0:16:30	1	0	100	6048	4032	0:16:30	1	0	100
314256	22 May-14 17:03:33	0:00:25	2	11.1	100	5574	5300	0:00:00	2	10.1	100	994	3600	0:04:13	1	0.0	100	120	2550	0:08:01	1	0.0	100	480	2803	0:11:14	1	0	100	0	4032	0:16:17	1	0	100	6048	4032	0:16:17	1	0	100
314257	22 May-14 17:03:38	0:00:25	2	11.1	100	5578	5300	0:00:00	2	10.1	100	1045	3600	0:04:01	1	0.0	100	120	2550	0:07:48	1	0.0	100	480	2803	0:11:02	1	0	100	0	4032	0:16:04	1	0	100	6048	4032	0:16:04	1	0	100
314258	22 May-14 17:03:43	0:00:24	2	11.2	100	5584	5300	0:00:00	2	10.1	100	1095	3600	0:03:49	1	0.0	100	120	2550	0:07:37	1	0.0	100	480	2803	0:10:50	1	0	100	0	4032	0:15:53	1	0	100	6048	4032	0:15:53	1	0	100
314259	22 May-14 17:03:48	0:00:24	2	11.3	100	5591	5300	0:00:00	2	10.1	100	1146	3600	0:03:38	1	0.0	100	120	2550	0:07:26	1	0.0	100	480	2803	0:10:39	1	0	100	0	4032	0:15:42	1	0	100	6048	4032	0:15:42	1	0	100
314260	22 May-14 17:03:53	0:00:24	2	11.1	100	5594	5300	0:00:00	2	10.1	100	1196	3600	0:03:27	1	0.0	100	120	2550	0:07:15	1	0.0	100	480	2803	0:10:29	1	0	100	0	4032	0:15:31	1	0	100	6048	4032	0:15:31	1	0	100
314261	22 May-14 17:03:58	0:00:24	2	11.2	100	5599	5300	0:00:00	2	10.1	100	1247	3600	0:03:17	1	0.0	100	120	2550	0:07:05	1	0.0	100	480	2803	0:10:19	1	0	100	0	4032	0:15:21	1	0	100	6048	4032	0:15:21	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
314262	22 May-14 17:04:03	0:00:23	2	11.1	100	5604	5300	0:00:00	2	10.1	100	1297	3600	0:03:08	1	0.0	100	120	2550	0:06:56	1	0.0	100	480	2803	0:10:09	1	0	100	0	4032	0:15:12	1	0	100	6048	4032	0:15:12	1	0	100
314263	22 May-14 17:04:08	0:00:23	2	11.0	100	5609	5300	0:00:00	2	10.1	100	1348	3600	0:03:01	1	0.0	100	120	2550	0:06:49	1	0.0	100	480	2803	0:10:02	1	0	100	0	4032	0:15:05	1	0	100	6048	4032	0:15:05	1	0	100
314264	22 May-14 17:04:13	0:00:24	2	11.1	100	5614	5300	0:00:00	2	10.1	100	1398	3600	0:02:57	1	0.0	100	120	2550	0:06:45	1	0.0	100	480	2803	0:09:58	1	0	100	0	4032	0:15:01	1	0	100	6048	4032	0:15:01	1	0	100
314265	22 May-14 17:04:18	0:00:24	2	11.1	100	5619	5300	0:00:00	2	10.1	100	1449	3600	0:02:53	1	0.0	100	120	2550	0:06:41	1	0.0	100	480	2803	0:09:54	1	0	100	0	4032	0:14:57	1	0	100	6048	4032	0:14:57	1	0	100
314266	22 May-14 17:04:23	0:00:25	2	10.6	100	5625	5300	0:00:00	2	9.6	100	1499	3600	0:02:49	1	0.0	100	120	2550	0:06:37	1	0.0	100	480	2803	0:09:50	1	0	100	0	4032	0:14:53	1	0	100	6048	4032	0:14:53	1	0	100
314267	22 May-14 17:04:28	0:00:25	2	10.6	100	5629	5300	0:00:00	2	9.6	100	1550	3600	0:02:46	1	0.0	100	120	2550	0:06:34	1	0.0	100	480	2803	0:09:47	1	0	100	0	4032	0:14:50	1	0	100	6048	4032	0:14:50	1	0	100
314268	22 May-14 17:04:33	0:00:26	2	10.7	100	5637	5300	0:00:00	2	9.6	100	1600	3600	0:02:42	1	0.0	100	120	2550	0:06:30	1	0.0	100	480	2803	0:09:43	1	0	100	0	4032	0:14:46	1	0	100	6048	4032	0:14:46	1	0	100
314269	22 May-14 17:04:38	0:00:26	2	10.6	100	5640	5300	0:00:00	2	9.6	100	1651	3600	0:02:38	1	0.0	100	120	2550	0:06:26	1	0.0	100	480	2803	0:09:39	1	0	100	0	4032	0:14:42	1	0	100	6048	4032	0:14:42	1	0	100
314270	22 May-14 17:04:43	0:00:26	2	11.1	100	5645	5300	0:00:00	2	10.1	100	1701	3600	0:02:34	1	0.0	100	120	2550	0:06:22	1	0.0	100	480	2803	0:09:35	1	0	100	0	4032	0:14:38	1	0	100	6048	4032	0:14:38	1	0	100
314271	22 May-14 17:04:48	0:00:27	2	11.3	100	5653	5300	0:00:00	2	10.1	100	1752	3600	0:02:30	1	0.0	100	120	2550	0:06:18	1	0.0	100	480	2803	0:09:31	1	0	100	0	4032	0:14:34	1	0	100	6048	4032	0:14:34	1	0	100
314272	22 May-14 17:04:53	0:00:27	2	11.0	100	5655	5300	0:00:00	2	10.1	100	1802	3600	0:02:26	1	0.0	100	120	2550	0:06:14	1	0.0	100	480	2803	0:09:27	1	0	100	0	4032	0:14:30	1	0	100	6048	4032	0:14:30	1	0	100
314273	22 May-14 17:04:58	0:00:28	2	11.1	100	5660	5300	0:00:00	2	10.1	100	1853	3600	0:02:22	1	0.0	100	120	2550	0:06:10	1	0.0	100	480	2803	0:09:23	1	0	100	0	4032	0:14:26	1	0	100	6048	4032	0:14:26	1	0	100
314274	22 May-14 17:05:04	0:00:28	2	11.2	100	5666	5300	0:00:00	2	10.1	100	1903	3600	0:02:18	1	0.0	100	120	2550	0:06:06	1	0.0	100	480	2803	0:09:19	1	0	100	0	4032	0:14:22	1	0	100	6048	4032	0:14:22	1	0	100
314275	22 May-14 17:05:10	0:00:28	2	11.0	100	5670	5300	0:00:00	2	10.1	100	1954	3600	0:02:14	1	0.0	100	120	2550	0:06:02	1	0.0	100	480	2803	0:09:15	1	0	100	0	4032	0:14:18	1	0	100	6048	4032	0:14:18	1	0	100
314276	22 May-14 17:05:15	0:00:29	2	11.3	100	5678	5300	0:00:00	2	10.1	100	2004	3600	0:02:10	1	0.0	100	120	2550	0:05:58	1	0.0	100	480	2803	0:09:11	1	0	100	0	4032	0:14:14	1	0	100	6048	4032	0:14:14	1	0	100
314277	22 May-14 17:05:20	0:00:29	2	11.6	100	5685	5300	0:00:00	2	10.3	100	2059	3600	0:02:05	1	0.0	100	120	2550	0:05:53	1	0.0	100	480	2803	0:09:07	1	0	100	0	4032	0:14:09	1	0	100	6048	4032	0:14:09	1	0	100
314278	22 May-14 17:05:25	0:00:30	2	11.8	100	5685	5300	0:00:00	2	10.8	100	2119	3600	0:02:01	1	0.0	100	120	2550	0:05:48	1	0.0	100	480	2803	0:09:02	1	0	100	0	4032	0:14:04	1	0	100	6048	4032	0:14:04	1	0	100
314279	22 May-14 17:05:30	0:00:30	2	11.6	100	5694	5300	0:00:00	2	10.5	100	2174	3600	0:01:55	1	0.0	100	120	2550	0:05:43	1	0.0	100	480	2803	0:08:57	1	0	100	0	4032	0:13:59	1	0	100	6048	4032	0:13:59	1	0	100
314280	22 May-14 17:05:35	0:00:30	2	11.4	100	5697	5300	0:00:00	2	10.5	100	2225	3600	0:01:51	1	0.0	100	120	2550	0:05:39	1	0.0	100	480	2803	0:08:53	1	0	100	0	4032	0:13:55	1	0	100	6048	4032	0:13:55	1	0	100
314281	22 May-14 17:05:40	0:00:31	2	11.1	100	5723	5300	0:00:00	2	9.3	100	2254	3600	0:01:47	1	0.0	100	120	2550	0:05:35	1	0.0	100	480	2803	0:08:49	1	0	100	0	4032	0:13:51	1	0	100	6048	4032	0:13:51	1	0	100
314282	22 May-14 17:05:45	0:00:33	2	11.6	100	5786	5300	0:00:00	2	6.8	100	2262	3600	0:01:46	1	0.0	100	120	2550	0:05:34	1	0.0	100	480	2803	0:08:48	1	0	100	0	4032	0:13:50	1	0	100	6048	4032	0:13:50	1	0	100
314283	22 May-14 17:05:50	0:00:39	2	11.0	100	5820	5300	0:00:00	2	4.7	100	2268	3600	0:01:48	1	0.0	100	120	2550	0:05:36	1	0.0	100	480	2803	0:08:49	1	0	100	0	4032	0:13:52	1	0	100	6048	4032	0:13:52	1	0	100
314284	22 May-14 17:05:55	0:00:43	2	11.2	100	5871	5300	0:00:00	2	2.5	100	2274	3600	0:01:50	1	0.0	100	120	2550	0:05:38	1	0.0	100	480	2803	0:08:51	1	0	100	0	4032	0:13:54	1	0	100	6048	4032	0:13:54	1	0	100
314285	22 May-14 17:06:00	0:00:48	2	11.2	100	5921	5300	0:00:00	2	1.3	100	2279	3600	0:01:52	1	0.0	100	120	2550	0:05:40	1	0.0	100	480	2803	0:08:54	1	0	100	0	4032	0:13:56	1	0	100	6048	4032	0:13:56	1	0	100
314286	22 May-14 17:06:05	0:00:54	2	9.9	100	5971	5300	0:00:00	2	1.1	100	2285	3600	0:01:55	1	0.0	100	120	2550	0:05:43	1	0.0	100	480	2803	0:08:56	1	0	100	0	4032	0:13:59	1	0	100	6048	4032	0:13:59	1	0	100
314287	22 May-14 17:06:10	0:01:00	2	10.6	100	6020	5300	0:00:00	2	1.1	100	2291	3600	0:01:58	1	0.0	100	120	2550	0:05:45	1	0.0	100	480	2803	0:08:59	1	0	100	0	4032	0:14:01	1	0	100	6048	4032	0:14:01	1	0	100
314288	22 May-14 17:06:16	0:01:06	2	10.6	100	6076	5300	0:00:00	2	0.0	100	2292	3600	0:02:00	1	0.0	100	120	2550	0:05:48	1	0.0	100	480	2803	0:09:02	1	0	100	0	4032	0:14:04	1	0	100	6048	4032	0:14:04	1	0	100
314289	22 May-14 17:06:21	0:01:14	2	10.6	100	6103	5300	0:00:00	2	2.0	100	2320	3600	0:02:05	1	0.0	100	120	2550	0:05:53	1	0.0	100	480	2803	0:09:06	1	0	100	0	4032	0:14:09	1	0	100	6048	4032	0:14:09	1	0	100
314290	22 May-14 17:06:26	0:01:18	2	11.2	100	6108	5300	0:00:00	2	4.4	100	2372	3600	0:02:04	1	0.0	100	120	2550	0:05:52	1	0.0	100	480	2803	0:09:05	1	0	100	0	4032	0:14:08	1	0	100	6048	4032	0:14:08	1	0	100
314291	22 May-14 17:06:31	0:01:18	2	11.4	100	6108	5300	0:00:00	2	7.0	100	2431	3600	0:01:59	1	0.0	100	120	2550	0:05:47	1	0.0	100	480	2803	0:09:00	1	0	100	0	4032	0:14:03	1	0	100	6048	4032	0:14:03	1	0	100
314292	22 May-14 17:06:36	0:01:17	2	11.5	100	6108	5300	0:00:00	2	9.9	100	2489	3600	0:01:51	1	0.0	100	120	2550	0:05:39	1	0.0	100	480	2803	0:08:52	1	0	100	0	4032	0:13:55	1	0	100	6048	4032	0:13:55	1	0	100
314293	22 May-14 17:06:41	0:01:14	2	11.6	100	6110	5300	0:00:00	2	11.3	100	2497	3600	0:01:42	2	2.4	100	168	2550	0:05:30	1	0.0	100	480	2803	0:08:44	1	0	100	0	4032	0:13:46	1	0	100	6048	4032	0:13:46	1	0	100
314294	22 May-14 17:06:46	0:01:12	2	11.5	100	6108	5300	0:00:00	2	11.5	100	2505	3600	0:01:38	2	4.8	100	216	2550	0:05:21	1	0.0	100	480	2803	0:08:35	1	0	100	0	4032	0:13:37	1	0	100	6048	4032	0:13:37	1	0	100
314295	22 May-14 17:06:51	0:01:10	2	11.3	100	6109	5300	0:00:00	2	11.3	100	2512	3600	0:01:35	2	7.2	100	264	2550	0:05:13	1	0.0	100	480	2803	0:08:26	1	0	100	0	4032	0:13:29	1	0	100	6048	4032	0:13:29	1	0	100
314296	22 May-14 17:06:56	0:01:08	2	11.2	100	6109	5300	0:00:00	2	11.2	100	2520	3600	0:01:32	2	9.6	100	312	2550	0:05:04	1	0.0	100	480	2803	0:08:18	1	0	100	0	4032	0:13:20	1	0	100	6048	4032	0:13:20	1	0	100
314297	22 May-14 17:07:01	0:01:06	2	11.1	100	6109	5300	0:00:00	2	11.1	100	2515	3600	0:01:28	2	10.2	100	372	2550	0:04:56	1	0.0	100	480	2803	0:08:09	1	0	100	0	4032	0:13:12	1	0	100	6048	4032	0:13:12	1	0	100
314298	22 May-14 17:07:06	0:01:04	2	11.2	100	6109	5300	0:00:00	2	11.1	100	2523	3600	0:01:26	2	10.2	100	420	2550	0:04:48	1	0.0	100	480	2803	0:08:01	1	0	100	0	4032	0:13:04	1	0	100	6048	4032	0:13:04	1	0	100
314299	22 May-14 17:07:11	0:01:02	2	11.1	100	6109	5300	0:00:00	2	11.1	100	2578	3600	0:01:23	2	10.2	100	420	2550	0:04:40	1	0.0	100	480	2803	0:07:53	1	0	100	0	4032	0:12:56	1	0	100	6048	4032	0:12:56	1	0	100
314300	22 May-14 17:07:16	0:01:01	2	11.2	100	6110	5300	0:00:00	2	11.1	100	2634	3600	0:01:18	2	10.2	100	420	2550	0:04:34	1	0.0	100	480	2803	0:07:48	1	0	100	0	4032	0:12:50	1	0	100	6048	4032	0:12:50	1	0	100
314301	22 May-14 17:07:21	0:01:01	2	11.1	100	6109	5300	0:00:00	2	11.1	100	2689	3600	0:01:13	0	0.0	90	420	2550	0:04:30	1	0.0	100	480	2803	0:07:44	1	0	100	0	4032	0:12:46	1	0	100	6048	4032	0:12:46	1	0	100
314302	22 May-14 17:07:26	0:01:01	2	11.1	100	6109	5300	0:00:00	2	11.1	100	2745	3600	0:01:09	0	0.0	70	420	2550	0:04:26	1	0.0	100	480	2803	0:07:39	1	0	100	0	4032	0:12:42	1	0	100	6048	4032	0:12:42	1	0	100
314303	22 May-14 17:07:31	0:01:02	2	11.2	100	6110	5300	0:00:00	2	11.1	100	2800	3600	0:01:05	0	0.0	50	420	2550	0:04:22	1	0.0	100	480	2803	0:07:35	1	0	100	0	4032	0:12:38	1	0	100	6048	4032	0:12:38	1	0	100
314304	22 May-14 17:07:36	0:01:02	2	11.0	100	6108	5300	0:00:00	2	11.1	100	2580	3600	0:01:01	2	9.2	40	696	2550	0:04:18	1	0.0	100	480	2803	0:07:32	1	0	100	0	4032	0:12:34	1	0	100	6048	4032	0:12:34	1	0	100
314305	22 May-14 17:07:41	0:01:01	2	11.2	100	6111	5300	0:00:00	2	11.1	100	2599	3600	0:01:18	2	12.5	50	732	2550	0:04:07	1	0.0	100	480	2803	0:07:21	1	0	100	0	4032	0:12:23	1	0	100	6048	4032	0:12:23	1	0	100
314306	22 May-14 17:07:46	0:01:02	2	11.1	100	6108	5300	0:00:00	2	11.1	100	2607	3600	0:01:16	2	8.4	60	780	2550	0:04:03	1	0.0	100	480	2803	0:07:16	1	0	100	0	4032	0:12:19	1	0	100	6048	4032	0:12:19	1	0	100
314307	22 May-14 17:07:52	0:01:01	2	11.1	100	6109	5300	0:00:00	2	11.1	100	2626	3600	0:01:16	2	4.0	70	816	2550	0:03:58	1	0.0	100	480	2803	0:07:11	1	0	100	0	4032	0:12:14	1	0	100	6048	4032	0:12:14	1	0	100
314308	22 May-14 17:07:57	0:01:02	2	11.1	100	6108	5300	0:00:00	2	11.1	100	2658	3600	0:01:14	2	7.2	80	840	2550	0:03:53	1	0.0	100	480	2803	0:07:07	1	0	100	0	4032	0:12:09	1	0	100	6048	4032	0:12:09	1	0	100
314309	22 May-14 17:08:02	0:01:01	2	11.1	100	6109	5300	0:00:00	2	11.2	100	2666	3600	0:01:12	2	4.5	90	888	2550	0:03:49	1	0.0	100	480	2803	0:07:02	1	0	100	0	4032	0:12:05	1	0	100	6048	4032	0:12:05	1	0	100
314310	22 May-14 17:08:07	0:01:02	2	10.6	100	6104	5300	0:00:00	2	10.8	100	2689	3600	0:01:11	2	6.9	100	924	2550	0:03:43	1	0.0	100	480	2803	0:06:57	1	0	100	0	4032	0:11:59	1	0	100	6048	4032	0:11:59	1	0	100
314311	22 May-14 17:08:13	0:01:01	2	11.0	100	6108	5300	0:00:00	2	11.0	100	2701	3600	0:01:10	2	7.4	100	972	2550	0:03:38	1	0.0	100	480	2803	0:06:52	1	0	100	0	4032	0:11:54	1	0	100	6048	4032	0:11:54	1	0	100
314312	22 May-14 17:08:18	0:01:02	2	11.0	100	6108	5300	0:00:00	2	11.0	100	2721	3600	0:01:09	2	8.0	100	1008	2550	0:03:31	1	0.0	100	480	2803	0:06:45	1	0	100	0	4032	0:11:47	1	0	100	6048	4032	0:11:47	1	0	100
314313	22 May-14 17:08:23	0:01:02	2	11.0	100	6111	5300	0:00:00	2	11.0	100	2728	3600	0:01:07	2	8.0	100	1056	2550	0:03:29	1	0.0	100	480	2803	0:06:42	1	0	100	0	4032	0:11:45	1	0	100	6048	4032	0:11:45	1	0	100
314314	22 May-14 17:08:28	0:01:02	2	11.7	100	6108	5300	0:00:00	2	11.5	100	2739	3600	0:01:06	2	9.0	100	1104	2550	0:03:24	1	0.0	100	480	2803	0:06:38	1	0	100	0	4032	0:11:40	1	0	100	6048	4032	0:11:40	1	0	100
314315	22 May-14 17:08:34	0:01:01	2	10.8	100	6108	5300	0:00:00	2	10.8	100	2760	3600	0:01:06	2	8.0	100	1140	2550	0:03:18	1	0.0	100	480	2803	0:06:32	1	0	100	0	4032	0:11:34	1	0	100	6048	4032	0:11:34	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
314316	22 May-14 17:08:39	0:01:02	2	10.8	100	6105	5300	0:00:00	2	11.0	100	2771	3600	0:01:04	2	8.6	100	1188	2550	0:03:14	1	0.0	100	480	2803	0:06:28	1	0	100	0	4032	0:11:30	1	0	100	6048	4032	0:11:30	1	0	100
314317	22 May-14 17:08:44	0:01:01	2	11.0	100	6109	5300	0:00:00	2	11.1	100	2793	3600	0:01:03	2	8.0	100	1224	2550	0:03:08	1	0.0	100	480	2803	0:06:22	1	0	100	0	4032	0:11:24	1	0	100	6048	4032	0:11:24	1	0	100
314318	22 May-14 17:08:49	0:01:02	2	11.0	100	6109	5300	0:00:00	2	11.0	100	2813	3600	0:01:01	2	7.4	100	1260	2550	0:03:03	1	0.0	100	480	2803	0:06:17	1	0	100	0	4032	0:11:19	1	0	100	6048	4032	0:11:19	1	0	100
314319	22 May-14 17:08:54	0:01:02	2	11.2	100	6111	5300	0:00:00	2	11.0	100	2836	3600	0:01:00	2	7.4	100	1296	2550	0:02:58	1	0.0	100	480	2803	0:06:12	1	0	100	0	4032	0:11:14	1	0	100	6048	4032	0:11:14	1	0	100
314320	22 May-14 17:08:59	0:01:02	2	11.2	100	6106	5300	0:00:00	2	11.1	100	2885	3600	0:00:58	2	5.7	100	1308	2550	0:02:54	1	0.0	100	480	2803	0:06:12	1	0	100	0	4032	0:11:10	1	0	100	6048	4032	0:11:10	1	0	100
314321	22 May-14 17:09:04	0:01:01	2	11.1	100	6108	5300	0:00:00	2	11.1	100	2943	3600	0:00:54	1	0.0	100	1308	2550	0:02:49	1	0.0	100	480	2803	0:06:12	1	0	100	0	4032	0:11:05	1	0	100	6048	4032	0:11:05	1	0	100
314322	22 May-14 17:09:09	0:01:01	2	11.1	100	6108	5300	0:00:00	2	11.1	100	2999	3600	0:00:50	1	0.0	100	1308	2550	0:02:44	1	0.0	100	480	2803	0:06:12	1	0	100	0	4032	0:11:00	1	0	100	6048	4032	0:11:00	1	0	100
314323	22 May-14 17:09:15	0:01:01	2	11.4	100	6108	5300	0:00:00	2	11.5	100	3054	3600	0:00:46	1	0.0	100	1308	2550	0:02:40	1	0.0	100	480	2803	0:06:12	1	0	100	0	4032	0:10:56	1	0	100	6048	4032	0:10:56	1	0	100
314324	22 May-14 17:09:21	0:01:01	2	11.2	100	6109	5300	0:00:00	2	11.1	100	3165	3600	0:00:41	1	0.0	100	1308	2550	0:02:36	1	0.0	100	480	2803	0:06:12	1	0	100	0	4032	0:10:52	1	0	100	6048	4032	0:10:52	1	0	100
314325	22 May-14 17:09:26	0:01:01	2	11.2	100	6108	5300	0:00:00	2	11.2	100	3222	3600	0:00:33	1	0.0	100	1308	2550	0:02:28	1	0.0	100	480	2803	0:06:12	1	0	100	0	4032	0:10:44	1	0	100	6048	4032	0:10:44	1	0	100
314326	22 May-14 17:09:31	0:01:01	2	11.2	100	6108	5300	0:00:00	2	11.2	100	3222	3600	0:00:28	1	0.0	100	1308	2550	0:02:24	1	0.0	100	480	2803	0:06:12	1	0	100	0	4032	0:10:40	1	0	100	6048	4032	0:10:40	1	0	100
314327	22 May-14 17:09:36	0:01:01	2	11.0	100	6108	5300	0:00:00	2	11.0	100	3285	3600	0:00:28	1	0.0	100	1308	2550	0:02:24	1	0.0	100	480	2803	0:06:12	1	0	100	0	4032	0:10:40	1	0	100	6048	4032	0:10:40	1	0	100
314328	22 May-14 17:09:42	0:01:02	2	10.7	100	6106	5300	0:00:00	2	10.8	100	3348	3600	0:00:24	1	0.0	100	1308	2550	0:02:20	1	0.0	100	480	2803	0:06:12	1	0	100	0	4032	0:10:36	1	0	100	6048	4032	0:10:36	1	0	100
314329	22 May-14 17:09:47	0:01:02	2	11.0	100	6108	5300	0:00:00	2	11.1	100	3373	3600	0:00:19	2	1.6	100	1344	2550	0:02:15	1	0.0	100	480	2803	0:06:12	1	0	100	0	4032	0:10:31	1	0	100	6048	4032	0:10:31	1	0	100
314330	22 May-14 17:09:52	0:01:01	2	11.0	100	6108	5300	0:00:00	2	11.0	100	3369	3600	0:00:17	2	4.4	100	1404	2550	0:02:10	1	0.0	100	480	2803	0:06:12	1	0	100	0	4032	0:10:26	1	0	100	6048	4032	0:10:26	1	0	100
314331	22 May-14 17:09:57	0:01:01	2	11.2	100	6109	5300	0:00:00	2	11.2	100	3376	3600	0:00:17	2	6.9	100	1452	2550	0:02:04	1	0.0	100	480	2803	0:06:12	1	0	100	0	4032	0:10:20	1	0	100	6048	4032	0:10:20	1	0	100
314332	22 May-14 17:10:02	0:01:02	2	11.3	100	6106	5300	0:00:00	2	11.3	100	3369	3600	0:00:17	2	10.3	100	1524	2550	0:01:59	1	0.0	100	480	2803	0:06:12	1	0	100	0	4032	0:10:15	1	0	100	6048	4032	0:10:15	1	0	100
314333	22 May-14 17:10:07	0:01:01	2	11.0	100	6109	5300	0:00:00	2	11.0	100	3376	3600	0:00:17	2	10.9	100	1572	2550	0:01:52	1	0.0	100	480	2803	0:06:12	1	0	100	0	4032	0:10:08	1	0	100	6048	4032	0:10:08	1	0	100
314334	22 May-14 17:10:12	0:01:02	2	11.0	100	6109	5300	0:00:00	2	11.0	100	3372	3600	0:00:17	2	10.9	100	1632	2550	0:01:47	1	0.0	100	480	2803	0:06:12	1	0	100	0	4032	0:10:03	1	0	100	6048	4032	0:10:03	1	0	100
314335	22 May-14 17:10:17	0:01:02	2	11.0	100	6110	5300	0:00:00	2	11.0	100	3367	3600	0:00:17	2	11.4	100	1644	2550	0:01:42	2	2.3	100	528	2803	0:06:12	1	0	100	0	4032	0:09:58	1	0	100	6048	4032	0:09:58	1	0	100
314336	22 May-14 17:10:22	0:01:02	2	11.3	100	6109	5300	0:00:00	2	11.2	100	3376	3600	0:00:17	2	10.8	100	1644	2550	0:01:41	2	4.8	100	576	2803	0:06:12	1	0	100	0	4032	0:09:53	1	0	100	6048	4032	0:09:53	1	0	100
314337	22 May-14 17:10:27	0:01:02	2	11.2	100	6110	5300	0:00:00	2	11.2	100	3371	3600	0:00:17	2	11.4	100	1656	2550	0:01:40	2	7.2	100	624	2803	0:06:12	1	0	100	0	4032	0:09:47	1	0	100	6048	4032	0:09:47	1	0	100
314338	22 May-14 17:10:32	0:01:02	2	11.2	100	6110	5300	0:00:00	2	11.2	100	3367	3600	0:00:17	2	11.4	100	1644	2550	0:01:39	2	10.8	100	696	2803	0:06:12	1	0	100	0	4032	0:09:42	1	0	100	6048	4032	0:09:42	1	0	100
314339	22 May-14 17:10:37	0:01:01	2	11.2	100	6109	5300	0:00:00	2	11.2	100	3363	3600	0:00:17	2	11.4	100	1656	2550	0:01:40	2	10.8	100	744	2803	0:06:12	1	0	100	0	4032	0:09:37	1	0	100	6048	4032	0:09:37	1	0	100
314340	22 May-14 17:10:42	0:01:02	2	11.2	100	6110	5300	0:00:00	2	11.1	100	3370	3600	0:00:18	2	11.4	100	1656	2550	0:01:39	2	10.8	100	792	2803	0:06:12	1	0	100	0	4032	0:09:32	1	0	100	6048	4032	0:09:32	1	0	100
314341	22 May-14 17:10:48	0:01:02	2	11.2	100	6110	5300	0:00:00	2	11.2	100	3366	3600	0:00:17	2	11.4	100	1644	2550	0:01:39	2	12.0	100	864	2803	0:06:12	1	0	100	0	4032	0:09:27	1	0	100	6048	4032	0:09:27	1	0	100
314342	22 May-14 17:10:53	0:01:02	2	11.3	100	6112	5300	0:00:00	2	11.2	100	3362	3600	0:00:17	2	11.4	100	1656	2550	0:01:40	2	10.8	100	912	2803	0:06:12	1	0	100	0	4032	0:09:23	1	0	100	6048	4032	0:09:23	1	0	100
314343	22 May-14 17:10:58	0:01:02	2	10.6	100	6110	5300	0:00:00	2	10.6	100	3369	3600	0:00:18	2	10.3	100	1656	2550	0:01:39	2	10.3	100	960	2803	0:06:12	1	0	100	0	4032	0:09:18	1	0	100	6048	4032	0:09:18	1	0	100
314344	22 May-14 17:11:03	0:01:02	2	10.6	100	6101	5300	0:00:00	2	11.0	100	3362	3600	0:00:17	2	11.4	100	1656	2550	0:01:39	2	11.4	100	1032	2803	0:06:12	1	0	100	0	4032	0:09:13	1	0	100	6048	4032	0:09:13	1	0	100
314345	22 May-14 17:11:08	0:01:01	2	11.0	100	6111	5300	0:00:00	2	11.0	100	3369	3600	0:00:18	2	10.9	100	1656	2550	0:01:39	2	10.3	100	1080	2803	0:06:12	1	0	100	0	4032	0:09:07	1	0	100	6048	4032	0:09:07	1	0	100
314346	22 May-14 17:11:13	0:01:02	2	10.9	100	6110	5300	0:00:00	2	11.0	100	3365	3600	0:00:17	2	10.9	100	1644	2550	0:01:39	2	11.4	100	1152	2803	0:06:12	1	0	100	0	4032	0:09:03	1	0	100	6048	4032	0:09:03	1	0	100
314347	22 May-14 17:11:18	0:01:02	2	11.6	100	6111	5300	0:00:00	2	11.6	100	3360	3600	0:00:18	2	12.0	100	1656	2550	0:01:40	2	12.0	100	1200	2803	0:06:12	1	0	100	0	4032	0:08:58	1	0	100	6048	4032	0:08:58	1	0	100
314348	22 May-14 17:11:23	0:01:02	2	11.6	100	6111	5300	0:00:00	2	11.1	100	3368	3600	0:00:18	2	10.8	100	1656	2550	0:01:39	2	10.8	100	1248	2803	0:06:12	1	0	100	0	4032	0:08:54	1	0	100	6048	4032	0:08:54	1	0	100
314349	22 May-14 17:11:28	0:01:02	2	11.1	100	6111	5300	0:00:00	2	11.1	100	3363	3600	0:00:17	2	11.4	100	1644	2550	0:01:39	2	12.0	100	1320	2803	0:06:12	1	0	100	0	4032	0:08:49	1	0	100	6048	4032	0:08:49	1	0	100
314350	22 May-14 17:11:33	0:01:02	2	11.2	100	6111	5300	0:00:00	2	11.1	100	3359	3600	0:00:18	2	11.4	100	1656	2550	0:01:40	2	10.8	100	1368	2803	0:06:12	1	0	100	0	4032	0:08:45	1	0	100	6048	4032	0:08:45	1	0	100
314351	22 May-14 17:11:38	0:01:02	2	11.1	100	6110	5300	0:00:00	2	11.2	100	3367	3600	0:00:18	2	10.8	100	1656	2550	0:01:39	2	10.8	100	1416	2803	0:06:12	1	0	100	0	4032	0:08:40	1	0	100	6048	4032	0:08:40	1	0	100
314352	22 May-14 17:11:43	0:01:02	2	11.1	100	6111	5300	0:00:00	2	11.1	100	3362	3600	0:00:17	2	11.4	100	1644	2550	0:01:39	2	12.0	100	1488	2803	0:06:12	1	0	100	0	4032	0:08:35	1	0	100	6048	4032	0:08:35	1	0	100
314353	22 May-14 17:11:48	0:01:02	2	11.2	100	6111	5300	0:00:00	2	11.2	100	3358	3600	0:00:18	2	11.4	100	1656	2550	0:01:40	2	10.8	100	1536	2803	0:06:12	1	0	100	0	4032	0:08:31	1	0	100	6048	4032	0:08:31	1	0	100
314354	22 May-14 17:11:53	0:01:01	2	11.1	100	6111	5300	0:00:00	2	11.1	100	3365	3600	0:00:18	2	10.8	100	1656	2550	0:01:39	2	10.8	100	1584	2803	0:06:12	1	0	100	0	4032	0:08:26	1	0	100	6048	4032	0:08:26	1	0	100
314355	22 May-14 17:11:59	0:01:02	2	11.2	100	6111	5300	0:00:00	2	11.1	100	3361	3600	0:00:18	2	11.4	100	1668	2550	0:01:39	2	10.8	100	1632	2803	0:06:12	1	0	100	0	4032	0:08:22	1	0	100	6048	4032	0:08:22	1	0	100
314356	22 May-14 17:12:04	0:01:02	2	11.1	100	6111	5300	0:00:00	2	11.1	100	3356	3600	0:00:18	2	11.4	100	1704	2550	0:01:38	2	8.4	100	1656	2803	0:06:12	1	0	100	0	4032	0:08:17	1	0	100	6048	4032	0:08:17	1	0	100
314357	22 May-14 17:12:09	0:01:02	2	11.1	100	6111	5300	0:00:00	2	11.1	100	3364	3600	0:00:18	2	10.8	100	1752	2550	0:01:35	1	0.0	100	1656	2803	0:06:12	1	0	100	0	4032	0:08:12	1	0	100	6048	4032	0:08:12	1	0	100
314358	22 May-14 17:12:14	0:01:02	2	11.1	100	6111	5300	0:00:00	2	11.1	100	3359	3600	0:00:18	2	11.4	100	1812	2550	0:01:30	1	0.0	100	1656	2803	0:06:12	1	0	100	0	4032	0:08:07	1	0	100	6048	4032	0:08:07	1	0	100
314359	22 May-14 17:12:19	0:01:02	2	11.2	100	6115	5300	0:00:00	2	11.0	100	3352	3600	0:00:18	2	11.4	100	1884	2550	0:01:25	1	0.0	100	1656	2803	0:06:12	1	0	100	0	4032	0:08:02	1	0	100	6048	4032	0:08:02	1	0	100
314360	22 May-14 17:12:24	0:01:02	2	11.1	100	6112	5300	0:00:00	2	11.0	100	3360	3600	0:00:19	2	10.9	100	1932	2550	0:01:19	1	0.0	100	1656	2803	0:06:12	1	0	100	0	4032	0:07:56	1	0	100	6048	4032	0:07:56	1	0	100
314361	22 May-14 17:12:30	0:01:02	2	11.2	100	6114	5300	0:00:00	2	11.0	100	3356	3600	0:00:18	2	11.4	100	1992	2550	0:01:14	1	0.0	100	1656	2803	0:06:12	1	0	100	0	4032	0:07:52	1	0	100	6048	4032	0:07:52	1	0	100
314362	22 May-14 17:12:35	0:01:02	2	11.1	100	6112	5300	0:00:00	2	11.0	100	3351	3600	0:00:18	2	11.4	100	2052	2550	0:01:09	1	0.0	100	1656	2803	0:06:12	1	0	100	0	4032	0:07:47	1	0	100	6048	4032	0:07:47	1	0	100
314363	22 May-14 17:12:40	0:01:02	2	11.0	100	6112	5300	0:00:00	2	11.2	100	3359	3600	0:00:19	2	10.8	100	2100	2550	0:01:04	1	0.0	100	1656	2803	0:06:12	1	0	100	0	4032	0:07:42	1	0	100	6048	4032	0:07:42	1	0	100
314364	22 May-14 17:12:45	0:01:02	2	11.2	100	6103	5300	0:00:00	2	11.6	100	3352	3600	0:00:18	2	12.0	100	2172	2550	0:00:59	1	0.0	100	1656	2803	0:06:12	1	0	100	0	4032	0:07:37	1	0	100	6048	4032	0:07:37	1	0	100
314365	22 May-14 17:12:50	0:01:01	2	11.0	100	6112	5300	0:00:00	2	11.0	100	3360	3600	0:00:18	2	10.9	100	2220	2550	0:00:53	1	0.0	100	1656	2803	0:06:12	1	0	100	0	4032	0:07:31	1	0	100	4032	4032	0:07:31	2	25	100
314366	22 May-14 17:12:55	0:01:02	2	11.2	100	6114	5300	0:00:00	2	11.1	100	3356	3600	0:00:18	2	10.9	100	2280	2550	0:00:48	1	0.0	100	1656	2803	0:04:12	1	0	100	0	4032	0:07:26	1	0	100	4032	4032	0:07:26	1	0	100
314367	22 May-14 17:13:00	0:01:02	2	11.1	100	6113	5300	0:00:00	2	11.0	100	3351	3600	0:00:18	2	11.4	100	2340	2550	0:00:43	1	0.0	100	1656	2803	0:04:12	1	0	100	0	4032	0:07:21	1	0	100	4032	4032	0:07:21	1	0	100
314368	22 May-14 17:13:05	0:01:02	2	11.0	100	6112	5300	0:00:00	2	10.6	100	3359	3600	0:00:19	2	10.3	100	2388	2550	0:00:38	1	0.0	100	1656	2803	0:04:12	1	0	100	0	4032	0:07:16	1	0	100	4032	4032	0:07:16	1	0	100
314369	22 May-14 17:13:11	0:01:02	2	11.2	100	6113	5300	0:00:00	2	11.1	100	3354	3600	0:00:18	2	11.4	100	2448	2550	0:00:33	1	0.0	100	1656	2803	0:04:12	1	0	100	0	4032	0:07:11	1	0	100	4032	4032	0:07:11	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
314370	22 May-14 17:13:16	0:01:02	2	11.1	100	6113	5300	0:00:00	2	11.1	100	3350	3600	0:00:18	2	11.4	100	2508	2550	0:00:28	1	0.0	100	1656	2803	0:04:12	1	0	100	0	4032	0:07:06	1	0	100	4032	4032	0:07:06	1	0	100
314371	22 May-14 17:13:21	0:01:02	2	11.1	100	6113	5300	0:00:00	2	11.1	100	3357	3600	0:00:19	2	10.8	100	2484	2550	0:00:23	2	3.6	100	1728	2803	0:04:12	1	0	100	0	4032	0:07:00	1	0	100	4032	4032	0:07:00	1	0	100
314372	22 May-14 17:13:26	0:01:02	2	11.2	100	6113	5300	0:00:00	2	11.1	100	3341	3600	0:00:18	2	12.0	100	2484	2550	0:00:24	2	7.2	100	1800	2803	0:04:12	1	0	100	0	4032	0:06:56	1	0	100	4032	4032	0:06:56	1	0	100
314373	22 May-14 17:13:31	0:01:02	2	11.0	100	6112	5300	0:00:00	2	11.0	100	3346	3600	0:00:19	2	11.4	100	2472	2550	0:00:25	2	10.3	100	1872	2803	0:04:12	1	0	100	0	4032	0:06:51	1	0	100	4032	4032	0:06:51	1	0	100
314374	22 May-14 17:13:36	0:01:02	2	11.0	100	6113	5300	0:00:00	2	11.0	100	3354	3600	0:00:19	2	10.9	100	2448	2550	0:00:26	2	13.7	100	1944	2803	0:04:12	1	0	100	0	4032	0:06:46	1	0	100	4032	4032	0:06:46	1	0	100
314375	22 May-14 17:13:41	0:01:02	2	11.2	100	6115	5300	0:00:00	2	11.1	100	3362	3600	0:00:18	2	10.9	100	2448	2550	0:00:28	2	12.6	100	1992	2803	0:04:12	1	0	100	0	4032	0:06:41	1	0	100	4032	4032	0:06:41	1	0	100
314376	22 May-14 17:13:46	0:01:02	2	11.1	100	6114	5300	0:00:00	2	11.0	100	3369	3600	0:00:18	2	9.7	100	2424	2550	0:00:27	2	12.6	100	2064	2803	0:04:12	1	0	100	0	4032	0:06:37	1	0	100	4032	4032	0:06:37	1	0	100
314377	22 May-14 17:13:51	0:01:02	2	11.3	100	6115	5300	0:00:00	2	11.2	100	3377	3600	0:00:17	2	9.6	100	2424	2550	0:00:29	2	12.0	100	2112	2803	0:04:12	1	0	100	0	4032	0:06:32	1	0	100	4032	4032	0:06:32	1	0	100
314378	22 May-14 17:13:56	0:01:02	2	11.2	100	6114	5300	0:00:00	2	11.1	100	3384	3600	0:00:17	2	9.6	100	2400	2550	0:00:28	2	12.0	100	2184	2803	0:04:12	1	0	100	0	4032	0:06:27	1	0	100	4032	4032	0:06:27	1	0	100
314379	22 May-14 17:14:01	0:01:02	2	11.0	100	6116	5300	0:00:00	2	11.0	100	3377	3600	0:00:16	2	10.2	100	2388	2550	0:00:30	2	13.2	100	2256	2803	0:04:12	1	0	100	0	4032	0:06:23	1	0	100	4032	4032	0:06:23	1	0	100
314380	22 May-14 17:14:06	0:01:02	2	11.1	100	6122	5300	0:00:00	2	10.7	100	3379	3600	0:00:17	2	10.2	100	2364	2550	0:00:31	2	13.2	100	2328	2803	0:04:12	1	0	100	0	4032	0:06:19	1	0	100	4032	4032	0:06:19	1	0	100
314381	22 May-14 17:14:11	0:01:03	2	11.0	100	6126	5300	0:00:00	2	10.5	100	3370	3600	0:00:17	2	10.8	100	2376	2550	0:00:34	2	13.2	100	2376	2803	0:04:12	1	0	100	0	4032	0:06:15	1	0	100	4032	4032	0:06:15	1	0	100
314382	22 May-14 17:14:16	0:01:03	2	11.1	100	6132	5300	0:00:00	2	10.2	100	3360	3600	0:00:17	2	11.4	100	2388	2550	0:00:33	2	12.0	100	2424	2803	0:04:12	1	0	100	0	4032	0:06:11	1	0	100	4032	4032	0:06:11	1	0	100
314383	22 May-14 17:14:21	0:01:04	2	11.2	100	6137	5300	0:00:00	2	10.1	100	3363	3600	0:00:18	2	10.8	100	2364	2550	0:00:33	2	12.0	100	2496	2803	0:04:12	1	0	100	0	4032	0:06:06	1	0	100	4032	4032	0:06:06	1	0	100
314384	22 May-14 17:14:26	0:01:04	2	11.1	100	6142	5300	0:00:00	2	10.1	100	3353	3600	0:00:18	2	11.4	100	2376	2550	0:00:35	2	10.8	100	2544	2803	0:04:12	1	0	100	0	4032	0:06:02	1	0	100	4032	4032	0:06:02	1	0	100
314385	22 May-14 17:14:31	0:01:05	2	11.2	100	6147	5300	0:00:00	2	10.1	100	3344	3600	0:00:19	2	11.4	100	2364	2550	0:00:35	2	12.0	100	600	2803	0:04:12	2	20	100	2016	4032	0:05:58	1	0	100	4032	4032	0:05:58	1	0	100
314386	22 May-14 17:14:36	0:01:06	2	11.2	100	6152	5300	0:00:00	2	10.2	100	3347	3600	0:00:19	2	10.8	100	2340	2550	0:00:36	2	13.2	100	672	2803	0:04:12	1	0	100	2016	4032	0:06:09	1	0	100	4032	4032	0:06:09	1	0	100
314387	22 May-14 17:14:42	0:01:06	2	11.2	100	6158	5300	0:00:00	2	10.1	100	3337	3600	0:00:19	2	11.4	100	2352	2550	0:00:38	2	12.0	100	720	2803	0:04:12	1	0	100	2016	4032	0:06:05	1	0	100	4032	4032	0:06:05	1	0	100
314388	22 May-14 17:14:47	0:01:07	2	11.2	100	6161	5300	0:00:00	2	10.2	100	3329	3600	0:00:20	2	11.4	100	2340	2550	0:00:38	2	13.2	100	792	2803	0:04:12	1	0	100	2016	4032	0:06:00	1	0	100	4032	4032	0:06:00	1	0	100
314389	22 May-14 17:14:52	0:01:07	2	10.6	100	6167	5300	0:00:00	2	9.7	100	3319	3600	0:00:21	2	10.9	100	2352	2550	0:00:40	2	11.4	100	840	2803	0:04:12	1	0	100	2016	4032	0:05:56	1	0	100	4032	4032	0:05:56	1	0	100
314390	22 May-14 17:14:57	0:01:08	2	11.0	100	6172	5300	0:00:00	2	10.1	100	3319	3600	0:00:22	2	11.4	100	2340	2550	0:00:40	2	11.4	100	912	2803	0:04:12	1	0	100	2016	4032	0:05:52	1	0	100	4032	4032	0:05:52	1	0	100
314391	22 May-14 17:15:02	0:01:08	2	11.0	100	6178	5300	0:00:00	2	10.1	100	3309	3600	0:00:22	2	11.4	100	2352	2550	0:00:41	2	11.4	100	960	2803	0:04:12	1	0	100	2016	4032	0:05:47	1	0	100	4032	4032	0:05:47	1	0	100
314392	22 May-14 17:15:07	0:01:09	2	11.1	100	6183	5300	0:00:00	2	10.0	100	3312	3600	0:00:22	2	10.9	100	2352	2550	0:00:40	2	10.3	100	1008	2803	0:04:12	1	0	100	2016	4032	0:05:43	1	0	100	4032	4032	0:05:43	1	0	100
314393	22 May-14 17:15:12	0:01:09	2	11.6	100	6188	5300	0:00:00	2	10.6	100	3302	3600	0:00:22	2	11.4	100	2340	2550	0:00:40	2	12.0	100	1080	2803	0:04:12	1	0	100	2016	4032	0:05:39	1	0	100	4032	4032	0:05:39	1	0	100
314394	22 May-14 17:15:17	0:01:09	2	11.2	100	6193	5300	0:00:00	2	10.1	100	3293	3600	0:00:23	2	11.4	100	2352	2550	0:00:42	2	10.8	100	1128	2803	0:04:12	1	0	100	2016	4032	0:05:35	1	0	100	4032	4032	0:05:35	1	0	100
314395	22 May-14 17:15:22	0:01:10	2	11.1	100	6198	5300	0:00:00	2	10.1	100	3295	3600	0:00:24	2	10.8	100	2352	2550	0:00:42	2	10.8	100	1176	2803	0:04:12	1	0	100	2016	4032	0:05:31	1	0	100	4032	4032	0:05:31	1	0	100
314396	22 May-14 17:15:28	0:01:10	2	11.2	100	6205	5300	0:00:00	2	10.1	100	3286	3600	0:00:24	2	11.4	100	2340	2550	0:00:42	2	12.0	100	1248	2803	0:04:12	1	0	100	2016	4032	0:05:27	1	0	100	4032	4032	0:05:27	1	0	100
314397	22 May-14 17:15:33	0:01:11	2	11.2	100	6209	5300	0:00:00	2	10.1	100	3276	3600	0:00:24	2	11.4	100	2352	2550	0:00:43	2	10.8	100	1296	2803	0:04:12	1	0	100	2016	4032	0:05:22	1	0	100	4032	4032	0:05:22	1	0	100
314398	22 May-14 17:15:38	0:01:11	2	11.1	100	6213	5300	0:00:00	2	10.1	100	3279	3600	0:00:25	2	10.8	100	2352	2550	0:00:43	2	10.8	100	1344	2803	0:04:12	1	0	100	2016	4032	0:05:18	1	0	100	4032	4032	0:05:18	1	0	100
314399	22 May-14 17:15:43	0:01:11	2	11.2	100	6219	5300	0:00:00	2	10.1	100	3269	3600	0:00:25	2	11.4	100	2340	2550	0:00:43	2	12.0	100	1416	2803	0:04:12	1	0	100	2016	4032	0:05:14	1	0	100	4032	4032	0:05:14	1	0	100
314400	22 May-14 17:15:48	0:01:12	2	11.1	100	6224	5300	0:00:00	2	10.1	100	3260	3600	0:00:25	2	11.4	100	2352	2550	0:00:45	2	10.8	100	1464	2803	0:04:12	1	0	100	2016	4032	0:05:10	1	0	100	4032	4032	0:05:10	1	0	100
314401	22 May-14 17:15:53	0:01:12	2	11.3	100	6229	5300	0:00:00	2	10.3	100	3253	3600	0:00:26	2	11.4	100	2340	2550	0:00:44	2	12.0	100	1536	2803	0:04:12	1	0	100	2016	4032	0:05:06	1	0	100	4032	4032	0:05:06	1	0	100
314402	22 May-14 17:15:58	0:01:13	2	11.1	100	6237	5300	0:00:00	2	10.0	100	3249	3600	0:00:27	2	11.4	100	2352	2550	0:00:46	2	11.4	100	1584	2803	0:04:12	1	0	100	2016	4032	0:05:01	1	0	100	4032	4032	0:05:01	1	0	100
314403	22 May-14 17:16:03	0:01:13	2	11.1	100	6242	5300	0:00:00	2	10.0	100	3240	3600	0:00:27	2	11.4	100	2340	2550	0:00:45	2	11.4	100	1656	2803	0:04:12	1	0	100	2016	4032	0:04:57	1	0	100	4032	4032	0:04:57	1	0	100
314404	22 May-14 17:16:08	0:01:14	2	11.0	100	6244	5300	0:00:00	2	10.0	100	3243	3600	0:00:28	2	10.9	100	2340	2550	0:00:47	2	11.4	100	1704	2803	0:04:12	1	0	100	2016	4032	0:04:53	1	0	100	4032	4032	0:04:53	1	0	100
314405	22 May-14 17:16:13	0:01:14	2	10.9	100	6250	5300	0:00:00	2	9.9	100	3233	3600	0:00:28	2	10.9	100	2352	2550	0:00:47	2	10.3	100	1752	2803	0:04:12	1	0	100	2016	4032	0:04:48	1	0	100	4032	4032	0:04:48	1	0	100
314406	22 May-14 17:16:18	0:01:14	2	11.1	100	6255	5300	0:00:00	2	10.2	100	3236	3600	0:00:28	2	10.8	100	2328	2550	0:00:46	2	12.0	100	1824	2803	0:04:12	1	0	100	2016	4032	0:04:44	1	0	100	4032	4032	0:04:44	1	0	100
314407	22 May-14 17:16:23	0:01:15	2	11.2	100	6262	5300	0:00:00	2	10.2	100	3227	3600	0:00:28	2	10.8	100	2340	2550	0:00:48	2	10.8	100	1872	2803	0:04:12	1	0	100	2016	4032	0:04:40	1	0	100	4032	4032	0:04:40	1	0	100
314408	22 May-14 17:16:28	0:01:15	2	11.2	100	6266	5300	0:00:00	2	10.1	100	3217	3600	0:00:29	2	11.4	100	2352	2550	0:00:48	2	10.8	100	1920	2803	0:04:12	1	0	100	2016	4032	0:04:36	1	0	100	4032	4032	0:04:36	1	0	100
314409	22 May-14 17:16:33	0:01:16	2	11.3	100	6272	5300	0:00:00	2	10.2	100	3208	3600	0:00:30	2	11.4	100	2340	2550	0:00:48	2	12.0	100	1992	2803	0:04:12	1	0	100	2016	4032	0:04:32	1	0	100	4032	4032	0:04:32	1	0	100
314410	22 May-14 17:16:38	0:01:16	2	11.2	100	6276	5300	0:00:00	2	10.1	100	3210	3600	0:00:30	2	11.4	100	2340	2550	0:00:49	2	10.8	100	2040	2803	0:04:12	1	0	100	2016	4032	0:04:27	1	0	100	4032	4032	0:04:27	1	0	100
314411	22 May-14 17:16:43	0:01:16	2	11.0	100	6280	5300	0:00:00	2	10.1	100	3201	3600	0:00:30	2	11.4	100	2352	2550	0:00:49	2	10.8	100	2088	2803	0:04:12	1	0	100	2016	4032	0:04:23	1	0	100	4032	4032	0:04:23	1	0	100
314412	22 May-14 17:16:48	0:01:17	2	11.1	100	6285	5300	0:00:00	2	10.1	100	3191	3600	0:00:31	2	11.4	100	2340	2550	0:00:49	2	12.0	100	2160	2803	0:04:12	1	0	100	2016	4032	0:04:19	1	0	100	4032	4032	0:04:19	1	0	100
314413	22 May-14 17:16:53	0:01:17	2	11.0	100	6290	5300	0:00:00	2	10.1	100	3194	3600	0:00:32	2	10.8	100	2340	2550	0:00:51	2	10.8	100	2208	2803	0:04:12	1	0	100	2016	4032	0:04:15	1	0	100	4032	4032	0:04:15	1	0	100
314414	22 May-14 17:16:58	0:01:17	2	11.1	100	6295	5300	0:00:00	2	10.1	100	3184	3600	0:00:31	2	11.4	100	2352	2550	0:00:51	2	10.8	100	2256	2803	0:04:12	1	0	100	2016	4032	0:04:11	1	0	100	4032	4032	0:04:11	1	0	100
314415	22 May-14 17:17:03	0:01:18	2	11.2	100	6300	5300	0:00:00	2	10.1	100	3175	3600	0:00:32	2	11.4	100	2340	2550	0:00:50	2	12.0	100	2328	2803	0:04:12	1	0	100	2016	4032	0:04:06	1	0	100	4032	4032	0:04:06	1	0	100
314416	22 May-14 17:17:08	0:01:18	2	11.1	100	6300	5300	0:00:00	2	10.1	100	3165	3600	0:00:33	2	11.4	100	2352	2550	0:00:52	2	10.8	100	2376	2803	0:04:12	1	0	100	2016	4032	0:04:02	1	0	100	4032	4032	0:04:02	1	0	100
314417	22 May-14 17:17:13	0:01:18	2	11.1	100	6300	5300	0:00:00	2	10.1	100	3168	3600	0:00:34	2	11.4	100	2352	2550	0:00:52	2	10.8	100	2424	2803	0:04:12	1	0	100	2016	4032	0:03:58	1	0	100	4032	4032	0:03:58	1	0	100
314418	22 May-14 17:17:18	0:01:18	2	10.6	100	6300	5300	0:00:00	2	9.6	100	3158	3600	0:00:34	2	10.9	100	2340	2550	0:00:52	2	11.4	100	2496	2803	0:04:12	1	0	100	2016	4032	0:03:54	1	0	100	4032	4032	0:03:54	1	0	100
314419	22 May-14 17:17:23	0:01:19	2	10.5	100	6300	5300	0:00:00	2	9.6	100	3161	3600	0:00:34	2	10.3	100	2340	2550	0:00:54	2	10.3	100	2544	2803	0:04:12	1	0	100	2016	4032	0:03:50	1	0	100	4032	4032	0:03:50	1	0	100
314420	22 May-14 17:17:28	0:01:19	2	10.6	100	6300	5300	0:00:00	2	9.6	100	3151	3600	0:00:34	2	10.3	100	2352	2550	0:00:53	2	10.3	100	2592	2803	0:04:12	1	0	100	2016	4032	0:03:46	1	0	100	4032	4032	0:03:46	1	0	100
314421	22 May-14 17:17:33	0:01:19	2	10.6	100	6300	5300	0:00:00	2	9.6	100	3130	3600	0:00:35	2	11.4	100	2352	2550	0:00:53	2	11.4	100	2664	2803	0:04:12	1	0	100	2016	4032	0:03:42	1	0	100	4032	4032	0:03:42	1	0	100
314422	22 May-14 17:17:38	0:01:19	2	11.1	100	6300	5300	0:00:00	2	10.1	100	3144	3600	0:00:37	2	10.8	100	2340	2550	0:00:55	2	10.8	100	2712	2803	0:04:12	1	0	100	2016	4032	0:03:37	1	0	100	4032	4032	0:03:37	1	0	100
314423	22 May-14 17:17:43	0:01:19	2	11.2	100	6300	5300	0:00:00	2	10.1	100	3135	3600	0:00:36	2	11.4	100	2376	2550	0:00:55	2	9.6	100	2736	2803	0:04:12	1	0	100	2016	4032	0:03:33	1	0	100	4032	4032	0:03:33	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
314424	22 May-14 17:17:48	0:01:19	2	11.1	100	6300	5300	0:00:00	2	10.1	100	3125	3600	0:00:36	2	11.4	100	2364	2550	0:00:52	2	10.8	100	2808	2803	0:04:12	1	0	100	2016	4032	0:03:29	1	0	100	4032	4032	0:03:29	1	0	100
314425	22 May-14 17:17:53	0:01:19	2	11.1	100	6300	5300	0:00:00	2	10.1	100	3128	3600	0:00:37	2	10.2	100	2364	2550	0:00:54	2	9.6	100	2856	2803	0:04:12	1	0	100	2016	4032	0:03:25	1	0	100	4032	4032	0:03:25	1	0	100
314426	22 May-14 17:17:58	0:01:19	2	11.1	100	6300	5300	0:00:00	2	10.1	100	3118	3600	0:00:37	2	11.4	100	2376	2550	0:00:54	2	9.6	100	2904	2803	0:04:12	1	0	100	0	4032	0:03:25	2	24	100	6048	4032	0:03:25	1	0	100
314427	22 May-14 17:18:03	0:01:19	2	11.0	100	6300	5300	0:00:00	2	10.1	100	3109	3600	0:00:38	2	11.4	100	2364	2550	0:00:54	2	12.0	100	2976	2803	0:06:12	1	0	100	0	4032	0:05:56	1	0	100	6048	4032	0:05:56	1	0	100
314428	22 May-14 17:18:08	0:01:19	2	11.2	100	6300	5300	0:00:00	2	10.1	100	3111	3600	0:00:38	2	10.8	100	2364	2550	0:00:55	2	10.8	100	3024	2803	0:06:12	1	0	100	0	4032	0:05:58	1	0	100	6048	4032	0:05:58	1	0	100
314429	22 May-14 17:18:13	0:01:18	2	11.1	100	6300	5300	0:00:00	2	10.1	100	3102	3600	0:00:38	2	11.4	100	2376	2550	0:00:55	2	10.8	100	3072	2803	0:06:12	1	0	100	0	4032	0:05:57	1	0	100	6048	4032	0:05:57	1	0	100
314430	22 May-14 17:18:18	0:01:18	2	11.2	100	6300	5300	0:00:00	2	10.2	100	3093	3600	0:00:39	2	11.4	100	2364	2550	0:00:55	2	12.0	100	3144	2803	0:06:12	1	0	100	0	4032	0:05:57	1	0	100	6048	4032	0:05:57	1	0	100
314431	22 May-14 17:18:23	0:01:18	2	11.3	100	6300	5300	0:00:00	2	10.1	100	3083	3600	0:00:39	2	11.4	100	2376	2550	0:00:56	2	10.8	100	3192	2803	0:06:12	1	0	100	0	4032	0:05:59	1	0	100	6048	4032	0:05:59	1	0	100
314432	22 May-14 17:18:28	0:01:18	2	11.2	100	6300	5300	0:00:00	2	10.1	100	3085	3600	0:00:40	2	11.4	100	2376	2550	0:00:56	2	10.8	100	3240	2803	0:06:12	1	0	100	0	4032	0:05:58	1	0	100	6048	4032	0:05:58	1	0	100
314433	22 May-14 17:18:33	0:01:18	2	11.2	100	6300	5300	0:00:00	2	10.1	100	3076	3600	0:00:40	2	11.4	100	2364	2550	0:00:56	2	12.0	100	1296	2803	0:06:12	2	20	100	2016	4032	0:05:58	1	0	100	6048	4032	0:05:58	1	0	100
314434	22 May-14 17:18:38	0:01:18	2	11.2	100	6300	5300	0:00:00	2	10.1	100	3066	3600	0:00:41	2	11.4	100	2376	2550	0:00:58	2	10.8	100	1344	2803	0:06:12	1	0	100	2016	4032	0:05:33	1	0	100	6048	4032	0:05:33	1	0	100
314435	22 May-14 17:18:43	0:01:18	2	11.0	100	6300	5300	0:00:00	2	10.1	100	3069	3600	0:00:42	2	10.8	100	2376	2550	0:00:57	2	10.8	100	1392	2803	0:06:12	1	0	100	2016	4032	0:05:29	1	0	100	6048	4032	0:05:29	1	0	100
314436	22 May-14 17:18:48	0:01:18	2	11.1	100	6300	5300	0:00:00	2	10.2	100	3060	3600	0:00:41	2	11.4	100	2364	2550	0:00:57	2	12.0	100	1464	2803	0:06:12	1	0	100	2016	4032	0:05:24	1	0	100	6048	4032	0:05:24	1	0	100
314437	22 May-14 17:18:53	0:01:18	2	11.0	100	6300	5300	0:00:00	2	10.1	100	3050	3600	0:00:42	2	11.4	100	2376	2550	0:00:59	2	10.8	100	1512	2803	0:06:12	1	0	100	2016	4032	0:05:20	1	0	100	6048	4032	0:05:20	1	0	100
314438	22 May-14 17:18:58	0:01:18	2	11.1	100	6300	5300	0:00:00	2	10.2	100	3053	3600	0:00:43	2	10.8	100	2376	2550	0:00:59	2	10.8	100	1560	2803	0:06:12	1	0	100	2016	4032	0:05:16	1	0	100	6048	4032	0:05:16	1	0	100
314439	22 May-14 17:19:03	0:01:18	2	11.1	100	6300	5300	0:00:00	2	10.1	100	3043	3600	0:00:43	2	11.4	100	2364	2550	0:00:58	2	12.0	100	1632	2803	0:06:12	1	0	100	2016	4032	0:05:12	1	0	100	6048	4032	0:05:12	1	0	100
314440	22 May-14 17:19:09	0:01:18	2	11.2	100	6300	5300	0:00:00	2	10.1	100	3046	3600	0:00:43	2	10.8	100	2364	2550	0:01:00	2	10.8	100	1680	2803	0:06:12	1	0	100	2016	4032	0:05:08	1	0	100	6048	4032	0:05:08	1	0	100
314441	22 May-14 17:19:15	0:01:18	2	11.2	100	6300	5300	0:00:00	2	10.1	100	3036	3600	0:00:43	2	10.8	100	2376	2550	0:01:00	2	10.8	100	1728	2803	0:06:12	1	0	100	2016	4032	0:05:04	1	0	100	6048	4032	0:05:04	1	0	100
314442	22 May-14 17:19:20	0:01:18	2	11.1	100	6300	5300	0:00:00	2	10.1	100	3027	3600	0:00:44	2	11.4	100	2364	2550	0:01:00	2	12.0	100	1800	2803	0:06:12	1	0	100	2016	4032	0:04:59	1	0	100	6048	4032	0:04:59	1	0	100
314443	22 May-14 17:19:25	0:01:18	2	11.2	100	6300	5300	0:00:00	2	10.1	100	3041	3600	0:00:45	2	10.2	100	2352	2550	0:01:02	2	10.8	100	1848	2803	0:06:12	1	0	100	2016	4032	0:04:55	1	0	100	6048	4032	0:04:55	1	0	100
314444	22 May-14 17:19:30	0:01:18	2	11.1	100	6300	5300	0:00:00	2	10.1	100	3056	3600	0:00:44	2	9.6	100	2340	2550	0:01:02	2	10.8	100	1896	2803	0:06:12	1	0	100	2016	4032	0:04:51	1	0	100	6048	4032	0:04:51	1	0	100
314445	22 May-14 17:19:35	0:01:18	2	11.2	100	6300	5300	0:00:00	2	10.1	100	3082	3600	0:00:42	2	7.8	100	2340	2550	0:01:01	2	9.6	100	1920	2803	0:06:12	1	0	100	2016	4032	0:04:47	1	0	100	6048	4032	0:04:47	1	0	100
314446	22 May-14 17:19:40	0:01:18	2	11.2	100	6300	5300	0:00:00	2	10.1	100	3109	3600	0:00:40	2	6.0	100	2364	2550	0:00:59	1	0.0	100	1920	2803	0:06:12	1	0	100	2016	4032	0:04:43	1	0	100	6048	4032	0:04:43	1	0	100
314447	22 May-14 17:19:45	0:01:18	2	11.1	100	6300	5300	0:00:00	2	10.1	100	3123	3600	0:00:38	2	6.0	100	2400	2550	0:00:55	1	0.0	100	1920	2803	0:06:12	1	0	100	2016	4032	0:04:39	1	0	100	6048	4032	0:04:39	1	0	100
314448	22 May-14 17:19:51	0:01:18	2	11.1	100	6300	5300	0:00:00	2	10.1	100	3138	3600	0:00:37	2	6.0	100	2436	2550	0:00:51	1	0.0	100	1920	2803	0:06:12	1	0	100	2016	4032	0:04:35	1	0	100	6048	4032	0:04:35	1	0	100
314449	22 May-14 17:19:56	0:01:18	2	12.8	100	6300	5300	0:00:00	2	10.1	100	3078	3600	0:00:36	2	12.0	100	2532	2550	0:00:46	2	1.1	100	1944	2803	0:06:12	1	0	100	2016	4032	0:04:31	1	0	100	6048	4032	0:04:31	1	0	100
314450	22 May-14 17:20:01	0:01:18	0	0.0	100	6249	5300	0:00:00	2	10.1	100	3153	3600	0:00:41	2	7.4	100	2484	2550	0:00:42	2	2.3	100	1968	2803	0:06:12	1	0	100	2016	4032	0:04:25	1	0	100	6048	4032	0:04:25	1	0	100
314451	22 May-14 17:20:06	0:01:14	2	10.3	90	6245	5300	0:00:00	2	10.6	100	3166	3600	0:00:35	2	8.6	100	2532	2550	0:00:41	1	0.0	100	1968	2803	0:06:12	1	0	100	2016	4032	0:04:21	1	0	100	6048	4032	0:04:21	1	0	100
314452	22 May-14 17:20:11	0:01:13	1	0.0	100	6188	5300	0:00:00	2	10.4	100	3199	3600	0:00:33	2	7.6	100	2556	2550	0:00:35	1	0.0	100	1968	2803	0:06:12	1	0	100	0	4032	0:04:16	2	24	100	6048	4032	0:04:16	1	0	100
314453	22 May-14 17:20:16	0:01:09	1	0.0	100	6137	5300	0:00:00	2	10.5	100	3214	3600	0:00:31	2	6.8	100	2592	2550	0:00:31	1	0.0	100	1968	2803	0:06:12	1	0	100	0	4032	0:06:43	1	0	100	6048	4032	0:06:43	1	0	100
314454	22 May-14 17:20:22	0:01:05	1	0.0	100	6087	5300	0:00:00	2	10.4	100	3264	3600	0:00:30	1	0.0	100	2592	2550	0:00:30	1	0.0	100	1968	2803	0:06:12	1	0	100	0	4032	0:06:42	1	0	100	6048	4032	0:06:42	1	0	100
314455	22 May-14 17:20:27	0:01:01	1	0.0	100	6036	5300	0:00:00	2	10.0	100	3315	3600	0:00:26	1	0.0	100	2592	2550	0:00:26	1	0.0	100	1968	2803	0:06:12	1	0	100	0	4032	0:06:38	1	0	100	6048	4032	0:06:38	1	0	100
314456	22 May-14 17:20:32	0:00:57	1	0.0	100	5986	5300	0:00:00	2	9.6	100	3365	3600	0:00:22	1	0.0	100	2592	2550	0:00:22	1	0.0	100	1968	2803	0:06:12	1	0	100	0	4032	0:06:34	1	0	100	6048	4032	0:06:34	1	0	100
314457	22 May-14 17:20:37	0:00:54	1	0.0	100	5935	5300	0:00:00	2	9.6	100	3416	3600	0:00:18	1	0.0	100	2592	2550	0:00:18	1	0.0	100	1968	2803	0:06:12	1	0	100	0	4032	0:06:30	1	0	100	6048	4032	0:06:30	1	0	100
314458	22 May-14 17:20:42	0:00:50	1	0.0	100	5882	5300	0:00:00	2	9.8	100	3469	3600	0:00:14	1	0.0	100	2592	2550	0:00:14	1	0.0	100	1968	2803	0:06:12	1	0	100	0	4032	0:06:26	1	0	100	6048	4032	0:06:26	1	0	100
314459	22 May-14 17:20:47	0:00:45	1	0.0	100	5831	5300	0:00:00	2	9.8	100	3520	3600	0:00:10	1	0.0	100	2592	2550	0:00:10	1	0.0	100	1968	2803	0:06:12	1	0	100	0	4032	0:06:22	1	0	100	6048	4032	0:06:22	1	0	100
314460	22 May-14 17:20:52	0:00:41	1	0.0	100	5781	5300	0:00:00	2	10.3	100	3570	3600	0:00:06	1	0.0	100	2592	2550	0:00:06	1	0.0	100	1968	2803	0:06:12	1	0	100	0	4032	0:06:18	1	0	100	6048	4032	0:06:18	1	0	100
314461	22 May-14 17:20:58	0:00:38	1	0.0	100	5725	5300	0:00:00	2	10.5	100	3626	3600	0:00:03	1	0.0	100	2592	2550	0:00:02	1	0.0	100	1968	2803	0:06:12	1	0	100	0	4032	0:06:14	1	0	100	6048	4032	0:06:14	1	0	100
314462	22 May-14 17:21:04	0:00:39	1	0.0	100	5624	5300	0:00:05	2	10.4	100	3727	3600	0:00:03	1	0.0	100	2592	2550	0:00:00	1	0.0	100	1968	2803	0:06:12	1	0	100	0	4032	0:06:11	1	0	100	6048	4032	0:06:11	1	0	100
314463	22 May-14 17:21:09	0:00:40	1	0.0	100	5563	5300	0:00:15	2	10.9	100	3788	3600	0:00:03	1	0.0	100	2592	2550	0:00:00	1	0.0	100	1968	2803	0:06:12	1	0	100	0	4032	0:06:11	1	0	100	6048	4032	0:06:11	1	0	100
314464	22 May-14 17:21:14	0:00:41	1	0.0	100	5563	5300	0:00:21	2	10.9	100	3788	3600	0:00:03	1	0.0	100	2592	2550	0:00:00	1	0.0	100	1968	2803	0:06:12	1	0	100	0	4032	0:06:11	1	0	100	6048	4032	0:06:11	1	0	100
314465	22 May-14 17:21:19	0:00:41	1	0.0	100	5506	5300	0:00:21	2	10.4	100	3845	3600	0:00:03	1	0.0	100	2592	2550	0:00:00	1	0.0	100	1968	2803	0:06:12	1	0	100	0	4032	0:06:11	1	0	100	6048	4032	0:06:11	1	0	100
314466	22 May-14 17:21:24	0:00:42	1	0.0	100	5453	5300	0:00:26	2	10.1	100	3898	3600	0:00:03	1	0.0	100	2592	2550	0:00:00	1	0.0	100	1968	2803	0:06:12	1	0	100	0	4032	0:06:11	1	0	100	6048	4032	0:06:11	1	0	100
314467	22 May-14 17:21:29	0:00:43	1	0.0	100	5402	5300	0:00:31	2	10.1	100	3949	3600	0:00:03	1	0.0	100	2592	2550	0:00:00	1	0.0	100	1968	2803	0:06:12	1	0	100	0	4032	0:06:11	1	0	100	6048	4032	0:06:11	1	0	100
314468	22 May-14 17:21:34	0:00:44	1	0.0	100	5351	5300	0:00:36	2	9.6	100	4000	3600	0:00:03	1	0.0	100	2592	2550	0:00:00	1	0.0	100	1968	2803	0:06:12	1	0	100	0	4032	0:06:11	1	0	100	6048	4032	0:06:11	1	0	100
314469	22 May-14 17:21:40	0:00:45	1	0.0	100	5301	5300	0:00:41	2	9.8	100	4050	3600	0:00:03	1	0.0	100	2592	2550	0:00:00	1	0.0	100	0	2803	0:06:12	2	20	100	2016	4032	0:06:11	1	0	100	6048	4032	0:06:11	1	0	100
314470	22 May-14 17:21:45	0:00:45	1	0.0	100	5250	5300	0:00:45	2	10.2	100	4101	3600	0:00:03	1	0.0	100	2592	2550	0:00:00	1	0.0	100	0	2803	0:06:12	1	0	100	2016	4032	0:06:24	1	0	100	6048	4032	0:06:24	1	0	100
314471	22 May-14 17:21:50	0:00:46	1	0.0	100	5200	5300	0:00:50	2	10.1	100	4151	3600	0:00:06	1	0.0	100	2592	2550	0:00:06	1	0.0	100	0	2803	0:06:12	1	0	100	2016	4032	0:06:30	1	0	100	6048	4032	0:06:30	1	0	100
314472	22 May-14 17:21:55	0:00:47	1	0.0	100	5140	5300	0:00:55	2	10.6	100	4211	3600	0:00:12	1	0.0	100	2592	2550	0:00:12	1	0.0	100	0	2803	0:06:12	1	0	100	2016	4032	0:06:37	1	0	100	6048	4032	0:06:37	1	0	100
314473	22 May-14 17:22:00	0:00:48	1	0.0	100	5096	5300	0:01:00	2	9.8	100	4255	3600	0:00:20	1	0.0	100	2592	2550	0:00:20	1	0.0	100	0	2803	0:06:12	1	0	100	2016	4032	0:06:44	1	0	100	6048	4032	0:06:44	1	0	100
314474	22 May-14 17:22:05	0:00:48	1	0.0	100	5055	5300	0:01:04	2	9.3	100	4296	3600	0:00:25	1	0.0	100	2592	2550	0:00:25	1	0.0	100	0	2803	0:06:12	1	0	100	2016	4032	0:06:50	1	0	100	6048	4032	0:06:50	1	0	100
314475	22 May-14 17:22:10	0:00:49	1	0.0	100	5015	5300	0:01:08	2	8.8	100	4336	3600	0:00:30	1	0.0	100	2592	2550	0:00:30	1	0.0	100	0	2803	0:06:12	1	0	100	2016	4032	0:06:55	1	0	100	6048	4032	0:06:55	1	0	100
314476	22 May-14 17:22:16	0:00:49	1	0.0	100	4975	5300	0:01:12	2	7.9	100	4376	3600	0:00:35	1	0.0	100	2592	2550	0:00:35	1	0.0	100	0	2803	0:06:12	1	0	100	2016	4032	0:07:00	1	0	100	6048	4032	0:07:00	1	0	100
314477	22 May-14 17:22:21	0:00:50	1	0.0	100	4934	5300	0:01:16	2	8.1	100	4417	3600	0:00:40	1	0.0	100	2592	2550	0:00:40	1	0.0	100	0	2803	0:06:12	1	0	100	2016	4032	0:07:05	1	0	100	6048	4032	0:07:05	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
314478	22 May-14 17:22:26	0:00:50	1	0.0	100	4894	5300	0:01:20	2	8.1	100	4457	3600	0:00:45	1	0.0	100	2544	2550	0:00:45	2	2.4	100	48	2803	0:06:12	1	0	100	2016	4032	0:07:10	1	0	100	6048	4032	0:07:10	1	0	100
314479	22 May-14 17:22:31	0:00:47	2	0.0	100	4867	5300	0:01:20	2	8.1	100	4498	3600	0:00:50	1	0.0	100	2472	2550	0:00:51	2	6.0	100	120	2803	0:06:12	1	0	100	2016	4032	0:07:11	1	0	100	6048	4032	0:07:11	1	0	100
314480	22 May-14 17:22:36	0:00:48	2	1.8	100	4830	5300	0:01:24	2	8.7	100	4500	3600	0:00:53	1	0.0	100	2400	2550	0:01:00	2	9.1	100	192	2803	0:06:12	1	0	100	2016	4032	0:07:15	1	0	100	6048	4032	0:07:15	1	0	100
314481	22 May-14 17:22:41	0:00:46	1	0.0	100	4780	5300	0:01:24	2	9.1	100	4500	3600	0:00:57	2	0.0	100	2340	2550	0:01:11	2	12.6	100	264	2803	0:06:12	1	0	100	2016	4032	0:07:18	1	0	100	6048	4032	0:07:18	1	0	100
314482	22 May-14 17:22:46	0:00:41	1	0.0	100	4729	5300	0:01:24	2	9.6	100	4491	3600	0:01:03	2	3.4	100	2352	2550	0:01:22	2	12.6	100	312	2803	0:06:12	1	0	100	2016	4032	0:07:24	1	0	100	6048	4032	0:07:24	1	0	100
314483	22 May-14 17:22:51	0:00:36	1	0.0	100	4687	5300	0:01:23	2	9.7	100	4485	3600	0:01:09	2	5.7	100	2352	2550	0:01:27	2	11.4	100	360	2803	0:06:12	1	0	100	2016	4032	0:07:25	1	0	100	6048	4032	0:07:25	1	0	100
314484	22 May-14 17:22:56	0:00:32	1	0.0	100	4647	5300	0:01:22	2	9.2	100	4465	3600	0:01:14	2	9.0	100	2364	2550	0:01:32	2	10.8	100	408	2803	0:06:12	1	0	100	2016	4032	0:07:25	1	0	100	6048	4032	0:07:25	1	0	100
314485	22 May-14 17:23:01	0:00:27	2	0.0	100	4625	5300	0:01:20	2	8.7	100	4446	3600	0:01:19	2	11.4	100	2376	2550	0:01:36	2	9.6	100	456	2803	0:06:12	1	0	100	2016	4032	0:07:25	1	0	100	6048	4032	0:07:25	1	0	100
314486	22 May-14 17:23:06	0:00:23	1	0.0	100	4585	5300	0:01:20	2	8.2	100	4462	3600	0:01:20	2	9.6	100	2328	2550	0:01:36	2	10.8	100	528	2803	0:06:12	1	0	100	2016	4032	0:07:21	1	0	100	6048	4032	0:07:21	1	0	100
314487	22 May-14 17:23:11	0:00:21	2	1.8	100	4562	5300	0:01:25	2	8.1	100	4500	3600	0:01:25	1	0.0	100	2280	2550	0:01:46	2	10.8	100	576	2803	0:06:12	1	0	100	2016	4032	0:07:24	1	0	100	6048	4032	0:07:24	1	0	100
314488	22 May-14 17:23:16	0:00:22	2	4.0	100	4564	5300	0:01:27	2	8.1	100	4500	3600	0:01:27	1	0.0	100	2208	2550	0:01:52	2	12.0	100	648	2803	0:06:12	1	0	100	2016	4032	0:07:26	1	0	100	6048	4032	0:07:26	1	0	100
314489	22 May-14 17:23:21	0:00:23	1	0.0	100	4524	5300	0:01:24	2	8.1	100	4500	3600	0:01:24	1	0.0	100	2136	2550	0:01:55	2	13.2	100	720	2803	0:06:12	1	0	100	2016	4032	0:07:24	1	0	100	6048	4032	0:07:24	1	0	100
314490	22 May-14 17:23:26	0:00:19	1	0.0	100	4483	5300	0:01:29	2	8.1	100	4500	3600	0:01:29	1	0.0	100	2064	2550	0:02:07	2	13.2	100	792	2803	0:06:12	1	0	100	2016	4032	0:07:30	1	0	100	6048	4032	0:07:30	1	0	100
314491	22 May-14 17:23:31	0:00:16	1	0.0	100	4447	5300	0:01:35	2	7.9	100	4500	3600	0:01:35	1	0.0	100	1992	2550	0:02:20	2	14.4	100	864	2803	0:06:12	1	0	100	2016	4032	0:07:37	1	0	100	6048	4032	0:07:37	1	0	100
314492	22 May-14 17:23:36	0:00:12	1	0.0	100	4438	5300	0:01:40	2	6.3	100	4500	3600	0:01:40	1	0.0	100	1944	2550	0:02:31	2	13.2	100	912	2803	0:06:12	1	0	100	2016	4032	0:07:42	1	0	100	6048	4032	0:07:42	1	0	100
314493	22 May-14 17:23:41	0:00:10	1	0.0	100	4431	5300	0:01:41	2	4.7	100	4500	3600	0:01:41	1	0.0	100	1896	2550	0:02:37	2	12.0	100	960	2803	0:06:12	1	0	100	2016	4032	0:07:43	1	0	100	6048	4032	0:07:43	1	0	100
314494	22 May-14 17:23:46	0:00:08	1	0.0	100	4426	5300	0:01:41	2	2.9	100	4500	3600	0:01:41	1	0.0	100	1824	2550	0:02:42	2	12.0	100	1032	2803	0:06:12	1	0	100	2016	4032	0:07:45	1	0	100	6048	4032	0:07:45	1	0	100
314495	22 May-14 17:23:51	0:00:06	1	0.0	100	4420	5300	0:01:42	2	1.4	100	4500	3600	0:01:42	1	0.0	100	1752	2550	0:02:50	2	12.0	100	1104	2803	0:06:12	1	0	100	2016	4032	0:07:46	1	0	100	6048	4032	0:07:46	1	0	100
314496	22 May-14 17:23:56	0:00:04	1	0.0	100	4415	5300	0:01:44	2	1.2	100	4500	3600	0:01:44	1	0.0	100	1680	2550	0:02:59	2	13.2	100	1176	2803	0:06:12	1	0	100	2016	4032	0:07:50	1	0	100	6048	4032	0:07:50	1	0	100
314497	22 May-14 17:24:01	0:00:02	1	0.0	100	4409	5300	0:01:45	2	1.1	100	4500	3600	0:01:45	1	0.0	100	1608	2550	0:03:06	2	14.4	100	1248	2803	0:06:12	1	0	100	2016	4032	0:07:51	1	0	100	6048	4032	0:07:51	1	0	100
314498	22 May-14 17:24:06	0:00:00	2	2.7	100	4457	5300	0:01:47	2	1.2	100	4500	3600	0:01:47	1	0.0	100	1560	2550	0:03:15	2	13.2	100	1296	2803	0:06:12	1	0	100	2016	4032	0:07:54	1	0	100	6048	4032	0:07:54	1	0	100
314499	22 May-14 17:24:11	0:00:03	2	5.4	100	4505	5300	0:01:40	2	1.1	100	4500	3600	0:01:40	1	0.0	100	1512	2550	0:03:13	2	12.0	100	1344	2803	0:06:12	1	0	100	2016	4032	0:07:48	1	0	100	6048	4032	0:07:48	1	0	100
314500	22 May-14 17:24:17	0:00:06	2	7.8	100	4559	5300	0:01:31	2	0.0	100	4500	3600	0:01:31	1	0.0	100	1440	2550	0:03:08	2	11.4	100	1416	2803	0:06:12	1	0	100	2016	4032	0:07:39	1	0	100	6048	4032	0:07:39	1	0	100
314501	22 May-14 17:24:23	0:00:09	2	10.4	100	4615	5300	0:01:24	1	0.0	100	4500	3600	0:01:21	1	0.0	100	1392	2550	0:03:05	2	10.3	100	1464	2803	0:06:12	1	0	100	2016	4032	0:07:30	1	0	100	6048	4032	0:07:30	1	0	100
314502	22 May-14 17:24:28	0:00:13	2	10.5	100	4670	5300	0:01:24	1	0.0	100	4500	3600	0:01:12	1	0.0	100	1344	2550	0:03:01	2	10.3	100	1512	2803	0:06:12	1	0	100	2016	4032	0:07:22	1	0	100	6048	4032	0:07:22	1	0	100
314503	22 May-14 17:24:33	0:00:18	2	10.7	100	4728	5300	0:01:24	1	0.0	100	4500	3600	0:01:04	1	0.0	100	1272	2550	0:02:57	2	11.4	100	1584	2803	0:06:12	1	0	100	2016	4032	0:07:14	1	0	100	6048	4032	0:07:14	1	0	100
314504	22 May-14 17:24:38	0:00:24	2	11.6	100	4790	5300	0:01:24	1	0.0	100	4500	3600	0:00:56	1	0.0	100	1200	2550	0:02:56	2	12.0	100	1656	2803	0:06:12	1	0	100	2016	4032	0:07:07	1	0	100	6048	4032	0:07:07	1	0	100
314505	22 May-14 17:24:43	0:00:30	2	11.1	100	4849	5300	0:01:24	1	0.0	100	4500	3600	0:00:48	1	0.0	100	1152	2550	0:02:54	2	11.4	100	1704	2803	0:06:12	1	0	100	2016	4032	0:07:00	1	0	100	6048	4032	0:07:00	1	0	100
314506	22 May-14 17:24:48	0:00:36	2	11.4	100	4909	5300	0:01:24	1	0.0	100	4500	3600	0:00:41	1	0.0	100	1080	2550	0:02:52	2	12.6	100	1776	2803	0:06:12	1	0	100	2016	4032	0:06:54	1	0	100	6048	4032	0:06:54	1	0	100
314507	22 May-14 17:24:53	0:00:43	2	11.2	100	4964	5300	0:01:24	1	0.0	100	4500	3600	0:00:34	1	0.0	100	1032	2550	0:02:52	2	11.4	100	1824	2803	0:06:12	1	0	100	2016	4032	0:06:48	1	0	100	6048	4032	0:06:48	1	0	100
314508	22 May-14 17:24:58	0:00:48	2	11.0	100	5022	5300	0:01:24	1	0.0	100	4500	3600	0:00:28	1	0.0	100	984	2550	0:02:51	2	10.3	100	1872	2803	0:06:12	1	0	100	2016	4032	0:06:42	1	0	100	6048	4032	0:06:42	1	0	100
314509	22 May-14 17:25:03	0:00:54	2	11.4	100	5077	5300	0:01:24	1	0.0	100	4500	3600	0:00:23	1	0.0	100	912	2550	0:02:50	2	12.0	100	1944	2803	0:06:12	1	0	100	2016	4032	0:06:38	1	0	100	6048	4032	0:06:38	1	0	100
314510	22 May-14 17:25:08	0:01:00	2	11.2	100	5133	5300	0:01:24	1	0.0	100	4500	3600	0:00:19	1	0.0	100	864	2550	0:02:52	2	10.8	100	1992	2803	0:06:12	1	0	100	2016	4032	0:06:34	1	0	100	6048	4032	0:06:34	1	0	100
314511	22 May-14 17:25:13	0:01:06	2	11.2	100	5188	5300	0:01:24	1	0.0	100	4500	3600	0:00:14	1	0.0	100	816	2550	0:02:52	2	10.8	100	2040	2803	0:06:12	1	0	100	2016	4032	0:06:30	1	0	100	6048	4032	0:06:30	1	0	100
314512	22 May-14 17:25:18	0:01:12	2	11.1	100	5244	5300	0:01:24	1	0.0	100	4500	3600	0:00:09	1	0.0	100	744	2550	0:02:52	2	12.0	100	2112	2803	0:06:12	1	0	100	2016	4032	0:06:26	1	0	100	6048	4032	0:06:26	1	0	100
314513	22 May-14 17:25:23	0:01:18	2	11.2	100	5300	5300	0:01:24	1	0.0	100	4500	3600	0:00:04	1	0.0	100	696	2550	0:02:54	2	10.8	100	2160	2803	0:06:12	1	0	100	2016	4032	0:06:22	1	0	100	6048	4032	0:06:22	1	0	100
314514	22 May-14 17:25:28	0:01:24	2	11.1	100	5355	5300	0:01:24	1	0.0	100	4500	3600	0:00:00	1	0.0	100	648	2550	0:02:53	2	10.8	100	2208	2803	0:06:12	1	0	100	2016	4032	0:06:17	1	0	100	6048	4032	0:06:17	1	0	100
314515	22 May-14 17:25:34	0:01:30	2	11.2	100	5411	5300	0:01:24	1	0.0	100	4500	3600	0:00:00	1	0.0	100	576	2550	0:02:58	2	12.0	100	2280	2803	0:06:12	1	0	100	2016	4032	0:06:18	1	0	100	6048	4032	0:06:18	1	0	100
314516	22 May-14 17:25:39	0:01:36	2	11.2	100	5467	5300	0:01:24	1	0.0	100	4500	3600	0:00:00	1	0.0	100	528	2550	0:03:05	2	10.8	100	2328	2803	0:06:12	1	0	100	2016	4032	0:06:19	1	0	100	6048	4032	0:06:19	1	0	100
314517	22 May-14 17:25:44	0:01:42	2	11.1	100	5522	5300	0:01:24	1	0.0	100	4500	3600	0:00:00	1	0.0	100	480	2550	0:03:09	2	10.8	100	2376	2803	0:06:12	1	0	100	2016	4032	0:06:19	1	0	100	6048	4032	0:06:19	1	0	100
314518	22 May-14 17:25:49	0:01:48	2	11.4	100	5583	5300	0:01:24	1	0.0	100	4500	3600	0:00:00	1	0.0	100	408	2550	0:03:14	2	12.0	100	2448	2803	0:06:12	1	0	100	2016	4032	0:06:20	1	0	100	6048	4032	0:06:20	1	0	100
314519	22 May-14 17:25:54	0:01:54	2	11.1	100	5644	5300	0:01:24	1	0.0	100	4500	3600	0:00:00	1	0.0	100	408	2550	0:03:20	1	0.0	100	2448	2803	0:06:12	1	0	100	2016	4032	0:06:21	1	0	100	6048	4032	0:06:21	1	0	100
314520	22 May-14 17:25:59	0:02:01	2	11.1	100	5700	5300	0:01:24	1	0.0	100	4500	3600	0:00:00	1	0.0	100	336	2550	0:03:20	2	9.1	100	2520	2803	0:06:12	1	0	100	2016	4032	0:06:21	1	0	100	6048	4032	0:06:21	1	0	100
314521	22 May-14 17:26:04	0:02:07	2	11.1	100	5755	5300	0:01:24	1	0.0	100	4500	3600	0:00:00	1	0.0	100	288	2550	0:03:27	2	9.1	100	2568	2803	0:06:12	1	0	100	2016	4032	0:06:22	1	0	100	6048	4032	0:06:22	1	0	100
314522	22 May-14 17:26:09	0:02:13	2	10.9	100	5811	5300	0:01:24	1	0.0	100	4500	3600	0:00:00	1	0.0	100	240	2550	0:03:32	2	8.0	100	2616	2803	0:06:12	1	0	100	2016	4032	0:06:22	1	0	100	6048	4032	0:06:22	1	0	100
314523	22 May-14 17:26:14	0:02:19	2	11.2	100	5867	5300	0:01:24	1	0.0	100	4500	3600	0:00:00	1	0.0	100	168	2550	0:03:36	2	12.0	100	2688	2803	0:06:12	1	0	100	2016	4032	0:06:23	1	0	100	6048	4032	0:06:23	1	0	100
314524	22 May-14 17:26:19	0:02:25	2	11.2	100	5923	5300	0:01:24	1	0.0	100	4500	3600	0:00:00	1	0.0	100	120	2550	0:03:43	2	10.8	100	2736	2803	0:06:12	1	0	100	2016	4032	0:06:23	1	0	100	6048	4032	0:06:23	1	0	100
314525	22 May-14 17:26:24	0:02:31	2	11.2	100	5978	5300	0:01:24	1	0.0	100	4500	3600	0:00:00	1	0.0	100	120	2550	0:03:47	1	0.0	100	2736	2803	0:06:12	1	0	100	2016	4032	0:06:24	1	0	100	6048	4032	0:06:24	1	0	100
314526	22 May-14 17:26:29	0:02:37	2	11.2	100	6035	5300	0:01:24	1	0.0	100	4500	3600	0:00:00	1	0.0	100	120	2550	0:03:47	1	0.0	100	2736	2803	0:06:12	1	0	100	2016	4032	0:06:24	1	0	100	6048	4032	0:06:24	1	0	100
314527	22 May-14 17:26:35	0:02:43	2	11.1	100	6089	5300	0:01:24	1	0.0	100	4500	3600	0:00:00	1	0.0	100	120	2550	0:03:47	1	0.0	100	2736	2803	0:06:12	1	0	100	2016	4032	0:06:24	1	0	100	6048	4032	0:06:24	1	0	100
314528	22 May-14 17:26:40	0:02:48	2	11.1	100	6145	5300	0:01:24	1	0.0	100	4500	3600	0:00:00	1	0.0	100	120	2550	0:03:47	1	0.0	100	2736	2803	0:06:12	1	0	100	2016	4032	0:06:24	1	0	100	6048	4032	0:06:24	1	0	100
314529	22 May-14 17:26:45	0:02:54	2	11.1	100	6200	5300	0:01:24	1	0.0	100	4500	3600	0:00:00	1	0.0	100	120	2550	0:03:47	1	0.0	100	2736	2803	0:06:12	1	0	100	2016	4032	0:06:24	1	0	100	6048	4032	0:06:24	1	0	100
314530	22 May-14 17:26:50	0:03:00	2	11.6	100	6266	5300	0:01:24	1	0.0	100	4500	3600	0:00:00	1	0.0	100	120	2550	0:03:47	1	0.0	100	2736	2803	0:06:12	1	0	100	2016	4032	0:06:24	1	0	100	6048	4032	0:06:24	1	0	100
314531	22 May-14 17:26:55	0:03:07	2	11.1	100	6300	5300	0:01:24	1	0.0	100	4500	3600	0:00:00	1	0.0	100	120	2550	0:03:47	1	0.0	100	2736	2803	0:06:12	1	0	100	2016	4032	0:06:24	1	0	100	6048	4032	0:06:24	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
314532	22 May-14 17:27:00	0:03:11	2	11.1	100	6300	5300	0:01:24	1	0.0	100	4500	3600	0:00:00	1	0.0	100	120	2550	0:03:47	1	0.0	100	2736	2803	0:06:12	1	0	100	2016	4032	0:06:24	1	0	100	6048	4032	0:06:24	1	0	100
314533	22 May-14 17:27:05	0:03:11	2	11.1	100	6300	5300	0:01:24	1	0.0	100	4500	3600	0:00:00	1	0.0	100	120	2550	0:03:47	1	0.0	100	2736	2803	0:06:12	1	0	100	2016	4032	0:06:24	1	0	100	6048	4032	0:06:24	1	0	100
314534	22 May-14 17:27:10	0:03:11	2	10.2	100	6300	5300	0:01:24	1	0.0	100	4500	3600	0:00:00	1	0.0	100	120	2550	0:03:47	1	0.0	100	720	2803	0:06:12	2	20	100	4032	4032	0:06:24	1	0	100	6048	4032	0:06:24	1	0	100
314535	22 May-14 17:27:15	0:03:11	2	8.0	100	6300	5300	0:01:24	1	0.0	100	4488	3600	0:00:00	2	0.0	100	132	2550	0:03:47	1	0.0	100	720	2803	0:06:41	1	0	100	4032	4032	0:06:41	1	0	100	6048	4032	0:06:41	1	0	100
314536	22 May-14 17:27:20	0:03:10	1	0.0	100	6300	5300	0:01:23	1	0.0	100	4452	3600	0:00:00	2	2.4	100	168	2550	0:03:46	1	0.0	100	720	2803	0:06:40	1	0	100	4032	4032	0:06:40	1	0	100	6048	4032	0:06:40	1	0	100
314537	22 May-14 17:27:25	0:03:06	1	0.0	100	6300	5300	0:01:19	1	0.0	100	4416	3600	0:00:00	2	4.2	100	204	2550	0:03:42	1	0.0	100	720	2803	0:06:36	1	0	100	4032	4032	0:06:36	1	0	100	6048	4032	0:06:36	1	0	100
314538	22 May-14 17:27:30	0:03:03	1	0.0	100	6300	5300	0:01:16	1	0.0	100	4368	3600	0:00:00	2	6.3	100	252	2550	0:03:38	1	0.0	100	720	2803	0:06:32	1	0	100	4032	4032	0:06:32	1	0	100	6048	4032	0:06:32	1	0	100
314539	22 May-14 17:27:35	0:02:58	1	0.0	100	6300	5300	0:01:11	1	0.0	100	4296	3600	0:00:00	2	9.1	100	324	2550	0:03:34	1	0.0	100	720	2803	0:06:27	1	0	100	4032	4032	0:06:27	1	0	100	6048	4032	0:06:27	1	0	100
314540	22 May-14 17:27:40	0:02:51	1	0.0	100	6300	5300	0:01:04	1	0.0	100	4224	3600	0:00:00	2	10.9	100	396	2550	0:03:26	1	0.0	100	720	2803	0:06:20	1	0	100	4032	4032	0:06:20	1	0	100	6048	4032	0:06:20	1	0	100
314541	22 May-14 17:27:45	0:02:44	1	0.0	100	6269	5300	0:00:57	2	1.5	100	4195	3600	0:00:00	2	12.0	100	456	2550	0:03:19	1	0.0	100	720	2803	0:06:12	1	0	100	4032	4032	0:06:12	1	0	100	6048	4032	0:06:12	1	0	100
314542	22 May-14 17:27:50	0:02:36	1	0.0	100	6218	5300	0:00:54	2	4.1	100	4162	3600	0:00:00	2	14.4	100	540	2550	0:03:13	1	0.0	100	720	2803	0:06:12	1	0	100	4032	4032	0:06:06	1	0	100	6048	4032	0:06:06	1	0	100
314543	22 May-14 17:27:55	0:02:24	1	0.0	100	6168	5300	0:00:51	2	6.6	100	4152	3600	0:00:00	2	13.8	100	600	2550	0:03:04	1	0.0	100	720	2803	0:06:12	1	0	100	4032	4032	0:05:58	1	0	100	6048	4032	0:05:58	1	0	100
314544	22 May-14 17:28:00	0:02:15	1	0.0	100	6117	5300	0:00:50	2	9.2	100	4143	3600	0:00:00	2	13.2	100	660	2550	0:02:58	1	0.0	100	720	2803	0:06:12	1	0	100	4032	4032	0:05:52	1	0	100	6048	4032	0:05:52	1	0	100
314545	22 May-14 17:28:05	0:02:07	1	0.0	100	6066	5300	0:00:49	2	10.2	100	4122	3600	0:00:00	2	13.8	100	732	2550	0:02:52	1	0.0	100	720	2803	0:06:12	1	0	100	4032	4032	0:05:46	1	0	100	6048	4032	0:05:46	1	0	100
314546	22 May-14 17:28:10	0:01:57	1	0.0	100	6015	5300	0:00:47	2	10.2	100	4113	3600	0:00:00	2	12.6	100	792	2550	0:02:45	1	0.0	100	720	2803	0:06:12	1	0	100	4032	4032	0:05:38	1	0	100	6048	4032	0:05:38	1	0	100
314547	22 May-14 17:28:15	0:01:50	1	0.0	100	5964	5300	0:00:46	2	10.2	100	4092	3600	0:00:00	2	13.2	100	864	2550	0:02:39	1	0.0	100	720	2803	0:06:12	1	0	100	4032	4032	0:05:33	1	0	100	6048	4032	0:05:33	1	0	100
314548	22 May-14 17:28:21	0:01:42	1	0.0	100	5914	5300	0:00:44	2	10.2	100	4082	3600	0:00:00	2	13.2	100	924	2550	0:02:32	1	0.0	100	720	2803	0:06:12	1	0	100	4032	4032	0:05:26	1	0	100	6048	4032	0:05:26	1	0	100
314549	22 May-14 17:28:26	0:01:35	1	0.0	100	5863	5300	0:00:43	2	10.2	100	4061	3600	0:00:00	2	13.2	100	996	2550	0:02:27	1	0.0	100	720	2803	0:06:12	1	0	100	4032	4032	0:05:20	1	0	100	6048	4032	0:05:20	1	0	100
314550	22 May-14 17:28:31	0:01:27	1	0.0	100	5813	5300	0:00:41	2	10.1	100	4039	3600	0:00:00	2	13.8	100	1068	2550	0:02:20	1	0.0	100	720	2803	0:06:12	1	0	100	4032	4032	0:05:14	1	0	100	6048	4032	0:05:14	1	0	100
314551	22 May-14 17:28:36	0:01:20	1	0.0	100	5758	5300	0:00:39	2	10.3	100	4034	3600	0:00:00	2	13.2	100	1128	2550	0:02:14	1	0.0	100	720	2803	0:06:12	1	0	100	4032	4032	0:05:07	1	0	100	6048	4032	0:05:07	1	0	100
314552	22 May-14 17:28:42	0:01:15	1	0.0	100	5696	5300	0:00:39	2	10.9	100	4012	3600	0:00:00	2	14.4	100	1212	2550	0:02:08	1	0.0	100	720	2803	0:06:12	1	0	100	4032	4032	0:05:02	1	0	100	6048	4032	0:05:02	1	0	100
314553	22 May-14 17:28:48	0:01:08	2	0.0	100	5587	5300	0:00:37	2	11.4	100	3991	3600	0:00:00	2	13.8	100	1344	2550	0:02:01	1	0.0	100	720	2803	0:06:12	1	0	100	4032	4032	0:04:54	1	0	100	6048	4032	0:04:54	1	0	100
314554	22 May-14 17:28:53	0:00:57	2	0.0	100	5531	5300	0:00:35	2	11.5	100	3976	3600	0:00:00	2	14.4	100	1416	2550	0:01:49	1	0.0	100	720	2803	0:06:12	1	0	100	4032	4032	0:04:42	1	0	100	6048	4032	0:04:42	1	0	100
314555	22 May-14 17:28:58	0:00:51	2	0.0	100	5531	5300	0:00:34	2	11.5	100	3976	3600	0:00:00	2	14.4	100	1416	2550	0:01:42	1	0.0	100	720	2803	0:06:12	1	0	100	4032	4032	0:04:36	1	0	100	6048	4032	0:04:36	1	0	100
314556	22 May-14 17:29:04	0:00:51	1	0.0	100	5414	5300	0:00:34	2	11.2	100	3954	3600	0:00:00	2	13.7	100	1560	2550	0:01:42	1	0.0	100	720	2803	0:06:12	1	0	100	4032	4032	0:04:36	1	0	100	4032	4032	0:04:36	1	0	100
314557	22 May-14 17:29:09	0:00:40	1	0.0	100	5414	5300	0:00:32	2	11.2	100	3954	3600	0:00:00	2	13.7	100	1560	2550	0:01:29	1	0.0	100	720	2803	0:04:23	1	0	100	4032	4032	0:04:23	1	0	100	4032	4032	0:04:23	1	0	100
314558	22 May-14 17:29:15	0:00:40	1	0.0	100	5295	5300	0:00:32	2	11.0	100	3929	3600	0:00:00	2	13.1	100	1704	2550	0:01:29	1	0.0	100	720	2803	0:04:23	1	0	100	4032	4032	0:04:23	1	0	100	4032	4032	0:04:23	1	0	100
314559	22 May-14 17:29:20	0:00:29	2	0.0	100	5246	5300	0:00:29	2	11.1	100	3924	3600	0:00:00	2	13.1	100	1764	2550	0:01:17	1	0.0	100	720	2803	0:04:12	1	0	100	4032	4032	0:04:10	1	0	100	4032	4032	0:04:10	1	0	100
314560	22 May-14 17:29:25	0:00:25	1	0.0	100	5190	5300	0:00:29	2	11.0	100	3908	3600	0:00:06	2	13.1	100	1836	2550	0:01:17	1	0.0	100	720	2803	0:04:12	1	0	100	4032	4032	0:04:11	1	0	100	4032	4032	0:04:11	1	0	100
314561	22 May-14 17:29:30	0:00:19	1	0.0	100	5132	5300	0:00:27	2	11.3	100	3894	3600	0:00:13	2	13.8	100	1908	2550	0:01:18	1	0.0	100	720	2803	0:04:12	1	0	100	2016	4032	0:04:11	2	24	100	6048	4032	0:04:11	1	0	100
314562	22 May-14 17:29:35	0:00:13	1	0.0	100	5132	5300	0:00:26	2	11.3	100	3894	3600	0:00:20	2	13.8	100	1908	2550	0:01:18	1	0.0	100	720	2803	0:06:12	1	0	100	2016	4032	0:06:43	2	24	100	6048	4032	0:06:43	1	0	100
314563	22 May-14 17:29:40	0:00:13	1	0.0	100	5074	5300	0:00:26	2	10.8	100	3880	3600	0:00:20	2	13.1	100	1980	2550	0:01:18	1	0.0	100	720	2803	0:06:12	1	0	100	2016	4032	0:06:43	1	0	100	6048	4032	0:06:43	1	0	100
314564	22 May-14 17:29:45	0:00:07	1	0.0	100	5018	5300	0:00:27	2	10.9	100	3876	3600	0:00:27	2	13.1	100	2040	2550	0:01:19	1	0.0	100	720	2803	0:06:12	1	0	100	2016	4032	0:06:44	1	0	100	6048	4032	0:06:44	1	0	100
314565	22 May-14 17:29:50	0:00:03	1	0.0	100	4963	5300	0:00:34	2	10.8	100	3859	3600	0:00:34	2	13.1	100	2112	2550	0:01:21	1	0.0	100	720	2803	0:06:12	1	0	100	0	4032	0:06:45	2	24	100	6048	4032	0:06:45	2	25	100
314566	22 May-14 17:29:55	0:00:00	1	0.0	100	4907	5300	0:00:41	2	10.7	100	3855	3600	0:00:41	2	12.6	100	2172	2550	0:01:21	1	0.0	100	720	2803	0:06:12	1	0	100	0	4032	0:09:17	1	0	100	6048	4032	0:09:17	1	0	100
314567	22 May-14 17:30:00	0:00:00	1	0.0	100	4852	5300	0:00:48	2	11.1	100	3838	3600	0:00:48	2	13.2	100	2244	2550	0:01:23	1	0.0	100	720	2803	0:06:12	1	0	100	0	4032	0:09:19	1	0	100	6048	4032	0:09:19	1	0	100
314568	22 May-14 17:30:05	0:00:00	1	0.0	100	4796	5300	0:00:55	2	11.1	100	3822	3600	0:00:55	2	13.8	100	2316	2550	0:01:23	1	0.0	100	720	2803	0:06:12	1	0	100	0	4032	0:09:19	1	0	100	6048	4032	0:09:19	1	0	100
314569	22 May-14 17:30:10	0:00:00	1	0.0	100	4741	5300	0:01:02	2	11.1	100	3817	3600	0:01:02	2	13.2	100	2376	2550	0:01:23	1	0.0	100	720	2803	0:06:12	1	0	100	0	4032	0:09:19	1	0	100	6048	4032	0:09:19	1	0	100
314570	22 May-14 17:30:16	0:00:00	1	0.0	100	4630	5300	0:01:09	2	11.1	100	3832	3600	0:01:09	2	11.4	100	2472	2550	0:01:25	1	0.0	100	720	2803	0:06:12	1	0	100	0	4032	0:09:21	1	0	100	6048	4032	0:09:21	1	0	100
314571	22 May-14 17:30:21	0:00:00	1	0.0	100	4569	5300	0:01:23	2	11.4	100	3857	3600	0:01:23	2	9.6	100	2508	2550	0:01:30	1	0.0	100	720	2803	0:06:12	1	0	100	0	4032	0:09:26	1	0	100	6048	4032	0:09:26	1	0	100
314572	22 May-14 17:30:26	0:00:00	1	0.0	100	4513	5300	0:01:31	2	11.4	100	3853	3600	0:01:31	2	9.6	100	2568	2550	0:01:35	1	0.0	100	720	2803	0:06:12	1	0	100	0	4032	0:09:31	1	0	100	6048	4032	0:09:31	1	0	100
314573	22 May-14 17:30:31	0:00:00	1	0.0	100	4458	5300	0:01:38	2	11.4	100	3836	3600	0:01:38	2	10.2	100	2640	2550	0:01:38	1	0.0	100	720	2803	0:06:12	1	0	100	0	4032	0:09:34	1	0	100	6048	4032	0:09:34	1	0	100
314574	22 May-14 17:30:36	0:00:00	1	0.0	100	4400	5300	0:01:45	2	11.5	100	3822	3600	0:01:45	2	12.0	100	2712	2550	0:01:45	1	0.0	100	720	2803	0:06:12	1	0	100	0	4032	0:09:41	1	0	100	6048	4032	0:09:41	1	0	100
314575	22 May-14 17:30:41	0:00:00	1	0.0	100	4400	5300	0:01:52	2	11.5	100	3822	3600	0:01:52	2	12.0	100	2712	2550	0:01:52	1	0.0	100	720	2803	0:06:12	1	0	100	0	4032	0:09:48	1	0	100	6048	4032	0:09:48	1	0	100
314576	22 May-14 17:30:46	0:00:00	1	0.0	100	4339	5300	0:01:52	2	11.0	100	3811	3600	0:01:52	2	13.1	100	2784	2550	0:01:52	1	0.0	100	720	2803	0:06:12	1	0	100	0	4032	0:09:48	1	0	100	6048	4032	0:09:48	1	0	100
314577	22 May-14 17:30:51	0:00:00	1	0.0	100	4282	5300	0:02:00	2	11.0	100	3796	3600	0:02:00	2	13.7	100	2856	2550	0:02:00	1	0.0	100	720	2803	0:06:12	1	0	100	0	4032	0:09:56	1	0	100	6048	4032	0:09:56	1	0	100
314578	22 May-14 17:30:56	0:00:00	1	0.0	100	4214	5300	0:02:07	2	11.1	100	3780	3600	0:02:07	2	13.6	100	2892	2550	0:02:07	2	2.2	100	768	2803	0:06:12	1	0	100	0	4032	0:10:03	1	0	100	6048	4032	0:10:03	1	0	100
314579	22 May-14 17:31:01	0:00:00	1	0.0	100	4158	5300	0:02:15	2	11.0	100	3776	3600	0:02:15	2	13.1	100	2880	2550	0:02:15	2	5.5	100	840	2803	0:06:12	1	0	100	0	4032	0:10:07	1	0	100	6048	4032	0:10:07	1	0	100
314580	22 May-14 17:31:06	0:00:00	1	0.0	100	4102	5300	0:02:22	2	11.3	100	3760	3600	0:02:22	2	13.7	100	2880	2550	0:02:22	2	9.1	100	912	2803	0:06:12	1	0	100	0	4032	0:10:08	1	0	100	6048	4032	0:10:08	1	0	100
314581	22 May-14 17:31:11	0:00:00	1	0.0	100	4053	5300	0:02:29	2	10.9	100	3737	3600	0:02:29	2	13.7	100	2904	2550	0:02:29	2	11.4	100	960	2803	0:06:12	1	0	100	0	4032	0:10:09	1	0	100	6048	4032	0:10:09	1	0	100
314582	22 May-14 17:31:16	0:00:00	1	0.0	100	4042	5300	0:02:35	2	8.6	100	3688	3600	0:02:35	2	13.2	100	2892	2550	0:02:35	2	13.2	100	1032	2803	0:06:12	1	0	100	0	4032	0:10:11	1	0	100	6048	4032	0:10:11	1	0	100
314583	22 May-14 17:31:21	0:00:00	1	0.0	100	4035	5300	0:02:37	2	6.2	100	3623	3600	0:02:37	2	13.8	100	2892	2550	0:02:37	2	13.2	100	1104	2803	0:06:12	1	0	100	0	4032	0:10:06	1	0	100	6048	4032	0:10:06	1	0	100
314584	22 May-14 17:31:27	0:00:00	1	0.0	100	4029	5300	0:02:38	2	3.7	100	3569	3600	0:02:38	2	13.2	100	2904	2550	0:02:38	2	12.0	100	1152	2803	0:06:12	1	0	100	0	4032	0:10:00	1	0	100	6048	4032	0:10:00	1	0	100
314585	22 May-14 17:31:32	0:00:00	1	0.0	100	4025	5300	0:02:38	2	1.4	100	3501	3600	0:02:41	2	13.2	100	2904	2550	0:02:41	2	13.2	100	1224	2803	0:06:12	1	0	100	0	4032	0:10:00	1	0	100	6048	4032	0:10:00	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
314586	22 May-14 17:31:37	0:00:00	1	0.0	100	4020	5300	0:02:39	2	1.1	100	3506	3600	0:02:47	2	13.2	100	2832	2550	0:02:47	2	13.2	100	1296	2803	0:06:12	1	0	100	0	4032	0:10:00	1	0	100	6048	4032	0:10:00	1	0	100
314587	22 May-14 17:31:42	0:00:00	1	0.0	100	4018	5300	0:02:40	2	0.0	100	3376	3600	0:02:48	2	13.4	100	2892	2550	0:02:48	2	13.2	100	1368	2803	0:06:12	1	0	100	0	4032	0:09:54	1	0	100	6048	4032	0:09:54	1	0	100
314588	22 May-14 17:31:47	0:00:00	1	0.0	100	4018	5300	0:02:40	1	0.0	100	3304	3600	0:03:00	2	12.9	100	2892	2550	0:03:00	2	13.7	100	1440	2803	0:06:12	1	0	100	0	4032	0:10:00	1	0	100	6048	4032	0:10:00	1	0	100
314589	22 May-14 17:31:52	0:00:00	1	0.0	100	4018	5300	0:02:40	1	0.0	100	3232	3600	0:03:08	2	13.4	100	2916	2550	0:03:08	2	12.6	100	1488	2803	0:06:12	1	0	100	0	4032	0:10:02	1	0	100	6048	4032	0:10:02	1	0	100
314590	22 May-14 17:31:57	0:00:00	1	0.0	100	4018	5300	0:02:40	1	0.0	100	3184	3600	0:03:16	2	12.5	100	2892	2550	0:03:16	2	12.6	100	1560	2803	0:06:12	1	0	100	0	4032	0:10:06	1	0	100	6048	4032	0:10:06	1	0	100
314591	22 May-14 17:32:02	0:00:00	2	0.0	100	4021	5300	0:02:40	1	0.0	100	3184	3600	0:03:22	1	0.0	100	2820	2550	0:03:22	2	12.6	100	1632	2803	0:06:12	1	0	100	0	4032	0:10:06	1	0	100	6048	4032	0:10:06	1	0	100
314592	22 May-14 17:32:07	0:00:00	1	0.0	100	4021	5300	0:02:39	1	0.0	100	3184	3600	0:03:22	1	0.0	100	2748	2550	0:03:22	2	13.2	100	1704	2803	0:06:12	1	0	100	0	4032	0:10:01	1	0	100	6048	4032	0:10:01	1	0	100
314593	22 May-14 17:32:12	0:00:00	1	0.0	100	4020	5300	0:02:39	2	0.0	100	3185	3600	0:03:23	1	0.0	100	2676	2550	0:03:23	2	14.4	100	1776	2803	0:06:12	1	0	100	0	4032	0:09:55	1	0	100	6048	4032	0:09:55	1	0	100
314594	22 May-14 17:32:17	0:00:00	1	0.0	100	4018	5300	0:02:39	2	0.0	100	3187	3600	0:03:23	1	0.0	100	2628	2550	0:03:23	2	13.2	100	1824	2803	0:06:12	1	0	100	0	4032	0:09:50	1	0	100	6048	4032	0:09:50	1	0	100
314595	22 May-14 17:32:22	0:00:00	1	0.0	100	4009	5300	0:02:39	2	0.0	100	3196	3600	0:03:23	1	0.0	100	2556	2550	0:03:23	2	13.2	100	1896	2803	0:06:12	1	0	100	0	4032	0:09:46	1	0	100	6048	4032	0:09:46	1	0	100
314596	22 May-14 17:32:28	0:00:00	1	0.0	100	3999	5300	0:02:40	2	1.1	100	3206	3600	0:03:23	1	0.0	100	2508	2550	0:03:23	2	12.0	100	1944	2803	0:06:12	1	0	100	0	4032	0:09:40	1	0	100	6048	4032	0:09:40	1	0	100
314597	22 May-14 17:32:33	0:00:00	1	0.0	100	3966	5300	0:02:42	2	2.7	100	3239	3600	0:03:23	1	0.0	100	2436	2550	0:03:27	2	12.0	100	2016	2803	0:06:12	1	0	100	0	4032	0:09:40	1	0	100	6048	4032	0:09:40	1	0	100
314598	22 May-14 17:32:38	0:00:00	1	0.0	100	3911	5300	0:02:46	2	5.4	100	3282	3600	0:03:23	2	0.0	100	2376	2550	0:03:34	2	13.2	100	2088	2803	0:06:12	1	0	100	0	4032	0:09:41	1	0	100	6048	4032	0:09:41	1	0	100
314599	22 May-14 17:32:43	0:00:00	1	0.0	100	3854	5300	0:02:53	2	7.8	100	3339	3600	0:03:24	1	0.0	100	2304	2550	0:03:40	2	13.2	100	2160	2803	0:06:12	1	0	100	0	4032	0:09:42	1	0	100	6048	4032	0:09:42	1	0	100
314600	22 May-14 17:32:48	0:00:00	1	0.0	100	3798	5300	0:03:00	2	9.6	100	3359	3600	0:03:25	2	2.3	100	2268	2550	0:03:48	2	13.7	100	2232	2803	0:06:12	1	0	100	0	4032	0:09:43	1	0	100	6048	4032	0:09:43	1	0	100
314601	22 May-14 17:32:53	0:00:00	1	0.0	100	3737	5300	0:03:07	2	10.9	100	3348	3600	0:03:29	2	5.7	100	2268	2550	0:03:55	2	13.7	100	2304	2803	0:06:12	1	0	100	0	4032	0:09:45	1	0	100	6048	4032	0:09:45	1	0	100
314602	22 May-14 17:32:58	0:00:00	1	0.0	100	3679	5300	0:03:15	2	11.0	100	3334	3600	0:03:37	2	8.6	100	2292	2550	0:04:04	2	12.6	100	2352	2803	0:06:12	1	0	100	0	4032	0:09:47	1	0	100	6048	4032	0:09:47	1	0	100
314603	22 May-14 17:33:03	0:00:00	1	0.0	100	3623	5300	0:03:22	2	11.0	100	3318	3600	0:03:45	2	12.0	100	2292	2550	0:04:09	2	12.6	100	2424	2803	0:06:12	1	0	100	0	4032	0:09:49	1	0	100	6048	4032	0:09:49	1	0	100
314604	22 May-14 17:33:08	0:00:00	1	0.0	100	3568	5300	0:03:29	2	11.5	100	3313	3600	0:03:53	2	13.8	100	2280	2550	0:04:17	2	13.2	100	2496	2803	0:06:12	1	0	100	0	4032	0:09:50	1	0	100	6048	4032	0:09:50	1	0	100
314605	22 May-14 17:33:13	0:00:00	1	0.0	100	3512	5300	0:03:36	2	11.3	100	3297	3600	0:03:59	2	13.8	100	2304	2550	0:04:24	2	12.0	100	2544	2803	0:06:12	1	0	100	0	4032	0:09:52	1	0	100	6048	4032	0:09:52	1	0	100
314606	22 May-14 17:33:18	0:00:00	2	0.0	100	3458	5300	0:03:43	2	11.1	100	3292	3600	0:04:07	2	13.2	100	2292	2550	0:04:30	2	13.2	100	2616	2803	0:06:12	1	0	100	0	4032	0:09:53	1	0	100	6048	4032	0:09:53	1	0	100
314607	22 May-14 17:33:23	0:00:00	1	0.0	100	3402	5300	0:03:50	2	11.1	100	3276	3600	0:04:13	2	13.2	100	2292	2550	0:04:37	2	13.2	100	2688	2803	0:06:12	1	0	100	0	4032	0:09:55	1	0	100	6048	4032	0:09:55	1	0	100
314608	22 May-14 17:33:28	0:00:00	1	0.0	100	3347	5300	0:03:57	2	11.1	100	3271	3600	0:04:21	2	13.2	100	2280	2550	0:04:45	2	13.2	100	2760	2803	0:06:12	1	0	100	0	4032	0:09:57	1	0	100	6048	4032	0:09:57	1	0	100
314609	22 May-14 17:33:33	0:00:00	1	0.0	100	3291	5300	0:04:03	2	11.1	100	3255	3600	0:04:29	2	13.2	100	2304	2550	0:04:53	2	13.2	100	2808	2803	0:06:12	1	0	100	0	4032	0:09:59	1	0	100	6048	4032	0:09:59	1	0	100
314610	22 May-14 17:33:38	0:00:00	1	0.0	100	3236	5300	0:04:10	2	11.1	100	3310	3600	0:04:37	2	13.2	100	2232	2550	0:04:59	2	13.2	100	2880	2803	0:06:12	1	0	100	0	4032	0:10:02	1	0	100	6048	4032	0:10:02	1	0	100
314611	22 May-14 17:33:43	0:00:00	1	0.0	100	3180	5300	0:04:17	2	11.1	100	3234	3600	0:04:39	2	13.4	100	2292	2550	0:05:08	2	13.2	100	2952	2803	0:06:12	1	0	100	0	4032	0:10:11	1	0	100	6048	4032	0:10:11	1	0	100
314612	22 May-14 17:33:48	0:00:00	2	0.0	100	3127	5300	0:04:24	2	11.1	100	3217	3600	0:04:52	2	13.4	100	2292	2550	0:05:16	2	13.2	100	3024	2803	0:06:12	1	0	100	0	4032	0:10:18	1	0	100	6048	4032	0:10:18	1	0	100
314613	22 May-14 17:33:53	0:00:00	1	0.0	100	3071	5300	0:04:30	2	11.1	100	3153	3600	0:05:00	2	15.8	100	2364	2550	0:05:23	2	13.2	100	3072	2803	0:06:12	1	0	100	0	4032	0:10:26	1	0	100	6048	4032	0:10:26	1	0	100
314614	22 May-14 17:33:58	0:00:00	1	0.0	100	3015	5300	0:04:37	2	11.2	100	3209	3600	0:05:12	0	0.0	100	2292	2550	0:05:29	2	13.2	100	3144	2803	0:06:12	1	0	100	0	4032	0:10:31	1	0	100	6048	4032	0:10:31	1	0	100
314615	22 May-14 17:34:03	0:00:00	2	0.0	100	2964	5300	0:04:44	2	11.0	100	3178	3600	0:05:14	2	13.8	90	2304	2550	0:05:38	2	13.2	100	3216	2803	0:06:12	1	0	100	0	4032	0:10:40	1	0	100	6048	4032	0:10:40	1	0	100
314616	22 May-14 17:34:09	0:00:00	2	0.0	100	2914	5300	0:04:50	2	10.8	100	3169	3600	0:05:23	2	13.2	100	2316	2550	0:05:45	2	12.0	100	3264	2803	0:06:12	1	0	100	0	4032	0:10:47	1	0	100	6048	4032	0:10:47	1	0	100
314617	22 May-14 17:34:14	0:00:00	2	0.0	100	2865	5300	0:04:57	2	10.5	100	3147	3600	0:05:30	2	10.8	100	2340	2550	0:05:51	2	12.0	100	3312	2803	0:06:12	1	0	100	0	4032	0:10:53	1	0	100	6048	4032	0:10:53	1	0	100
314618	22 May-14 17:34:19	0:00:00	1	0.0	100	2814	5300	0:05:02	2	10.3	100	3138	3600	0:05:37	2	13.8	100	2328	2550	0:05:56	2	12.0	100	3384	2803	0:06:12	1	0	100	0	4032	0:10:59	1	0	100	6048	4032	0:10:59	1	0	100
314619	22 May-14 17:34:24	0:00:00	1	0.0	100	2760	5300	0:05:09	2	10.3	100	3132	3600	0:05:44	2	12.6	100	2340	2550	0:06:05	2	10.8	100	3432	2803	0:06:12	1	0	100	0	4032	0:11:07	1	0	100	6048	4032	0:11:07	1	0	100
314620	22 May-14 17:34:29	0:00:00	1	0.0	100	2709	5300	0:05:15	2	9.8	100	3123	3600	0:05:52	2	12.0	100	2328	2550	0:06:11	2	11.4	100	3504	2803	0:06:12	1	0	100	0	4032	0:11:13	1	0	100	6048	4032	0:11:13	1	0	100
314621	22 May-14 17:34:34	0:00:00	2	0.0	100	2662	5300	0:05:22	2	10.0	100	3130	3600	0:05:59	2	10.9	100	2328	2550	0:06:19	2	11.4	100	3504	2803	0:06:19	1	0	100	0	4032	0:11:22	1	0	100	6048	4032	0:11:22	1	0	100
314622	22 May-14 17:34:39	0:00:00	2	0.0	100	2614	5300	0:05:26	2	10.0	100	3120	3600	0:06:02	2	10.9	100	2316	2550	0:06:22	2	11.4	100	1560	2803	0:06:22	2	20	100	2016	4032	0:11:25	1	0	100	6048	4032	0:11:25	1	0	100
314623	22 May-14 17:34:45	0:00:00	2	1.0	100	2575	5300	0:05:31	2	9.9	100	3111	3600	0:06:09	2	10.9	100	2328	2550	0:06:30	2	11.4	100	1608	2803	0:08:12	1	0	100	2016	4032	0:10:44	1	0	100	6048	4032	0:10:44	1	0	100
314624	22 May-14 17:34:50	0:00:00	2	1.2	100	2526	5300	0:05:33	2	10.3	100	3113	3600	0:06:11	2	10.8	100	2328	2550	0:06:32	2	10.8	100	1656	2803	0:08:10	1	0	100	2016	4032	0:10:41	1	0	100	6048	4032	0:10:41	1	0	100
314625	22 May-14 17:34:55	0:00:00	1	0.0	100	2475	5300	0:05:39	2	10.1	100	3104	3600	0:06:17	2	11.4	100	2316	2550	0:06:37	2	12.0	100	1728	2803	0:08:12	1	0	100	2016	4032	0:10:43	1	0	100	6048	4032	0:10:43	1	0	100
314626	22 May-14 17:35:00	0:00:00	1	0.0	100	2419	5300	0:05:46	2	10.4	100	3100	3600	0:06:25	2	11.4	100	2328	2550	0:06:46	2	10.8	100	1776	2803	0:08:14	1	0	100	2016	4032	0:10:45	1	0	100	6048	4032	0:10:45	1	0	100
314627	22 May-14 17:35:05	0:00:00	1	0.0	100	2364	5300	0:05:53	2	10.1	100	3083	3600	0:06:32	2	11.4	100	2328	2550	0:06:52	2	11.4	100	1848	2803	0:08:17	1	0	100	2016	4032	0:10:48	1	0	100	6048	4032	0:10:48	1	0	100
314628	22 May-14 17:35:10	0:00:00	1	0.0	100	2314	5300	0:06:00	2	10.1	100	3085	3600	0:06:41	2	11.4	100	2328	2550	0:07:01	2	11.4	100	1896	2803	0:08:19	1	0	100	2016	4032	0:10:50	1	0	100	6048	4032	0:10:50	1	0	100
314629	22 May-14 17:35:15	0:00:00	1	0.0	100	2263	5300	0:06:06	2	10.1	100	3076	3600	0:06:47	2	11.4	100	2340	2550	0:07:07	2	10.3	100	1944	2803	0:08:21	1	0	100	2016	4032	0:10:53	1	0	100	6048	4032	0:10:53	1	0	100
314630	22 May-14 17:35:20	0:00:00	1	0.0	100	2213	5300	0:06:12	2	9.8	100	3066	3600	0:06:54	2	11.4	100	2328	2550	0:07:13	2	11.4	100	2016	2803	0:08:23	1	0	100	2016	4032	0:10:55	1	0	100	6048	4032	0:10:55	1	0	100
314631	22 May-14 17:35:25	0:00:00	1	0.0	100	2162	5300	0:06:18	2	10.1	100	3069	3600	0:07:00	2	10.8	100	2328	2550	0:07:20	2	10.8	100	2064	2803	0:08:25	1	0	100	2016	4032	0:10:56	1	0	100	6048	4032	0:10:56	1	0	100
314632	22 May-14 17:35:30	0:00:00	1	0.0	100	2111	5300	0:06:27	2	10.2	100	3060	3600	0:07:09	2	11.4	100	2340	2550	0:07:29	2	10.8	100	2112	2803	0:08:30	1	0	100	2016	4032	0:11:01	1	0	100	6048	4032	0:11:01	1	0	100
314633	22 May-14 17:35:35	0:00:00	1	0.0	100	2061	5300	0:06:34	2	10.1	100	3062	3600	0:07:16	2	10.8	100	2316	2550	0:07:36	2	12.0	100	2184	2803	0:08:32	1	0	100	2016	4032	0:11:04	1	0	100	6048	4032	0:11:04	1	0	100
314634	22 May-14 17:35:40	0:00:00	2	0.0	100	2014	5300	0:06:44	2	10.2	100	3053	3600	0:07:26	2	10.8	100	2328	2550	0:07:48	2	10.8	100	2232	2803	0:08:39	1	0	100	2016	4032	0:11:10	1	0	100	6048	4032	0:11:10	1	0	100
314635	22 May-14 17:35:45	0:00:00	1	0.0	100	1964	5300	0:06:49	2	10.1	100	3043	3600	0:07:32	2	11.4	100	2388	2550	0:07:52	1	0.0	100	2232	2803	0:08:39	1	0	100	2016	4032	0:11:10	1	0	100	6048	4032	0:11:10	1	0	100
314636	22 May-14 17:35:50	0:00:00	1	0.0	100	1913	5300	0:06:55	2	10.1	100	3046	3600	0:07:39	2	10.8	100	2436	2550	0:07:54	1	0.0	100	2232	2803	0:08:41	1	0	100	2016	4032	0:11:12	1	0	100	6048	4032	0:11:12	1	0	100
314637	22 May-14 17:35:55	0:00:00	2	0.0	100	1866	5300	0:07:01	2	10.1	100	3036	3600	0:07:45	2	11.4	100	2496	2550	0:07:56	1	0.0	100	2232	2803	0:08:43	1	0	100	2016	4032	0:11:14	1	0	100	6048	4032	0:11:14	1	0	100
314638	22 May-14 17:36:00	0:00:00	1	0.0	100	1815	5300	0:07:06	2	10.1	100	3027	3600	0:07:51	2	11.4	100	2508	2550	0:07:56	2	2.4	100	2280	2803	0:08:43	1	0	100	2016	4032	0:11:14	1	0	100	6048	4032	0:11:14	1	0	100
314639	22 May-14 17:36:05	0:00:00	2	0.0	100	1768	5300	0:07:13	2	10.1	100	3029	3600	0:07:58	2	10.8	100	2484	2550	0:08:02	2	6.0	100	2352	2803	0:08:45	1	0	100	2016	4032	0:11:16	1	0	100	6048	4032	0:11:16	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_enthalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
314640	22 May-14 17:36:10	0:00:00	2	0.0	100	1719	5300	0:07:17	2	10.1	100	3020	3600	0:08:02	2	11.4	100	2496	2550	0:08:08	2	8.4	100	2400	2803	0:08:46	1	0	100	2016	4032	0:11:17	1	0	100	6048	4032	0:11:17	1	0	100
314641	22 May-14 17:36:16	0:00:00	2	0.0	100	1671	5300	0:07:23	2	10.1	100	3010	3600	0:08:08	2	11.4	100	2556	2550	0:08:13	1	0.0	100	2400	2803	0:08:47	1	0	100	0	4032	0:11:18	2	24	100	6048	4032	0:11:18	1	0	100
314642	22 May-14 17:36:21	0:00:00	2	0.0	100	1622	5300	0:07:28	2	10.1	100	3013	3600	0:08:14	2	10.8	100	2604	2550	0:08:14	1	0.0	100	2400	2803	0:08:48	1	0	100	0	4032	0:13:50	1	0	100	6048	4032	0:13:50	1	0	100
314643	22 May-14 17:36:26	0:00:00	1	0.0	100	1572	5300	0:07:33	2	10.1	100	3003	3600	0:08:19	2	11.4	100	2664	2550	0:08:19	1	0.0	100	2400	2803	0:08:53	1	0	100	0	4032	0:13:55	1	0	100	6048	4032	0:13:55	1	0	100
314644	22 May-14 17:36:31	0:00:00	1	0.0	100	1521	5300	0:07:39	2	10.1	100	2994	3600	0:08:26	2	11.4	100	2724	2550	0:08:26	1	0.0	100	2400	2803	0:09:00	1	0	100	0	4032	0:14:02	1	0	100	6048	4032	0:14:02	1	0	100
314645	22 May-14 17:36:36	0:00:00	1	0.0	100	1466	5300	0:07:47	2	9.9	100	3013	3600	0:08:35	2	9.7	100	2760	2550	0:08:35	1	0.0	100	2400	2803	0:09:08	1	0	100	0	4032	0:14:11	1	0	100	6048	4032	0:14:11	1	0	100
314646	22 May-14 17:36:41	0:00:00	1	0.0	100	1412	5300	0:07:54	2	10.0	100	3043	3600	0:08:40	2	8.6	100	2784	2550	0:08:40	1	0.0	100	2400	2803	0:09:14	1	0	100	0	4032	0:14:16	1	0	100	6048	4032	0:14:16	1	0	100
314647	22 May-14 17:36:46	0:00:00	1	0.0	100	1361	5300	0:08:01	2	10.0	100	3082	3600	0:08:45	2	6.3	100	2796	2550	0:08:45	1	0.0	100	2400	2803	0:09:18	1	0	100	0	4032	0:14:21	1	0	100	6048	4032	0:14:21	1	0	100
314648	22 May-14 17:36:52	0:00:00	1	0.0	100	1311	5300	0:08:08	2	10.0	100	3132	3600	0:08:49	1	0.0	100	2796	2550	0:08:49	1	0.0	100	2400	2803	0:09:23	1	0	100	0	4032	0:14:25	1	0	100	6048	4032	0:14:25	1	0	100
314649	22 May-14 17:36:57	0:00:00	1	0.0	100	1260	5300	0:08:14	2	10.3	100	3183	3600	0:08:51	1	0.0	100	2796	2550	0:08:51	1	0.0	100	2400	2803	0:09:25	1	0	100	0	4032	0:14:27	1	0	100	6048	4032	0:14:27	1	0	100
314650	22 May-14 17:37:02	0:00:00	1	0.0	100	1210	5300	0:08:22	2	10.1	100	3233	3600	0:08:55	1	0.0	100	2796	2550	0:08:55	1	0.0	100	2400	2803	0:09:28	1	0	100	0	4032	0:14:31	1	0	100	6048	4032	0:14:31	1	0	100
314651	22 May-14 17:37:07	0:00:00	2	0.0	100	1164	5300	0:08:29	2	10.0	100	3282	3600	0:08:58	1	0.0	100	2796	2550	0:08:58	1	0.0	100	2400	2803	0:09:32	1	0	100	0	4032	0:14:34	1	0	100	6048	4032	0:14:34	1	0	100
314652	22 May-14 17:37:12	0:00:00	1	0.0	100	1122	5300	0:08:34	2	9.6	100	3324	3600	0:08:59	1	0.0	100	2796	2550	0:08:59	1	0.0	100	2400	2803	0:09:33	1	0	100	0	4032	0:14:35	1	0	100	6048	4032	0:14:35	1	0	100
314653	22 May-14 17:37:17	0:00:00	1	0.0	100	1079	5300	0:08:40	2	8.8	100	3367	3600	0:09:02	1	0.0	100	2796	2550	0:09:02	1	0.0	100	384	2803	0:09:36	2	20	100	2016	4032	0:14:38	1	0	100	6048	4032	0:14:38	1	0	100
314654	22 May-14 17:37:22	0:00:00	2	0.0	100	1042	5300	0:08:46	2	8.4	100	3410	3600	0:09:04	1	0.0	100	2796	2550	0:09:04	1	0.0	100	384	2803	0:12:26	1	0	100	2016	4032	0:14:57	1	0	100	6048	4032	0:14:57	1	0	100
314655	22 May-14 17:37:27	0:00:00	2	1.2	100	1025	5300	0:08:48	2	7.8	100	3446	3600	0:09:03	1	0.0	100	2796	2550	0:09:03	1	0.0	100	384	2803	0:12:25	1	0	100	2016	4032	0:14:56	1	0	100	6048	4032	0:14:56	1	0	100
314656	22 May-14 17:37:32	0:00:00	2	1.4	100	1020	5300	0:08:42	2	6.2	100	3455	3600	0:08:54	1	0.0	100	2748	2550	0:08:54	2	2.3	100	432	2803	0:12:16	1	0	100	2016	4032	0:14:47	1	0	100	6048	4032	0:14:47	1	0	100
314657	22 May-14 17:37:37	0:00:00	1	0.0	100	1013	5300	0:08:41	2	4.8	100	3462	3600	0:08:53	1	0.0	100	2676	2550	0:08:53	2	6.0	100	504	2803	0:12:10	1	0	100	2016	4032	0:14:41	1	0	100	6048	4032	0:14:41	1	0	100
314658	22 May-14 17:37:42	0:00:00	2	1.9	100	1022	5300	0:08:42	2	2.9	100	3455	3600	0:08:53	2	0.0	100	2616	2550	0:08:53	2	9.6	100	576	2803	0:12:04	1	0	100	2016	4032	0:14:36	1	0	100	6048	4032	0:14:36	1	0	100
314659	22 May-14 17:37:47	0:00:00	2	1.3	100	1024	5300	0:08:35	2	1.4	100	3461	3600	0:08:47	1	0.0	100	2568	2550	0:08:47	2	12.0	100	624	2803	0:11:52	1	0	100	2016	4032	0:14:23	1	0	100	6048	4032	0:14:23	1	0	100
314660	22 May-14 17:37:52	0:00:00	2	1.2	100	1020	5300	0:08:31	2	1.2	100	3431	3600	0:08:44	2	2.4	100	2532	2550	0:08:44	2	13.2	100	696	2803	0:11:44	1	0	100	2016	4032	0:14:16	1	0	100	6048	4032	0:14:16	1	0	100
314661	22 May-14 17:37:57	0:00:00	2	2.0	100	1030	5300	0:08:31	2	1.1	100	3376	3600	0:08:47	2	5.4	100	2520	2550	0:08:48	2	13.2	100	768	2803	0:11:43	1	0	100	2016	4032	0:14:14	1	0	100	6048	4032	0:14:14	1	0	100
314662	22 May-14 17:38:02	0:00:00	1	0.0	100	1024	5300	0:08:25	2	1.2	100	3322	3600	0:08:46	2	7.8	100	2532	2550	0:08:49	2	12.0	100	816	2803	0:11:37	1	0	100	2016	4032	0:14:08	1	0	100	6048	4032	0:14:08	1	0	100
314663	22 May-14 17:38:08	0:00:00	1	0.0	100	1019	5300	0:08:26	2	1.1	100	3267	3600	0:08:53	2	10.8	100	2520	2550	0:08:54	2	13.2	100	888	2803	0:11:38	1	0	100	2016	4032	0:14:09	1	0	100	6048	4032	0:14:09	1	0	100
314664	22 May-14 17:38:14	0:00:00	1	0.0	100	1022	5300	0:08:26	1	0.0	100	3150	3600	0:08:59	2	12.0	100	2520	2550	0:09:01	2	12.0	100	1008	2803	0:11:39	1	0	100	2016	4032	0:14:10	1	0	100	6048	4032	0:14:10	1	0	100
314665	22 May-14 17:38:19	0:00:00	2	0.0	100	1030	5300	0:08:33	1	0.0	100	3078	3600	0:09:20	2	12.6	100	2520	2550	0:09:23	2	13.2	100	1080	2803	0:11:50	1	0	100	2016	4032	0:14:21	1	0	100	6048	4032	0:14:21	1	0	100
314666	22 May-14 17:38:24	0:00:00	2	0.0	100	1031	5300	0:08:31	1	0.0	100	3018	3600	0:09:25	2	12.6	100	2508	2550	0:09:28	2	13.2	100	1152	2803	0:11:49	1	0	100	2016	4032	0:14:20	1	0	100	6048	4032	0:14:20	1	0	100
314667	22 May-14 17:38:29	0:00:00	1	0.0	100	1031	5300	0:08:30	1	0.0	100	2946	3600	0:09:31	2	13.8	100	2508	2550	0:09:35	2	13.2	100	1224	2803	0:11:50	1	0	100	2016	4032	0:14:22	1	0	100	6048	4032	0:14:22	1	0	100
314668	22 May-14 17:38:34	0:00:00	2	1.1	100	1044	5300	0:08:36	1	0.0	100	2886	3600	0:09:44	2	13.2	100	2520	2550	0:09:48	2	13.2	100	1272	2803	0:11:58	1	0	100	2016	4032	0:14:29	1	0	100	6048	4032	0:14:29	1	0	100
314669	22 May-14 17:38:39	0:00:00	2	0.0	100	1045	5300	0:08:32	1	0.0	100	2814	3600	0:09:47	2	13.2	100	2520	2550	0:09:50	2	13.2	100	1344	2803	0:11:56	1	0	100	2016	4032	0:14:27	1	0	100	6048	4032	0:14:27	1	0	100
314670	22 May-14 17:38:44	0:00:00	2	1.2	100	1055	5300	0:08:33	1	0.0	100	2742	3600	0:09:56	2	13.8	100	2520	2550	0:09:58	2	13.2	100	1416	2803	0:11:58	1	0	100	2016	4032	0:14:29	1	0	100	6048	4032	0:14:29	1	0	100
314671	22 May-14 17:38:49	0:00:00	1	0.0	100	1055	5300	0:08:33	1	0.0	100	2682	3600	0:10:04	2	13.2	100	2508	2550	0:10:07	2	13.2	100	1488	2803	0:12:01	1	0	100	2016	4032	0:14:32	1	0	100	6048	4032	0:14:32	1	0	100
314672	22 May-14 17:38:54	0:00:00	1	0.0	100	1055	5300	0:08:33	1	0.0	100	2610	3600	0:10:11	2	13.8	100	2532	2550	0:10:15	2	13.2	100	1536	2803	0:12:03	1	0	100	0	4032	0:14:34	2	24	100	6048	4032	0:14:34	1	0	100
314673	22 May-14 17:38:59	0:00:00	1	0.0	100	1055	5300	0:08:33	1	0.0	100	2550	3600	0:10:19	2	13.2	100	2520	2550	0:10:21	2	13.2	100	1608	2803	0:12:05	1	0	100	0	4032	0:17:07	1	0	100	6048	4032	0:17:07	1	0	100
314674	22 May-14 17:39:04	0:00:00	1	0.0	100	1055	5300	0:08:36	1	0.0	100	2478	3600	0:10:28	2	13.2	100	2544	2550	0:10:31	2	12.0	100	1656	2803	0:12:09	1	0	100	0	4032	0:17:12	1	0	100	6048	4032	0:17:12	1	0	100
314675	22 May-14 17:39:09	0:00:00	1	0.0	100	1055	5300	0:08:36	1	0.0	100	2406	3600	0:10:36	2	13.8	100	2544	2550	0:10:37	2	12.0	100	1728	2803	0:12:11	1	0	100	0	4032	0:17:13	1	0	100	6048	4032	0:17:13	1	0	100
314676	22 May-14 17:39:14	0:00:00	1	0.0	100	1055	5300	0:08:39	1	0.0	100	2406	3600	0:10:47	2	13.8	100	2544	2550	0:10:48	2	12.0	100	1728	2803	0:12:16	1	0	100	0	4032	0:17:18	1	0	100	6048	4032	0:17:18	1	0	100
314677	22 May-14 17:39:19	0:00:00	1	0.0	100	1055	5300	0:08:39	1	0.0	100	2346	3600	0:10:47	2	12.6	100	2556	2550	0:10:48	2	11.4	100	1776	2803	0:12:16	1	0	100	0	4032	0:17:18	1	0	100	6048	4032	0:17:18	1	0	100
314678	22 May-14 17:39:24	0:00:00	1	0.0	100	1055	5300	0:08:40	1	0.0	100	2262	3600	0:10:54	2	13.7	100	2544	2550	0:10:54	2	12.6	100	1872	2803	0:12:19	1	0	100	0	4032	0:17:21	1	0	100	6048	4032	0:17:21	1	0	100
314679	22 May-14 17:39:29	0:00:00	1	0.0	100	1055	5300	0:08:40	1	0.0	100	2202	3600	0:11:03	2	12.5	100	2532	2550	0:11:04	2	13.1	100	1944	2803	0:12:20	1	0	100	0	4032	0:17:23	1	0	100	6048	4032	0:17:23	1	0	100
314680	22 May-14 17:39:34	0:00:00	1	0.0	100	1055	5300	0:08:45	1	0.0	100	2118	3600	0:11:15	2	13.1	100	2544	2550	0:11:17	2	13.1	100	2016	2803	0:12:27	1	0	100	0	4032	0:17:30	1	0	100	6048	4032	0:17:30	1	0	100
314681	22 May-14 17:39:39	0:00:00	2	0.0	100	1056	5300	0:08:46	1	0.0	100	2046	3600	0:11:25	2	14.3	100	2568	2550	0:11:25	2	13.7	100	2064	2803	0:12:30	1	0	100	0	4032	0:17:32	1	0	100	6048	4032	0:17:32	1	0	100
314682	22 May-14 17:39:45	0:00:00	2	0.0	100	1057	5300	0:08:50	1	0.0	100	1986	3600	0:11:36	2	13.1	100	2580	2550	0:11:36	2	11.4	100	2112	2803	0:12:37	1	0	100	0	4032	0:17:39	1	0	100	6048	4032	0:17:39	1	0	100
314683	22 May-14 17:39:51	0:00:00	1	0.0	100	1058	5300	0:08:49	1	0.0	100	1878	3600	0:11:42	2	12.0	100	2544	2550	0:11:42	2	12.0	100	2256	2803	0:12:39	1	0	100	0	4032	0:17:41	1	0	100	6048	4032	0:17:41	1	0	100
314684	22 May-14 17:39:56	0:00:00	2	0.0	100	1065	5300	0:08:48	1	0.0	100	1818	3600	0:11:53	2	11.4	100	2556	2550	0:11:54	2	12.0	100	2304	2803	0:12:38	1	0	100	0	4032	0:17:41	1	0	100	6048	4032	0:17:41	1	0	100
314685	22 May-14 17:40:01	0:00:00	2	0.0	100	1072	5300	0:08:45	1	0.0	100	1758	3600	0:11:56	2	11.4	100	2544	2550	0:11:56	2	13.2	100	2376	2803	0:12:37	1	0	100	0	4032	0:17:39	1	0	100	6048	4032	0:17:39	1	0	100
314686	22 May-14 17:40:06	0:00:00	1	0.0	100	1072	5300	0:08:41	1	0.0	100	1710	3600	0:11:58	2	10.8	100	2520	2550	0:11:59	2	13.2	100	2448	2803	0:12:34	1	0	100	0	4032	0:17:36	1	0	100	6048	4032	0:17:36	1	0	100
314687	22 May-14 17:40:11	0:00:00	1	0.0	100	1072	5300	0:08:41	1	0.0	100	1650	3600	0:12:03	2	11.4	100	2532	2550	0:12:06	2	12.0	100	2496	2803	0:12:35	1	0	100	0	4032	0:17:38	1	0	100	6048	4032	0:17:38	1	0	100
314688	22 May-14 17:40:16	0:00:00	1	0.0	100	1072	5300	0:08:41	1	0.0	100	1602	3600	0:12:10	2	10.8	100	2532	2550	0:12:11	2	12.0	100	2544	2803	0:12:37	1	0	100	0	4032	0:17:39	1	0	100	6048	4032	0:17:39	1	0	100
314689	22 May-14 17:40:21	0:00:00	1	0.0	100	1072	5300	0:08:41	1	0.0	100	1542	3600	0:12:15	2	10.8	100	2520	2550	0:12:16	2	12.0	100	2616	2803	0:12:38	1	0	100	0	4032	0:17:40	1	0	100	6048	4032	0:17:40	1	0	100
314690	22 May-14 17:40:26	0:00:00	1	0.0	100	1072	5300	0:08:41	1	0.0	100	1542	3600	0:12:21	2	10.8	100	2520	2550	0:12:24	2	12.0	100	2616	2803	0:12:39	1	0	100	0	4032	0:17:42	1	0	100	6048	4032	0:17:42	1	0	100
314691	22 May-14 17:40:31	0:00:00	1	0.0	100	1072	5300	0:08:41	1	0.0	100	1470	3600	0:12:21	2	10.9	100	2520	2550	0:12:24	2	10.9	100	2688	2803	0:12:39	1	0	100	0	4032	0:17:42	1	0	100	6048	4032	0:17:42	1	0	100
314692	22 May-14 17:40:36	0:00:00	2	0.0	100	1082	5300	0:08:41	1	0.0	100	1398	3600	0:12:30	2	11.5	100	2544	2550	0:12:32	2	10.9	100	2736	2803	0:12:42	1	0	100	0	4032	0:17:44	1	0	100	6048	4032	0:17:44	1	0	100
314693	22 May-14 17:40:41	0:00:00	2	0.0	100	1087	5300	0:08:36	1	0.0	100	1350	3600	0:12:32	2	11.5	100	2544	2550	0:12:33	2	10.9	100	2784	2803	0:12:38	1	0	100	0	4032	0:17:41	1	0	100	6048	4032	0:17:41	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
314694	22 May-14 17:40:46	0:00:00	1	0.0	100	1087	5300	0:08:34	1	0.0	100	1290	3600	0:12:35	2	11.5	100	2532	2550	0:12:36	2	10.9	100	2856	2803	0:12:37	1	0	100	0	4032	0:17:40	1	0	100	6048	4032	0:17:40	1	0	100
314695	22 May-14 17:40:51	0:00:00	1	0.0	100	1087	5300	0:08:34	1	0.0	100	1254	3600	0:12:42	2	10.8	100	2568	2550	0:12:43	1	0.0	100	2856	2803	0:12:43	1	0	100	0	4032	0:17:46	1	0	100	6048	4032	0:17:46	1	0	100
314696	22 May-14 17:40:56	0:00:00	1	0.0	100	1087	5300	0:08:37	1	0.0	100	1230	3600	0:12:48	2	8.4	100	2592	2550	0:12:48	1	0.0	100	2856	2803	0:12:48	1	0	100	0	4032	0:17:51	1	0	100	6048	4032	0:17:51	1	0	100
314697	22 May-14 17:41:01	0:00:00	1	0.0	100	1087	5300	0:08:40	1	0.0	100	1194	3600	0:12:54	2	7.8	100	2628	2550	0:12:54	1	0.0	100	2856	2803	0:12:54	1	0	100	0	4032	0:17:56	1	0	100	6048	4032	0:17:56	1	0	100
314698	22 May-14 17:41:06	0:00:00	2	0.0	100	1088	5300	0:08:40	1	0.0	100	1170	3600	0:12:58	2	6.0	100	2652	2550	0:12:58	1	0.0	100	2856	2803	0:12:58	1	0	100	0	4032	0:18:00	1	0	100	6048	4032	0:18:00	1	0	100
314699	22 May-14 17:41:11	0:00:00	1	0.0	100	1088	5300	0:08:39	1	0.0	100	1134	3600	0:13:00	2	6.0	100	2688	2550	0:13:00	1	0.0	100	2856	2803	0:13:00	1	0	100	0	4032	0:18:02	1	0	100	6048	4032	0:18:02	1	0	100
314700	22 May-14 17:41:16	0:00:00	2	0.0	100	1094	5300	0:08:39	1	0.0	100	1110	3600	0:13:04	2	6.0	100	2712	2550	0:13:04	1	0.0	100	2856	2803	0:13:04	1	0	100	0	4032	0:18:06	1	0	100	6048	4032	0:18:06	1	0	100
314701	22 May-14 17:41:21	0:00:00	1	0.0	100	1094	5300	0:08:36	1	0.0	100	1110	3600	0:13:03	1	0.0	100	2664	2550	0:13:03	2	2.4	100	2904	2803	0:13:03	1	0	100	0	4032	0:18:05	1	0	100	6048	4032	0:18:05	1	0	100
314702	22 May-14 17:41:26	0:00:00	1	0.0	100	1094	5300	0:08:36	1	0.0	100	1110	3600	0:13:03	1	0.0	100	2592	2550	0:13:03	2	6.0	100	2976	2803	0:13:03	1	0	100	0	4032	0:18:05	1	0	100	6048	4032	0:18:05	1	0	100
314703	22 May-14 17:41:31	0:00:00	1	0.0	100	1094	5300	0:08:40	1	0.0	100	1062	3600	0:13:07	2	3.6	100	2592	2550	0:13:07	2	8.4	100	3024	2803	0:13:07	1	0	100	0	4032	0:18:09	1	0	100	6048	4032	0:18:09	1	0	100
314704	22 May-14 17:41:36	0:00:00	1	0.0	100	1094	5300	0:08:42	1	0.0	100	1014	3600	0:13:14	2	4.8	100	2568	2550	0:13:14	2	12.0	100	3096	2803	0:13:14	1	0	100	0	4032	0:18:17	1	0	100	6048	4032	0:18:17	1	0	100
314705	22 May-14 17:41:41	0:00:00	1	0.0	100	1094	5300	0:08:42	1	0.0	100	966	3600	0:13:19	2	7.2	100	2544	2550	0:13:19	2	13.2	100	1152	2803	0:13:19	2	20	100	2016	4032	0:18:22	1	0	100	6048	4032	0:18:22	1	0	100
314706	22 May-14 17:41:46	0:00:00	1	0.0	100	1094	5300	0:08:42	1	0.0	100	918	3600	0:13:24	2	9.6	100	2520	2550	0:13:25	2	13.2	100	1224	2803	0:15:42	1	0	100	2016	4032	0:18:13	1	0	100	6048	4032	0:18:13	1	0	100
314707	22 May-14 17:41:52	0:00:00	1	0.0	100	1094	5300	0:08:42	1	0.0	100	882	3600	0:13:30	2	9.0	100	2508	2550	0:13:32	2	13.2	100	1272	2803	0:15:43	1	0	100	2016	4032	0:18:14	1	0	100	6048	4032	0:18:14	1	0	100
314708	22 May-14 17:41:57	0:00:00	1	0.0	100	1094	5300	0:08:42	1	0.0	100	834	3600	0:13:33	2	9.0	100	2484	2550	0:13:37	2	13.2	100	1344	2803	0:15:44	1	0	100	2016	4032	0:18:15	1	0	100	6048	4032	0:18:15	1	0	100
314709	22 May-14 17:42:02	0:00:00	1	0.0	100	1094	5300	0:08:43	1	0.0	100	798	3600	0:13:39	2	8.4	100	2448	2550	0:13:45	2	13.2	100	1416	2803	0:15:45	1	0	100	2016	4032	0:18:16	1	0	100	6048	4032	0:18:16	1	0	100
314710	22 May-14 17:42:07	0:00:00	1	0.0	100	1094	5300	0:08:43	1	0.0	100	750	3600	0:13:43	2	8.4	100	2424	2550	0:13:52	2	13.2	100	1488	2803	0:15:46	1	0	100	2016	4032	0:18:17	1	0	100	6048	4032	0:18:17	1	0	100
314711	22 May-14 17:42:12	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	714	3600	0:13:51	2	8.4	100	2388	2550	0:14:02	2	14.4	100	1560	2803	0:15:50	1	0	100	2016	4032	0:18:21	1	0	100	6048	4032	0:18:21	1	0	100
314712	22 May-14 17:42:17	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	678	3600	0:13:54	2	7.4	100	2376	2550	0:14:09	2	12.6	100	1608	2803	0:15:51	1	0	100	2016	4032	0:18:22	1	0	100	6048	4032	0:18:22	1	0	100
314713	22 May-14 17:42:22	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	642	3600	0:13:58	2	7.4	100	2340	2550	0:14:14	2	12.6	100	1680	2803	0:15:52	1	0	100	2016	4032	0:18:24	1	0	100	6048	4032	0:18:24	1	0	100
314714	22 May-14 17:42:27	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	618	3600	0:14:02	2	6.3	100	2340	2550	0:14:21	2	10.3	100	1704	2803	0:15:54	1	0	100	2016	4032	0:18:25	1	0	100	6048	4032	0:18:25	1	0	100
314715	22 May-14 17:42:32	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:05	2	5.7	100	2364	2550	0:14:24	1	0.0	100	1704	2803	0:15:54	1	0	100	2016	4032	0:18:25	1	0	100	6048	4032	0:18:25	1	0	100
314716	22 May-14 17:42:37	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	2364	2550	0:14:24	1	0.0	100	1704	2803	0:15:55	1	0	100	2016	4032	0:18:26	1	0	100	6048	4032	0:18:26	1	0	100
314717	22 May-14 17:42:42	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	2364	2550	0:14:24	1	0.0	100	1704	2803	0:15:55	1	0	100	2016	4032	0:18:26	1	0	100	6048	4032	0:18:26	1	0	100
314718	22 May-14 17:42:47	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	2364	2550	0:14:25	1	0.0	100	1704	2803	0:15:55	1	0	100	2016	4032	0:18:26	1	0	100	6048	4032	0:18:26	1	0	100
314719	22 May-14 17:42:52	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	2364	2550	0:14:25	1	0.0	100	1704	2803	0:15:55	1	0	100	2016	4032	0:18:27	1	0	100	6048	4032	0:18:27	1	0	100
314720	22 May-14 17:42:57	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	2364	2550	0:14:25	1	0.0	100	1704	2803	0:15:56	1	0	100	2016	4032	0:18:27	1	0	100	6048	4032	0:18:27	1	0	100
314721	22 May-14 17:43:02	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	2364	2550	0:14:25	1	0.0	100	1704	2803	0:15:56	1	0	100	2016	4032	0:18:27	1	0	100	6048	4032	0:18:27	1	0	100
314722	22 May-14 17:43:07	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	2364	2550	0:14:25	1	0.0	100	1704	2803	0:15:56	1	0	100	2016	4032	0:18:27	1	0	100	6048	4032	0:18:27	1	0	100
314723	22 May-14 17:43:12	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	2364	2550	0:14:25	1	0.0	100	1704	2803	0:15:56	1	0	100	2016	4032	0:18:27	1	0	100	6048	4032	0:18:27	1	0	100
314724	22 May-14 17:43:17	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	2364	2550	0:14:25	1	0.0	100	1704	2803	0:15:56	1	0	100	2016	4032	0:18:27	1	0	100	6048	4032	0:18:27	1	0	100
314725	22 May-14 17:43:22	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	2364	2550	0:14:25	1	0.0	100	1704	2803	0:15:56	1	0	100	2016	4032	0:18:28	1	0	100	6048	4032	0:18:28	1	0	100
314726	22 May-14 17:43:28	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	2364	2550	0:14:25	1	0.0	100	1704	2803	0:15:56	1	0	100	2016	4032	0:18:28	1	0	100	6048	4032	0:18:28	1	0	100
314727	22 May-14 17:43:33	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	2340	2550	0:14:25	2	1.2	100	1728	2803	0:15:56	1	0	100	2016	4032	0:18:28	1	0	100	6048	4032	0:18:28	1	0	100
314728	22 May-14 17:43:38	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	2292	2550	0:14:27	2	3.6	100	1776	2803	0:15:57	1	0	100	2016	4032	0:18:28	1	0	100	6048	4032	0:18:28	1	0	100
314729	22 May-14 17:43:43	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	2220	2550	0:14:32	2	7.2	100	1848	2803	0:15:57	1	0	100	2016	4032	0:18:28	1	0	100	6048	4032	0:18:28	1	0	100
314730	22 May-14 17:43:48	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	2196	2550	0:14:38	2	8.0	100	1872	2803	0:15:58	1	0	100	2016	4032	0:18:29	1	0	100	6048	4032	0:18:29	1	0	100
314731	22 May-14 17:43:54	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	2196	2550	0:14:41	1	0.0	100	1872	2803	0:15:58	1	0	100	2016	4032	0:18:29	1	0	100	6048	4032	0:18:29	1	0	100
314732	22 May-14 17:43:59	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	2196	2550	0:14:41	1	0.0	100	1872	2803	0:15:58	1	0	100	2016	4032	0:18:29	1	0	100	6048	4032	0:18:29	1	0	100
314733	22 May-14 17:44:04	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	2148	2550	0:14:41	2	3.4	100	1920	2803	0:15:58	1	0	100	2016	4032	0:18:29	1	0	100	6048	4032	0:18:29	1	0	100
314734	22 May-14 17:44:09	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	2100	2550	0:14:45	2	4.8	100	1968	2803	0:15:58	1	0	100	2016	4032	0:18:29	1	0	100	6048	4032	0:18:29	1	0	100
314735	22 May-14 17:44:15	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	2028	2550	0:14:50	2	8.4	100	2040	2803	0:15:59	1	0	100	2016	4032	0:18:30	1	0	100	6048	4032	0:18:30	1	0	100
314736	22 May-14 17:44:20	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	1956	2550	0:14:56	2	11.4	100	2112	2803	0:15:59	1	0	100	2016	4032	0:18:31	1	0	100	6048	4032	0:18:31	1	0	100
314737	22 May-14 17:44:25	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	1956	2550	0:15:03	1	0.0	100	2112	2803	0:16:00	1	0	100	2016	4032	0:18:31	1	0	100	6048	4032	0:18:31	1	0	100
314738	22 May-14 17:44:30	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	1956	2550	0:15:03	1	0.0	100	2112	2803	0:16:00	1	0	100	2016	4032	0:18:31	1	0	100	6048	4032	0:18:31	1	0	100
314739	22 May-14 17:44:35	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	1908	2550	0:15:03	2	5.5	100	2160	2803	0:16:00	1	0	100	2016	4032	0:18:31	1	0	100	6048	4032	0:18:31	1	0	100
314740	22 May-14 17:44:40	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	1836	2550	0:15:08	2	5.7	100	2232	2803	0:16:01	1	0	100	2016	4032	0:18:32	1	0	100	6048	4032	0:18:32	1	0	100
314741	22 May-14 17:44:45	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	1788	2550	0:15:14	2	8.0	100	2280	2803	0:16:01	1	0	100	2016	4032	0:18:33	1	0	100	6048	4032	0:18:33	1	0	100
314742	22 May-14 17:44:50	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	1716	2550	0:15:19	2	11.4	100	336	2803	0:16:02	2	20	100	4032	4032	0:18:33	1	0	100	6048	4032	0:18:33	1	0	100
314743	22 May-14 17:44:55	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	1644	2550	0:15:26	2	13.2	100	408	2803	0:18:49	1	0	100	4032	4032	0:18:49	1	0	100	6048	4032	0:18:49	1	0	100
314744	22 May-14 17:45:00	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	1572	2550	0:15:32	2	13.2	100	480	2803	0:18:50	1	0	100	4032	4032	0:18:50	1	0	100	6048	4032	0:18:50	1	0	100
314745	22 May-14 17:45:05	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	1524	2550	0:15:39	2	13.2	100	528	2803	0:18:50	1	0	100	4032	4032	0:18:50	1	0	100	6048	4032	0:18:50	1	0	100
314746	22 May-14 17:45:10	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	1452	2550	0:15:44	2	13.2	100	600	2803	0:18:51	1	0	100	4032	4032	0:18:51	1	0	100	6048	4032	0:18:51	1	0	100
314747	22 May-14 17:45:15	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	1380	2550	0:15:50	2	13.2	100	672	2803	0:18:52	1	0	100	4032	4032	0:18:52	1	0	100	6048	4032	0:18:52	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
314748	22 May-14 17:45:20	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	1332	2550	0:15:57	2	12.0	100	720	2803	0:18:52	1	0	100	4032	4032	0:18:52	1	0	100	6048	4032	0:18:52	1	0	100
314749	22 May-14 17:45:25	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	1260	2550	0:16:02	2	13.2	100	792	2803	0:18:53	1	0	100	4032	4032	0:18:53	1	0	100	6048	4032	0:18:53	1	0	100
314750	22 May-14 17:45:30	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	1188	2550	0:16:08	2	13.2	100	864	2803	0:18:53	1	0	100	4032	4032	0:18:53	1	0	100	6048	4032	0:18:53	1	0	100
314751	22 May-14 17:45:35	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	1140	2550	0:16:15	2	12.0	100	912	2803	0:18:54	1	0	100	4032	4032	0:18:54	1	0	100	6048	4032	0:18:54	1	0	100
314752	22 May-14 17:45:40	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	1068	2550	0:16:20	2	13.2	100	984	2803	0:18:55	1	0	100	4032	4032	0:18:55	1	0	100	6048	4032	0:18:55	1	0	100
314753	22 May-14 17:45:45	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	1020	2550	0:16:26	2	12.0	100	1032	2803	0:18:56	1	0	100	4032	4032	0:18:56	1	0	100	6048	4032	0:18:56	1	0	100
314754	22 May-14 17:45:50	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	972	2550	0:16:31	2	10.8	100	1080	2803	0:18:56	1	0	100	4032	4032	0:18:56	1	0	100	6048	4032	0:18:56	1	0	100
314755	22 May-14 17:45:55	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	900	2550	0:16:35	2	12.0	100	1152	2803	0:18:57	1	0	100	4032	4032	0:18:57	1	0	100	6048	4032	0:18:57	1	0	100
314756	22 May-14 17:46:00	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	852	2550	0:16:42	2	10.8	100	1200	2803	0:18:58	1	0	100	4032	4032	0:18:58	1	0	100	6048	4032	0:18:58	1	0	100
314757	22 May-14 17:46:05	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	804	2550	0:16:47	2	10.8	100	1248	2803	0:18:58	1	0	100	4032	4032	0:18:58	1	0	100	6048	4032	0:18:58	1	0	100
314758	22 May-14 17:46:10	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	732	2550	0:16:51	2	12.0	100	1320	2803	0:18:59	1	0	100	4032	4032	0:18:59	1	0	100	6048	4032	0:18:59	1	0	100
314759	22 May-14 17:46:15	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	684	2550	0:16:58	2	10.8	100	1368	2803	0:19:00	1	0	100	4032	4032	0:19:00	1	0	100	6048	4032	0:19:00	1	0	100
314760	22 May-14 17:46:20	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	636	2550	0:17:02	2	10.8	100	1416	2803	0:19:00	1	0	100	4032	4032	0:19:00	1	0	100	6048	4032	0:19:00	1	0	100
314761	22 May-14 17:46:25	0:00:00	1	0.0	100	1094	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	564	2550	0:17:07	2	12.0	100	1488	2803	0:19:01	1	0	100	4032	4032	0:19:01	1	0	100	6048	4032	0:19:01	1	0	100
314762	22 May-14 17:46:30	0:00:00	2	0.0	100	1099	5300	0:08:45	1	0.0	100	594	3600	0:14:07	1	0.0	100	564	2550	0:17:14	1	0.0	100	1488	2803	0:19:02	1	0	100	4032	4032	0:19:02	1	0	100	6048	4032	0:19:02	1	0	100
314763	22 May-14 17:46:35	0:00:00	2	0.0	100	1102	5300	0:08:42	1	0.0	100	594	3600	0:14:05	1	0.0	100	516	2550	0:17:11	2	8.4	100	1536	2803	0:18:59	1	0	100	4032	4032	0:18:59	1	0	100	6048	4032	0:18:59	1	0	100
314764	22 May-14 17:46:40	0:00:00	2	0.0	100	1103	5300	0:08:41	1	0.0	100	594	3600	0:14:03	1	0.0	100	516	2550	0:17:14	1	0.0	100	1536	2803	0:18:58	1	0	100	4032	4032	0:18:58	1	0	100	6048	4032	0:18:58	1	0	100
314765	22 May-14 17:46:45	0:00:00	2	0.0	100	1106	5300	0:08:40	1	0.0	100	594	3600	0:14:02	1	0.0	100	516	2550	0:17:13	1	0.0	100	1536	2803	0:18:57	1	0	100	4032	4032	0:18:57	1	0	100	6048	4032	0:18:57	1	0	100
314766	22 May-14 17:46:50	0:00:00	2	0.0	100	1110	5300	0:08:39	1	0.0	100	594	3600	0:14:01	1	0.0	100	516	2550	0:17:11	1	0.0	100	1536	2803	0:18:56	1	0	100	4032	4032	0:18:56	1	0	100	6048	4032	0:18:56	1	0	100
314767	22 May-14 17:46:55	0:00:00	1	0.0	100	1110	5300	0:08:36	1	0.0	100	594	3600	0:13:58	1	0.0	100	516	2550	0:17:09	1	0.0	100	1536	2803	0:18:54	1	0	100	4032	4032	0:18:54	1	0	100	6048	4032	0:18:54	1	0	100
314768	22 May-14 17:47:00	0:00:00	1	0.0	100	1110	5300	0:08:36	1	0.0	100	594	3600	0:13:58	1	0.0	100	492	2550	0:17:09	2	1.2	100	1560	2803	0:18:54	1	0	100	4032	4032	0:18:54	1	0	100	6048	4032	0:18:54	1	0	100
314769	22 May-14 17:47:05	0:00:00	1	0.0	100	1110	5300	0:08:36	1	0.0	100	594	3600	0:13:58	1	0.0	100	420	2550	0:17:11	2	4.8	100	1632	2803	0:18:54	1	0	100	4032	4032	0:18:54	1	0	100	6048	4032	0:18:54	1	0	100
314770	22 May-14 17:47:10	0:00:00	2	0.0	100	1114	5300	0:08:36	1	0.0	100	594	3600	0:13:58	1	0.0	100	372	2550	0:17:18	2	7.2	100	1680	2803	0:18:55	1	0	100	4032	4032	0:18:55	1	0	100	6048	4032	0:18:55	1	0	100
314771	22 May-14 17:47:15	0:00:00	2	0.0	100	1115	5300	0:08:34	1	0.0	100	594	3600	0:13:56	1	0.0	100	324	2550	0:17:20	2	9.1	100	1728	2803	0:18:53	1	0	100	4032	4032	0:18:53	1	0	100	6048	4032	0:18:53	1	0	100
314772	22 May-14 17:47:20	0:00:00	1	0.0	100	1115	5300	0:08:34	1	0.0	100	594	3600	0:13:56	1	0.0	100	252	2550	0:17:25	2	11.4	100	1800	2803	0:18:54	1	0	100	4032	4032	0:18:54	1	0	100	6048	4032	0:18:54	1	0	100
314773	22 May-14 17:47:25	0:00:00	1	0.0	100	1115	5300	0:08:36	1	0.0	100	594	3600	0:13:58	1	0.0	100	204	2550	0:17:33	2	10.3	100	1848	2803	0:18:56	1	0	100	4032	4032	0:18:56	1	0	100	6048	4032	0:18:56	1	0	100
314774	22 May-14 17:47:30	0:00:00	1	0.0	100	1115	5300	0:08:37	1	0.0	100	594	3600	0:13:59	1	0.0	100	180	2550	0:17:39	2	9.1	100	1872	2803	0:18:58	1	0	100	4032	4032	0:18:58	1	0	100	6048	4032	0:18:58	1	0	100
314775	22 May-14 17:47:35	0:00:00	1	0.0	100	1115	5300	0:08:38	1	0.0	100	594	3600	0:14:00	1	0.0	100	180	2550	0:17:42	1	0.0	100	1872	2803	0:18:59	1	0	100	4032	4032	0:18:59	1	0	100	6048	4032	0:18:59	1	0	100
314776	22 May-14 17:47:40	0:00:00	1	0.0	100	1115	5300	0:08:39	1	0.0	100	594	3600	0:14:01	1	0.0	100	180	2550	0:17:43	1	0.0	100	1872	2803	0:19:00	1	0	100	4032	4032	0:19:00	1	0	100	6048	4032	0:19:00	1	0	100
314777	22 May-14 17:47:45	0:00:00	1	0.0	100	1115	5300	0:08:40	1	0.0	100	594	3600	0:14:03	1	0.0	100	180	2550	0:17:45	1	0.0	100	1872	2803	0:19:02	1	0	100	4032	4032	0:19:02	1	0	100	6048	4032	0:19:02	1	0	100
314778	22 May-14 17:47:50	0:00:00	1	0.0	100	1115	5300	0:08:40	1	0.0	100	594	3600	0:14:03	1	0.0	100	180	2550	0:17:45	1	0.0	100	1872	2803	0:19:02	1	0	100	4032	4032	0:19:02	1	0	100	6048	4032	0:19:02	1	0	100
314779	22 May-14 17:47:55	0:00:00	1	0.0	100	1115	5300	0:08:40	1	0.0	100	594	3600	0:14:03	1	0.0	100	180	2550	0:17:45	1	0.0	100	1872	2803	0:19:02	1	0	100	4032	4032	0:19:02	1	0	100	6048	4032	0:19:02	1	0	100
314780	22 May-14 17:48:00	0:00:00	1	0.0	100	1115	5300	0:08:40	1	0.0	100	594	3600	0:14:03	1	0.0	100	180	2550	0:17:45	1	0.0	100	1872	2803	0:19:02	1	0	100	4032	4032	0:19:02	1	0	100	6048	4032	0:19:02	1	0	100
314781	22 May-14 17:48:05	0:00:00	1	0.0	100	1115	5300	0:08:42	1	0.0	100	594	3600	0:14:04	1	0.0	100	180	2550	0:17:46	1	0.0	100	1872	2803	0:19:04	1	0	100	4032	4032	0:19:04	1	0	100	6048	4032	0:19:04	1	0	100
314782	22 May-14 17:48:10	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	1872	2803	0:19:04	1	0	100	4032	4032	0:19:04	1	0	100	6048	4032	0:19:04	1	0	100
314783	22 May-14 17:48:15	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	1872	2803	0:19:04	1	0	100	4032	4032	0:19:04	1	0	100	6048	4032	0:19:04	1	0	100
314784	22 May-14 17:48:20	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	1872	2803	0:19:04	1	0	100	4032	4032	0:19:04	1	0	100	6048	4032	0:19:04	1	0	100
314785	22 May-14 17:48:25	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	1872	2803	0:19:04	1	0	100	4032	4032	0:19:04	1	0	100	6048	4032	0:19:04	1	0	100
314786	22 May-14 17:48:30	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	1872	2803	0:19:04	1	0	100	4032	4032	0:19:04	1	0	100	6048	4032	0:19:04	1	0	100
314787	22 May-14 17:48:35	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	1872	2803	0:19:04	1	0	100	4032	4032	0:19:04	1	0	100	6048	4032	0:19:04	1	0	100
314788	22 May-14 17:48:40	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	1872	2803	0:19:04	1	0	100	4032	4032	0:19:04	1	0	100	6048	4032	0:19:04	1	0	100
314789	22 May-14 17:48:45	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	1872	2803	0:19:04	1	0	100	4032	4032	0:19:04	1	0	100	6048	4032	0:19:04	1	0	100
314790	22 May-14 17:48:50	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	1872	2803	0:19:04	1	0	100	4032	4032	0:19:04	1	0	100	6048	4032	0:19:04	1	0	100
314791	22 May-14 17:48:55	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	1872	2803	0:19:04	1	0	100	4032	4032	0:19:04	1	0	100	6048	4032	0:19:04	1	0	100
314792	22 May-14 17:49:00	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	1872	2803	0:19:04	1	0	100	4032	4032	0:19:04	1	0	100	6048	4032	0:19:04	1	0	100
314793	22 May-14 17:49:05	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	1872	2803	0:19:04	1	0	100	4032	4032	0:19:04	1	0	100	6048	4032	0:19:04	1	0	100
314794	22 May-14 17:49:10	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	1872	2803	0:19:04	1	0	100	4032	4032	0:19:04	1	0	100	6048	4032	0:19:04	1	0	100
314795	22 May-14 17:49:15	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	1872	2803	0:19:04	1	0	100	4032	4032	0:19:04	1	0	100	6048	4032	0:19:04	1	0	100
314796	22 May-14 17:49:20	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	1872	2803	0:19:04	1	0	100	4032	4032	0:19:04	1	0	100	6048	4032	0:19:04	1	0	100
314797	22 May-14 17:49:25	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	1872	2803	0:19:04	1	0	100	4032	4032	0:19:04	1	0	100	6048	4032	0:19:04	1	0	100
314798	22 May-14 17:49:30	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	1872	2803	0:19:04	1	0	100	4032	4032	0:19:04	1	0	100	6048	4032	0:19:04	1	0	100
314799	22 May-14 17:49:35	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	1872	2803	0:19:04	1	0	100	4032	4032	0:19:04	1	0	100	6048	4032	0:19:04	1	0	100
314800	22 May-14 17:49:40	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	0	2803	0:19:04	2	20	100	6048	4032	0:19:04	1	0	100	6048	4032	0:19:04	1	0	100
314801	22 May-14 17:49:45	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	0	2803	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
314802	22 May-14 17:49:50	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	0	2803	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100
314803	22 May-14 17:49:55	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	0	2803	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100
314804	22 May-14 17:50:00	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	0	2803	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100
314805	22 May-14 17:50:05	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	0	2803	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100
314806	22 May-14 17:50:10	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	0	2803	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100
314807	22 May-14 17:50:15	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	0	2803	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100
314808	22 May-14 17:50:20	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	0	2803	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100
314809	22 May-14 17:50:25	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	0	2803	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100
314810	22 May-14 17:50:30	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	0	2803	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100
314811	22 May-14 17:50:35	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	0	2803	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100
314812	22 May-14 17:50:40	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	0	2803	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100
314813	22 May-14 17:50:45	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	0	2803	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100
314814	22 May-14 17:50:50	0:00:00	1	0.0	100	1115	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	0	2803	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100
314815	22 May-14 17:50:55	0:00:00	2	2.4	100	1163	5300	0:08:43	1	0.0	100	594	3600	0:14:05	1	0.0	100	180	2550	0:17:47	1	0.0	100	0	2803	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100	6048	4032	0:21:40	1	0	100
314816	22 May-14 17:51:00	0:00:00	2	4.0	100	1194	5300	0:08:17	1	0.0	100	594	3600	0:13:39	1	0.0	100	180	2550	0:17:21	1	0.0	100	0	2803	0:21:15	1	0	100	6048	4032	0:21:15	1	0	100	6048	4032	0:21:15	1	0	100
314817	22 May-14 17:51:05	0:00:00	1	0.0	100	1194	5300	0:08:01	1	0.0	100	594	3600	0:13:23	1	0.0	100	180	2550	0:17:05	1	0.0	100	0	2803	0:20:59	1	0	100	6048	4032	0:20:59	1	0	100	6048	4032	0:20:59	1	0	100
314818	22 May-14 17:51:10	0:00:00	1	0.0	100	1194	5300	0:08:01	1	0.0	100	594	3600	0:13:23	1	0.0	100	180	2550	0:17:05	1	0.0	100	0	2803	0:20:59	1	0	100	6048	4032	0:20:59	1	0	100	6048	4032	0:20:59	1	0	100
314819	22 May-14 17:51:15	0:00:00	1	0.0	100	1194	5300	0:08:01	1	0.0	100	594	3600	0:13:23	1	0.0	100	180	2550	0:17:05	1	0.0	100	0	2803	0:20:59	1	0	100	6048	4032	0:20:59	1	0	100	6048	4032	0:20:59	1	0	100
314820	22 May-14 17:51:20	0:00:00	1	0.0	100	1194	5300	0:08:01	1	0.0	100	594	3600	0:13:23	1	0.0	100	180	2550	0:17:05	1	0.0	100	0	2803	0:20:59	1	0	100	6048	4032	0:20:59	1	0	100	6048	4032	0:20:59	1	0	100
314821	22 May-14 17:51:25	0:00:00	1	0.0	100	1194	5300	0:08:01	1	0.0	100	594	3600	0:13:23	1	0.0	100	180	2550	0:17:05	1	0.0	100	0	2803	0:20:59	1	0	100	6048	4032	0:20:59	1	0	100	6048	4032	0:20:59	1	0	100
314822	22 May-14 17:51:30	0:00:00	1	0.0	100	1194	5300	0:08:01	1	0.0	100	594	3600	0:13:23	1	0.0	100	180	2550	0:17:05	1	0.0	100	0	2803	0:20:59	1	0	100	6048	4032	0:20:59	1	0	100	6048	4032	0:20:59	1	0	100
314823	22 May-14 17:51:35	0:00:00	1	0.0	100	1194	5300	0:08:01	1	0.0	100	594	3600	0:13:23	1	0.0	100	180	2550	0:17:05	1	0.0	100	0	2803	0:20:59	1	0	100	6048	4032	0:20:59	1	0	100	6048	4032	0:20:59	1	0	100
314824	22 May-14 17:51:40	0:00:00	1	0.0	100	1194	5300	0:08:01	1	0.0	100	594	3600	0:13:23	1	0.0	100	180	2550	0:17:05	1	0.0	100	0	2803	0:20:59	1	0	100	6048	4032	0:20:59	1	0	100	6048	4032	0:20:59	1	0	100
314825	22 May-14 17:51:45	0:00:00	1	0.0	100	1194	5300	0:08:01	1	0.0	100	594	3600	0:13:23	1	0.0	100	180	2550	0:17:05	1	0.0	100	0	2803	0:20:59	1	0	100	6048	4032	0:20:59	1	0	100	6048	4032	0:20:59	1	0	100
314826	22 May-14 17:51:50	0:00:00	2	1.4	100	1222	5300	0:08:20	1	0.0	100	594	3600	0:13:42	1	0.0	100	180	2550	0:17:24	1	0.0	100	0	2803	0:21:18	1	0	100	6048	4032	0:21:18	1	0	100	6048	4032	0:21:18	1	0	100
314827	22 May-14 17:51:55	0:00:00	2	4.3	100	1280	5300	0:08:18	1	0.0	100	594	3600	0:13:40	1	0.0	100	180	2550	0:17:22	1	0.0	100	0	2803	0:21:15	1	0	100	6048	4032	0:21:15	1	0	100	6048	4032	0:21:15	1	0	100
314828	22 May-14 17:52:00	0:00:00	2	7.0	100	1333	5300	0:07:48	1	0.0	100	594	3600	0:13:10	1	0.0	100	180	2550	0:16:53	1	0.0	100	0	2803	0:20:46	1	0	100	6048	4032	0:20:46	1	0	100	6048	4032	0:20:46	1	0	100
314829	22 May-14 17:52:06	0:00:00	2	9.8	100	1389	5300	0:07:24	1	0.0	100	594	3600	0:12:46	1	0.0	100	180	2550	0:16:28	1	0.0	100	0	2803	0:20:22	1	0	100	6048	4032	0:20:22	1	0	100	6048	4032	0:20:22	1	0	100
314830	22 May-14 17:52:11	0:00:00	2	11.1	100	1444	5300	0:07:00	1	0.0	100	594	3600	0:12:22	1	0.0	100	180	2550	0:16:04	1	0.0	100	0	2803	0:19:58	1	0	100	6048	4032	0:19:58	1	0	100	6048	4032	0:19:58	1	0	100
314831	22 May-14 17:52:16	0:00:00	2	11.0	100	1500	5300	0:06:38	1	0.0	100	594	3600	0:12:00	1	0.0	100	180	2550	0:15:43	1	0.0	100	0	2803	0:19:36	1	0	100	6048	4032	0:19:36	1	0	100	6048	4032	0:19:36	1	0	100
314832	22 May-14 17:52:21	0:00:00	2	11.2	100	1556	5300	0:06:18	1	0.0	100	594	3600	0:11:40	1	0.0	100	180	2550	0:15:22	1	0.0	100	0	2803	0:19:16	1	0	100	6048	4032	0:19:16	1	0	100	6048	4032	0:19:16	1	0	100
314833	22 May-14 17:52:26	0:00:00	2	11.1	100	1611	5300	0:05:59	1	0.0	100	594	3600	0:11:21	1	0.0	100	180	2550	0:15:03	1	0.0	100	0	2803	0:18:57	1	0	100	6048	4032	0:18:57	1	0	100	6048	4032	0:18:57	1	0	100
314834	22 May-14 17:52:31	0:00:00	2	11.2	100	1667	5300	0:05:42	1	0.0	100	594	3600	0:11:04	1	0.0	100	180	2550	0:14:46	1	0.0	100	0	2803	0:18:40	1	0	100	6048	4032	0:18:40	1	0	100	6048	4032	0:18:40	1	0	100
314835	22 May-14 17:52:36	0:00:00	2	11.1	100	1722	5300	0:05:25	1	0.0	100	594	3600	0:10:47	1	0.0	100	180	2550	0:14:29	1	0.0	100	0	2803	0:18:23	1	0	100	6048	4032	0:18:23	1	0	100	6048	4032	0:18:23	1	0	100
314836	22 May-14 17:52:41	0:00:00	2	11.1	100	1778	5300	0:05:10	1	0.0	100	594	3600	0:10:32	1	0.0	100	180	2550	0:14:14	1	0.0	100	0	2803	0:18:08	1	0	100	6048	4032	0:18:08	1	0	100	6048	4032	0:18:08	1	0	100
314837	22 May-14 17:52:46	0:00:00	2	11.2	100	1834	5300	0:05:00	1	0.0	100	594	3600	0:10:22	1	0.0	100	180	2550	0:14:05	1	0.0	100	0	2803	0:17:58	1	0	100	6048	4032	0:17:58	1	0	100	6048	4032	0:17:58	1	0	100
314838	22 May-14 17:52:51	0:00:00	2	11.2	100	1890	5300	0:04:56	1	0.0	100	594	3600	0:10:18	1	0.0	100	180	2550	0:14:00	1	0.0	100	0	2803	0:17:54	1	0	100	6048	4032	0:17:54	1	0	100	6048	4032	0:17:54	1	0	100
314839	22 May-14 17:52:56	0:00:00	2	11.2	100	1945	5300	0:04:51	1	0.0	100	594	3600	0:10:13	1	0.0	100	180	2550	0:13:55	1	0.0	100	0	2803	0:17:48	1	0	100	6048	4032	0:17:48	1	0	100	6048	4032	0:17:48	1	0	100
314840	22 May-14 17:53:01	0:00:00	2	11.1	100	1999	5300	0:04:46	1	0.0	100	594	3600	0:10:08	1	0.0	100	180	2550	0:13:50	1	0.0	100	0	2803	0:17:44	1	0	100	6048	4032	0:17:44	1	0	100	6048	4032	0:17:44	1	0	100
314841	22 May-14 17:53:06	0:00:00	2	11.0	100	2054	5300	0:04:42	1	0.0	100	594	3600	0:10:04	1	0.0	100	180	2550	0:13:46	1	0.0	100	0	2803	0:17:39	1	0	100	6048	4032	0:17:39	1	0	100	6048	4032	0:17:39	1	0	100
314842	22 May-14 17:53:11	0:00:00	2	11.0	100	2110	5300	0:04:37	1	0.0	100	594	3600	0:09:59	1	0.0	100	180	2550	0:13:41	1	0.0	100	0	2803	0:17:35	1	0	100	6048	4032	0:17:35	1	0	100	6048	4032	0:17:35	1	0	100
314843	22 May-14 17:53:16	0:00:00	2	10.6	100	2168	5300	0:04:32	1	0.0	100	594	3600	0:09:54	1	0.0	100	180	2550	0:13:37	1	0.0	100	0	2803	0:17:30	1	0	100	6048	4032	0:17:30	1	0	100	6048	4032	0:17:30	1	0	100
314844	22 May-14 17:53:21	0:00:00	2	10.8	100	2225	5300	0:04:29	1	0.0	100	594	3600	0:09:51	1	0.0	100	180	2550	0:13:33	1	0.0	100	0	2803	0:17:26	1	0	100	6048	4032	0:17:26	1	0	100	6048	4032	0:17:26	1	0	100
314845	22 May-14 17:53:26	0:00:00	2	10.7	100	2279	5300	0:04:24	1	0.0	100	594	3600	0:09:46	1	0.0	100	180	2550	0:13:28	1	0.0	100	0	2803	0:17:21	1	0	100	6048	4032	0:17:21	1	0	100	6048	4032	0:17:21	1	0	100
314846	22 May-14 17:53:31	0:00:00	2	10.6	100	2332	5300	0:04:19	1	0.0	100	594	3600	0:09:41	1	0.0	100	180	2550	0:13:23	1	0.0	100	0	2803	0:17:17	1	0	100	6048	4032	0:17:17	1	0	100	6048	4032	0:17:17	1	0	100
314847	22 May-14 17:53:36	0:00:00	2	11.0	100	2388	5300	0:04:15	1	0.0	100	594	3600	0:09:37	1	0.0	100	180	2550	0:13:19	1	0.0	100	0	2803	0:17:13	1	0	100	6048	4032	0:17:13	1	0	100	6048	4032	0:17:13	1	0	100
314848	22 May-14 17:53:41	0:00:00	2	11.0	100	2444	5300	0:04:10	1	0.0	100	594	3600	0:09:32	1	0.0	100	180	2550	0:13:14	1	0.0	100	0	2803	0:17:08	1	0	100	6048	4032	0:17:08	1	0	100	6048	4032	0:17:08	1	0	100
314849	22 May-14 17:53:46	0:00:00	2	11.1	100	2501	5300	0:04:05	1	0.0	100	594	3600	0:09:27	1	0.0	100	180	2550	0:13:10	1	0.0	100	0	2803	0:17:03	1	0	100	6048	4032	0:17:03	1	0	100	6048	4032	0:17:03	1	0	100
314850	22 May-14 17:53:51	0:00:00	2	11.2	100	2555	5300	0:04:00	1	0.0	100	594	3600	0:09:22	1	0.0	100	180	2550	0:13:04	1	0.0	100	0	2803	0:16:58	1	0	100	6048	4032	0:16:58	1	0	100	6048	4032	0:16:58	1	0	100
314851	22 May-14 17:53:56	0:00:00	2	11.2	100	2612	5300	0:03:55	1	0.0	100	594	3600	0:09:18	1	0.0	100	180	2550	0:13:00	1	0.0	100	0	2803	0:16:53	1	0	100	6048	4032	0:16:53	1	0	100	6048	4032	0:16:53	1	0	100
314852	22 May-14 17:54:01	0:00:00	2	11.2	100	2668	5300	0:03:50	1	0.0	100	594	3600	0:09:12	1	0.0	100	180	2550	0:12:55	1	0.0	100	0	2803	0:16:48	1	0	100	6048	4032	0:16:48	1	0	100	6048	4032	0:16:48	1	0	100
314853	22 May-14 17:54:06	0:00:00	2	11.1	100	2723	5300	0:03:45	1	0.0	100	594	3600	0:09:08	1	0.0	100	180	2550	0:12:50	1	0.0	100	0	2803	0:16:43	1	0	100	6048	4032	0:16:43	1	0	100	6048	4032	0:16:43	1	0	100
314854	22 May-14 17:54:11	0:00:00	2	11.2	100	2778	5300	0:03:40	1	0.0	100	594	3600	0:09:02	1	0.0	100	180	2550	0:12:44	1	0.0	100	0	2803	0:16:38	1	0	100	6048	4032	0:16:38	1	0	100	6048	4032	0:16:38	1	0	100
314855	22 May-14 17:54:16	0:00:00	2	11.1	100	2834	5300	0:03:35	1	0.0	100	594	3600	0:08:57	1	0.0	100	180	2550	0:12:40	1	0.0	100	0	2803	0:16:33	1	0	100	6048	4032	0:16:33	1	0	100	6048	4032	0:16:33	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
314856	22 May-14 17:54:21	0:00:00	2	11.1	100	2890	5300	0:03:30	1	0.0	100	594	3600	0:08:52	1	0.0	100	180	2550	0:12:35	1	0.0	100	0	2803	0:16:28	1	0	100	6048	4032	0:16:28	1	0	100	6048	4032	0:16:28	1	0	100
314857	22 May-14 17:54:26	0:00:00	2	11.1	100	2945	5300	0:03:25	1	0.0	100	594	3600	0:08:47	1	0.0	100	180	2550	0:12:29	1	0.0	100	0	2803	0:16:23	1	0	100	6048	4032	0:16:23	1	0	100	6048	4032	0:16:23	1	0	100
314858	22 May-14 17:54:31	0:00:00	2	11.2	100	3001	5300	0:03:21	1	0.0	100	594	3600	0:08:43	1	0.0	100	180	2550	0:12:25	1	0.0	100	0	2803	0:16:18	1	0	100	6048	4032	0:16:18	1	0	100	6048	4032	0:16:18	1	0	100
314859	22 May-14 17:54:36	0:00:00	2	11.1	100	3056	5300	0:03:16	1	0.0	100	594	3600	0:08:38	1	0.0	100	180	2550	0:12:20	1	0.0	100	0	2803	0:16:14	1	0	100	6048	4032	0:16:14	1	0	100	6048	4032	0:16:14	1	0	100
314860	22 May-14 17:54:41	0:00:00	2	11.1	100	3112	5300	0:03:11	1	0.0	100	594	3600	0:08:33	1	0.0	100	180	2550	0:12:16	1	0.0	100	0	2803	0:16:09	1	0	100	6048	4032	0:16:09	1	0	100	6048	4032	0:16:09	1	0	100
314861	22 May-14 17:54:46	0:00:00	2	11.2	100	3168	5300	0:03:06	1	0.0	100	594	3600	0:08:28	1	0.0	100	180	2550	0:12:11	1	0.0	100	0	2803	0:16:04	1	0	100	6048	4032	0:16:04	1	0	100	6048	4032	0:16:04	1	0	100
314862	22 May-14 17:54:51	0:00:00	2	11.1	100	3223	5300	0:03:02	1	0.0	100	594	3600	0:08:24	1	0.0	100	180	2550	0:12:06	1	0.0	100	0	2803	0:15:59	1	0	100	6048	4032	0:15:59	1	0	100	6048	4032	0:15:59	1	0	100
314863	22 May-14 17:54:56	0:00:00	2	11.2	100	3279	5300	0:02:57	1	0.0	100	594	3600	0:08:19	1	0.0	100	180	2550	0:12:01	1	0.0	100	0	2803	0:15:55	1	0	100	6048	4032	0:15:55	1	0	100	6048	4032	0:15:55	1	0	100
314864	22 May-14 17:55:01	0:00:00	2	11.2	100	3335	5300	0:02:52	1	0.0	100	594	3600	0:08:14	1	0.0	100	180	2550	0:11:56	1	0.0	100	0	2803	0:15:50	1	0	100	6048	4032	0:15:50	1	0	100	6048	4032	0:15:50	1	0	100
314865	22 May-14 17:55:06	0:00:00	2	11.3	100	3393	5300	0:02:47	1	0.0	100	594	3600	0:08:09	1	0.0	100	180	2550	0:11:52	1	0.0	100	0	2803	0:15:45	1	0	100	6048	4032	0:15:45	1	0	100	6048	4032	0:15:45	1	0	100
314866	22 May-14 17:55:11	0:00:00	2	11.2	100	3446	5300	0:02:42	1	0.0	100	594	3600	0:08:04	1	0.0	100	180	2550	0:11:46	1	0.0	100	0	2803	0:15:40	1	0	100	6048	4032	0:15:40	1	0	100	6048	4032	0:15:40	1	0	100
314867	22 May-14 17:55:16	0:00:00	2	11.1	100	3501	5300	0:02:38	1	0.0	100	594	3600	0:08:00	1	0.0	100	180	2550	0:11:42	1	0.0	100	0	2803	0:15:36	1	0	100	6048	4032	0:15:36	1	0	100	6048	4032	0:15:36	1	0	100
314868	22 May-14 17:55:21	0:00:00	2	11.2	100	3559	5300	0:02:33	1	0.0	100	594	3600	0:07:55	1	0.0	100	180	2550	0:11:37	1	0.0	100	0	2803	0:15:31	1	0	100	6048	4032	0:15:31	1	0	100	6048	4032	0:15:31	1	0	100
314869	22 May-14 17:55:26	0:00:00	2	11.0	100	3613	5300	0:02:28	1	0.0	100	594	3600	0:07:50	1	0.0	100	180	2550	0:11:32	1	0.0	100	0	2803	0:15:26	1	0	100	6048	4032	0:15:26	1	0	100	6048	4032	0:15:26	1	0	100
314870	22 May-14 17:55:31	0:00:00	2	11.2	100	3670	5300	0:02:24	1	0.0	100	594	3600	0:07:46	1	0.0	100	180	2550	0:11:28	1	0.0	100	0	2803	0:15:21	1	0	100	6048	4032	0:15:21	1	0	100	6048	4032	0:15:21	1	0	100
314871	22 May-14 17:55:36	0:00:00	2	11.2	100	3724	5300	0:02:19	1	0.0	100	594	3600	0:07:41	1	0.0	100	180	2550	0:11:23	1	0.0	100	0	2803	0:15:16	1	0	100	6048	4032	0:15:16	1	0	100	6048	4032	0:15:16	1	0	100
314872	22 May-14 17:55:41	0:00:00	2	11.1	100	3780	5300	0:02:14	1	0.0	100	594	3600	0:07:36	1	0.0	100	180	2550	0:11:18	1	0.0	100	0	2803	0:15:12	1	0	100	6048	4032	0:15:12	1	0	100	6048	4032	0:15:12	1	0	100
314873	22 May-14 17:55:46	0:00:00	2	11.1	100	3835	5300	0:02:09	1	0.0	100	594	3600	0:07:31	1	0.0	100	180	2550	0:11:14	1	0.0	100	0	2803	0:15:07	1	0	100	6048	4032	0:15:07	1	0	100	6048	4032	0:15:07	1	0	100
314874	22 May-14 17:55:51	0:00:00	2	11.1	100	3891	5300	0:02:05	1	0.0	100	594	3600	0:07:27	1	0.0	100	180	2550	0:11:09	1	0.0	100	0	2803	0:15:02	1	0	100	6048	4032	0:15:02	1	0	100	6048	4032	0:15:02	1	0	100
314875	22 May-14 17:55:56	0:00:00	2	11.3	100	3949	5300	0:02:00	1	0.0	100	594	3600	0:07:22	1	0.0	100	180	2550	0:11:04	1	0.0	100	0	2803	0:14:58	1	0	100	6048	4032	0:14:58	1	0	100	6048	4032	0:14:58	1	0	100
314876	22 May-14 17:56:01	0:00:00	2	11.1	100	4002	5300	0:01:55	1	0.0	100	594	3600	0:07:17	1	0.0	100	180	2550	0:10:59	1	0.0	100	0	2803	0:14:53	1	0	100	6048	4032	0:14:53	1	0	100	6048	4032	0:14:53	1	0	100
314877	22 May-14 17:56:06	0:00:00	2	11.2	100	4058	5300	0:01:50	1	0.0	100	594	3600	0:07:12	1	0.0	100	180	2550	0:10:55	1	0.0	100	0	2803	0:14:48	1	0	100	6048	4032	0:14:48	1	0	100	6048	4032	0:14:48	1	0	100
314878	22 May-14 17:56:11	0:00:00	2	11.2	100	4114	5300	0:01:46	1	0.0	100	594	3600	0:07:08	1	0.0	100	180	2550	0:10:50	1	0.0	100	0	2803	0:14:43	1	0	100	6048	4032	0:14:43	1	0	100	6048	4032	0:14:43	1	0	100
314879	22 May-14 17:56:16	0:00:00	2	11.0	100	4169	5300	0:01:41	1	0.0	100	594	3600	0:07:03	1	0.0	100	180	2550	0:10:45	1	0.0	100	0	2803	0:14:39	1	0	100	6048	4032	0:14:39	1	0	100	6048	4032	0:14:39	1	0	100
314880	22 May-14 17:56:22	0:00:00	2	11.5	100	4231	5300	0:01:36	1	0.0	100	594	3600	0:06:58	1	0.0	100	180	2550	0:10:40	1	0.0	100	0	2803	0:14:34	1	0	100	6048	4032	0:14:34	1	0	100	6048	4032	0:14:34	1	0	100
314881	22 May-14 17:56:27	0:00:00	2	11.1	100	4280	5300	0:01:31	1	0.0	100	594	3600	0:06:53	1	0.0	100	180	2550	0:10:35	1	0.0	100	0	2803	0:14:28	1	0	100	6048	4032	0:14:28	1	0	100	6048	4032	0:14:28	1	0	100
314882	22 May-14 17:56:32	0:00:00	2	11.1	100	4336	5300	0:01:27	1	0.0	100	594	3600	0:06:49	1	0.0	100	180	2550	0:10:31	1	0.0	100	0	2803	0:14:24	1	0	100	6048	4032	0:14:24	1	0	100	6048	4032	0:14:24	1	0	100
314883	22 May-14 17:56:37	0:00:00	2	11.2	100	4392	5300	0:01:22	1	0.0	100	594	3600	0:06:44	1	0.0	100	180	2550	0:10:26	1	0.0	100	0	2803	0:14:20	1	0	100	6048	4032	0:14:20	1	0	100	6048	4032	0:14:20	1	0	100
314884	22 May-14 17:56:42	0:00:00	2	10.9	100	4449	5300	0:01:17	1	0.0	100	594	3600	0:06:39	1	0.0	100	180	2550	0:10:21	1	0.0	100	0	2803	0:14:15	1	0	100	6048	4032	0:14:15	1	0	100	6048	4032	0:14:15	1	0	100
314885	22 May-14 17:56:47	0:00:00	2	11.3	100	4506	5300	0:01:12	1	0.0	100	594	3600	0:06:34	1	0.0	100	180	2550	0:10:16	1	0.0	100	0	2803	0:14:10	1	0	100	6048	4032	0:14:10	1	0	100	6048	4032	0:14:10	1	0	100
314886	22 May-14 17:56:52	0:00:00	2	11.3	100	4562	5300	0:01:07	1	0.0	100	594	3600	0:06:29	1	0.0	100	180	2550	0:10:12	1	0.0	100	0	2803	0:14:05	1	0	100	6048	4032	0:14:05	1	0	100	6048	4032	0:14:05	1	0	100
314887	22 May-14 17:56:57	0:00:00	2	11.2	100	4615	5300	0:01:02	1	0.0	100	594	3600	0:06:24	1	0.0	100	180	2550	0:10:07	1	0.0	100	0	2803	0:14:00	1	0	100	6048	4032	0:14:00	1	0	100	6048	4032	0:14:00	1	0	100
314888	22 May-14 17:57:02	0:00:00	2	11.1	100	4671	5300	0:00:58	1	0.0	100	594	3600	0:06:20	1	0.0	100	180	2550	0:10:02	1	0.0	100	0	2803	0:13:56	1	0	100	6048	4032	0:13:56	1	0	100	6048	4032	0:13:56	1	0	100
314889	22 May-14 17:57:07	0:00:00	2	11.0	100	4726	5300	0:00:53	1	0.0	100	594	3600	0:06:15	1	0.0	100	180	2550	0:09:57	1	0.0	100	0	2803	0:13:51	1	0	100	6048	4032	0:13:51	1	0	100	6048	4032	0:13:51	1	0	100
314890	22 May-14 17:57:12	0:00:00	2	11.1	100	4778	5300	0:00:49	2	0.0	100	599	3600	0:06:11	1	0.0	100	180	2550	0:09:53	1	0.0	100	0	2803	0:13:46	1	0	100	6048	4032	0:13:46	1	0	100	6048	4032	0:13:46	1	0	100
314891	22 May-14 17:57:17	0:00:00	2	11.2	100	4792	5300	0:00:44	2	2.3	100	640	3600	0:06:05	1	0.0	100	180	2550	0:09:47	1	0.0	100	0	2803	0:13:40	1	0	100	6048	4032	0:13:40	1	0	100	6048	4032	0:13:40	1	0	100
314892	22 May-14 17:57:22	0:00:00	2	11.2	100	4800	5300	0:00:43	2	4.7	100	688	3600	0:05:50	1	0.0	100	180	2550	0:09:32	1	0.0	100	0	2803	0:13:26	1	0	100	6048	4032	0:13:26	1	0	100	6048	4032	0:13:26	1	0	100
314893	22 May-14 17:57:27	0:00:00	2	11.2	100	4804	5300	0:00:42	2	7.3	100	739	3600	0:05:35	1	0.0	100	180	2550	0:09:17	1	0.0	100	0	2803	0:13:10	1	0	100	6048	4032	0:13:10	1	0	100	6048	4032	0:13:10	1	0	100
314894	22 May-14 17:57:32	0:00:00	2	11.1	100	4810	5300	0:00:42	2	9.5	100	789	3600	0:05:20	1	0.0	100	180	2550	0:09:02	1	0.0	100	0	2803	0:12:55	1	0	100	6048	4032	0:12:55	1	0	100	6048	4032	0:12:55	1	0	100
314895	22 May-14 17:57:37	0:00:00	2	11.2	100	4815	5300	0:00:41	2	10.0	100	840	3600	0:05:06	1	0.0	100	180	2550	0:08:48	1	0.0	100	0	2803	0:12:41	1	0	100	6048	4032	0:12:41	1	0	100	6048	4032	0:12:41	1	0	100
314896	22 May-14 17:57:42	0:00:00	2	11.1	100	4820	5300	0:00:41	2	10.1	100	890	3600	0:04:52	1	0.0	100	180	2550	0:08:35	1	0.0	100	0	2803	0:12:28	1	0	100	6048	4032	0:12:28	1	0	100	6048	4032	0:12:28	1	0	100
314897	22 May-14 17:57:47	0:00:00	2	11.2	100	4825	5300	0:00:41	2	10.1	100	941	3600	0:04:40	1	0.0	100	180	2550	0:08:22	1	0.0	100	0	2803	0:12:16	1	0	100	6048	4032	0:12:16	1	0	100	6048	4032	0:12:16	1	0	100
314898	22 May-14 17:57:52	0:00:00	2	11.1	100	4830	5300	0:00:40	2	10.1	100	991	3600	0:04:28	1	0.0	100	180	2550	0:08:11	1	0.0	100	0	2803	0:12:04	1	0	100	6048	4032	0:12:04	1	0	100	6048	4032	0:12:04	1	0	100
314899	22 May-14 17:57:57	0:00:00	2	11.1	100	4835	5300	0:00:40	2	10.1	100	1042	3600	0:04:17	1	0.0	100	180	2550	0:08:00	1	0.0	100	0	2803	0:11:53	1	0	100	6048	4032	0:11:53	1	0	100	6048	4032	0:11:53	1	0	100
314900	22 May-14 17:58:02	0:00:00	2	11.2	100	4841	5300	0:00:39	2	10.1	100	1092	3600	0:04:07	1	0.0	100	180	2550	0:07:49	1	0.0	100	0	2803	0:11:43	1	0	100	6048	4032	0:11:43	1	0	100	6048	4032	0:11:43	1	0	100
314901	22 May-14 17:58:07	0:00:00	2	11.2	100	4847	5300	0:00:39	2	10.1	100	1143	3600	0:03:57	1	0.0	100	180	2550	0:07:40	1	0.0	100	0	2803	0:11:33	1	0	100	6048	4032	0:11:33	1	0	100	6048	4032	0:11:33	1	0	100
314902	22 May-14 17:58:12	0:00:00	2	11.2	100	4851	5300	0:00:38	2	10.1	100	1193	3600	0:03:52	1	0.0	100	180	2550	0:07:34	1	0.0	100	0	2803	0:11:28	1	0	100	6048	4032	0:11:28	1	0	100	6048	4032	0:11:28	1	0	100
314903	22 May-14 17:58:17	0:00:00	2	11.1	100	4855	5300	0:00:38	2	10.1	100	1244	3600	0:03:47	1	0.0	100	180	2550	0:07:30	1	0.0	100	0	2803	0:11:23	1	0	100	6048	4032	0:11:23	1	0	100	6048	4032	0:11:23	1	0	100
314904	22 May-14 17:58:22	0:00:00	2	11.1	100	4861	5300	0:00:38	2	10.1	100	1294	3600	0:03:43	1	0.0	100	180	2550	0:07:25	1	0.0	100	0	2803	0:11:19	1	0	100	6048	4032	0:11:19	1	0	100	6048	4032	0:11:19	1	0	100
314905	22 May-14 17:58:27	0:00:00	2	11.1	100	4866	5300	0:00:37	2	10.1	100	1345	3600	0:03:39	1	0.0	100	180	2550	0:07:21	1	0.0	100	0	2803	0:11:14	1	0	100	6048	4032	0:11:14	1	0	100	6048	4032	0:11:14	1	0	100
314906	22 May-14 17:58:32	0:00:00	2	11.1	100	4870	5300	0:00:37	2	10.2	100	1396	3600	0:03:34	1	0.0	100	180	2550	0:07:16	1	0.0	100	0	2803	0:11:10	1	0	100	6048	4032	0:11:10	1	0	100	6048	4032	0:11:10	1	0	100
314907	22 May-14 17:58:37	0:00:00	2	11.3	100	4878	5300	0:00:36	2	10.1	100	1446	3600	0:03:30	1	0.0	100	180	2550	0:07:12	1	0.0	100	0	2803	0:11:05	1	0	100	6048	4032	0:11:05	1	0	100	6048	4032	0:11:05	1	0	100
314908	22 May-14 17:58:42	0:00:00	2	11.2	100	4881	5300	0:00:36	2	10.2	100	1497	3600	0:03:25	1	0.0	100	180	2550	0:07:07	1	0.0	100	0	2803	0:11:01	1	0	100	6048	4032	0:11:01	1	0	100	6048	4032	0:11:01	1	0	100
314909	22 May-14 17:58:47	0:00:00	2	11.1	100	4886	5300	0:00:35	2	10.1	100	1547	3600	0:03:21	1	0.0	100	180	2550	0:07:03	1	0.0	100	0	2803	0:10:57	1	0	100	6048	4032	0:10:57	1	0	100	6048	4032	0:10:57	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
314910	22 May-14 17:58:52	0:00:00	2	11.2	100	4891	5300	0:00:35	2	10.1	100	1598	3600	0:03:17	1	0.0	100	180	2550	0:06:59	1	0.0	100	0	2803	0:10:52	1	0	100	6048	4032	0:10:52	1	0	100	6048	4032	0:10:52	1	0	100
314911	22 May-14 17:58:57	0:00:00	2	11.1	100	4897	5300	0:00:34	2	10.1	100	1648	3600	0:03:12	1	0.0	100	180	2550	0:06:54	1	0.0	100	0	2803	0:10:48	1	0	100	6048	4032	0:10:48	1	0	100	6048	4032	0:10:48	1	0	100
314912	22 May-14 17:59:02	0:00:00	2	11.1	100	4901	5300	0:00:34	2	10.1	100	1699	3600	0:03:08	1	0.0	100	180	2550	0:06:50	1	0.0	100	0	2803	0:10:43	1	0	100	6048	4032	0:10:43	1	0	100	6048	4032	0:10:43	1	0	100
314913	22 May-14 17:59:07	0:00:00	2	11.1	100	4906	5300	0:00:34	2	10.1	100	1749	3600	0:03:03	1	0.0	100	180	2550	0:06:45	1	0.0	100	0	2803	0:10:39	1	0	100	6048	4032	0:10:39	1	0	100	6048	4032	0:10:39	1	0	100
314914	22 May-14 17:59:12	0:00:00	2	10.6	100	4912	5300	0:00:33	2	9.6	100	1800	3600	0:02:59	1	0.0	100	180	2550	0:06:41	1	0.0	100	0	2803	0:10:35	1	0	100	6048	4032	0:10:35	1	0	100	6048	4032	0:10:35	1	0	100
314915	22 May-14 17:59:17	0:00:00	2	10.6	100	4918	5300	0:00:33	2	9.6	100	1850	3600	0:02:55	1	0.0	100	180	2550	0:06:37	1	0.0	100	0	2803	0:10:31	1	0	100	6048	4032	0:10:31	1	0	100	6048	4032	0:10:31	1	0	100
314916	22 May-14 17:59:22	0:00:00	2	10.5	100	4920	5300	0:00:32	2	9.6	100	1901	3600	0:02:51	1	0.0	100	180	2550	0:06:33	1	0.0	100	0	2803	0:10:27	1	0	100	6048	4032	0:10:27	1	0	100	6048	4032	0:10:27	1	0	100
314917	22 May-14 17:59:27	0:00:00	2	10.6	100	4926	5300	0:00:32	2	9.6	100	1951	3600	0:02:47	1	0.0	100	180	2550	0:06:29	1	0.0	100	0	2803	0:10:22	1	0	100	6048	4032	0:10:22	1	0	100	6048	4032	0:10:22	1	0	100
314918	22 May-14 17:59:33	0:00:00	2	11.2	100	4933	5300	0:00:32	2	10.1	100	2002	3600	0:02:42	1	0.0	100	180	2550	0:06:24	1	0.0	100	0	2803	0:10:18	1	0	100	6048	4032	0:10:18	1	0	100	6048	4032	0:10:18	1	0	100
314919	22 May-14 17:59:38	0:00:00	2	11.0	100	4936	5300	0:00:31	2	10.1	100	2052	3600	0:02:38	1	0.0	100	180	2550	0:06:20	1	0.0	100	0	2803	0:10:13	1	0	100	6048	4032	0:10:13	1	0	100	6048	4032	0:10:13	1	0	100
314920	22 May-14 17:59:43	0:00:00	2	11.2	100	4941	5300	0:00:31	2	10.1	100	2103	3600	0:02:33	1	0.0	100	180	2550	0:06:16	1	0.0	100	0	2803	0:10:09	1	0	100	6048	4032	0:10:09	1	0	100	6048	4032	0:10:09	1	0	100
314921	22 May-14 17:59:48	0:00:00	2	11.4	100	4946	5300	0:00:30	2	10.4	100	2158	3600	0:02:29	1	0.0	100	180	2550	0:06:11	1	0.0	100	0	2803	0:10:05	1	0	100	6048	4032	0:10:05	1	0	100	6048	4032	0:10:05	1	0	100
314922	22 May-14 17:59:53	0:00:00	2	11.4	100	4952	5300	0:00:30	2	10.5	100	2211	3600	0:02:24	1	0.0	100	180	2550	0:06:06	1	0.0	100	0	2803	0:09:59	1	0	100	6048	4032	0:09:59	1	0	100	6048	4032	0:09:59	1	0	100
314923	22 May-14 17:59:58	0:00:00	2	11.6	100	4958	5300	0:00:29	2	10.5	100	2262	3600	0:02:19	1	0.0	100	180	2550	0:06:01	1	0.0	100	0	2803	0:09:55	1	0	100	6048	4032	0:09:55	1	0	100	6048	4032	0:09:55	1	0	100
314924	22 May-14 18:00:03	0:00:00	2	11.6	100	4962	5300	0:00:29	2	10.5	100	2313	3600	0:02:14	1	0.0	100	180	2550	0:05:56	1	0.0	100	0	2803	0:09:50	1	0	100	6048	4032	0:09:50	1	0	100	6048	4032	0:09:50	1	0	100
314925	22 May-14 18:00:08	0:00:00	2	11.4	100	4967	5300	0:00:28	2	10.3	100	2364	3600	0:02:09	1	0.0	100	180	2550	0:05:51	1	0.0	100	0	2803	0:09:45	1	0	100	6048	4032	0:09:45	1	0	100	6048	4032	0:09:45	1	0	100
314926	22 May-14 18:00:13	0:00:00	2	11.2	100	4973	5300	0:00:28	2	10.2	100	2414	3600	0:02:05	1	0.0	100	180	2550	0:05:47	1	0.0	100	0	2803	0:09:40	1	0	100	6048	4032	0:09:40	1	0	100	6048	4032	0:09:40	1	0	100
314927	22 May-14 18:00:18	0:00:00	2	11.1	100	4977	5300	0:00:27	2	10.2	100	2465	3600	0:02:00	1	0.0	100	180	2550	0:05:42	1	0.0	100	0	2803	0:09:36	1	0	100	6048	4032	0:09:36	1	0	100	6048	4032	0:09:36	1	0	100
314928	22 May-14 18:00:23	0:00:00	2	11.2	100	4983	5300	0:00:27	2	10.1	100	2515	3600	0:01:56	1	0.0	100	180	2550	0:05:38	1	0.0	100	0	2803	0:09:32	1	0	100	6048	4032	0:09:32	1	0	100	6048	4032	0:09:32	1	0	100
314929	22 May-14 18:00:28	0:00:00	2	11.2	100	4988	5300	0:00:26	2	10.1	100	2566	3600	0:01:52	1	0.0	100	180	2550	0:05:34	1	0.0	100	0	2803	0:09:27	1	0	100	6048	4032	0:09:27	1	0	100	6048	4032	0:09:27	1	0	100
314930	22 May-14 18:00:33	0:00:00	2	11.1	100	4993	5300	0:00:26	2	10.1	100	2616	3600	0:01:47	1	0.0	100	180	2550	0:05:29	1	0.0	100	0	2803	0:09:23	1	0	100	6048	4032	0:09:23	1	0	100	6048	4032	0:09:23	1	0	100
314931	22 May-14 18:00:38	0:00:00	2	11.2	100	4998	5300	0:00:26	2	10.1	100	2667	3600	0:01:43	1	0.0	100	180	2550	0:05:25	1	0.0	100	0	2803	0:09:19	1	0	100	6048	4032	0:09:19	1	0	100	6048	4032	0:09:19	1	0	100
314932	22 May-14 18:00:43	0:00:00	2	11.1	100	5003	5300	0:00:25	2	10.1	100	2717	3600	0:01:39	1	0.0	100	180	2550	0:05:21	1	0.0	100	0	2803	0:09:14	1	0	100	6048	4032	0:09:14	1	0	100	6048	4032	0:09:14	1	0	100
314933	22 May-14 18:00:48	0:00:00	2	11.1	100	5008	5300	0:00:25	2	10.1	100	2768	3600	0:01:34	1	0.0	100	180	2550	0:05:17	1	0.0	100	0	2803	0:09:10	1	0	100	6048	4032	0:09:10	1	0	100	6048	4032	0:09:10	1	0	100
314934	22 May-14 18:00:53	0:00:00	2	11.2	100	5014	5300	0:00:24	2	10.1	100	2806	3600	0:01:30	2	0.0	100	192	2550	0:05:12	1	0.0	100	0	2803	0:09:06	1	0	100	6048	4032	0:09:06	1	0	100	6048	4032	0:09:06	1	0	100
314935	22 May-14 18:00:58	0:00:00	2	11.1	100	5018	5300	0:00:24	2	10.1	100	2809	3600	0:01:26	2	3.0	100	240	2550	0:05:07	1	0.0	100	0	2803	0:09:01	1	0	100	6048	4032	0:09:01	1	0	100	6048	4032	0:09:01	1	0	100
314936	22 May-14 18:01:03	0:00:00	2	11.2	100	5024	5300	0:00:24	2	10.1	100	2799	3600	0:01:26	2	6.0	100	300	2550	0:05:02	1	0.0	100	0	2803	0:08:55	1	0	100	6048	4032	0:08:55	1	0	100	6048	4032	0:08:55	1	0	100
314937	22 May-14 18:01:08	0:00:00	2	10.6	100	5029	5300	0:00:23	2	9.6	100	2790	3600	0:01:26	2	8.6	100	360	2550	0:04:56	1	0.0	100	0	2803	0:08:49	1	0	100	6048	4032	0:08:49	1	0	100	6048	4032	0:08:49	1	0	100
314938	22 May-14 18:01:13	0:00:00	2	10.6	100	5034	5300	0:00:23	2	9.6	100	2792	3600	0:01:27	2	10.3	100	408	2550	0:04:50	1	0.0	100	0	2803	0:08:44	1	0	100	6048	4032	0:08:44	1	0	100	6048	4032	0:08:44	1	0	100
314939	22 May-14 18:01:18	0:00:00	2	10.6	100	5039	5300	0:00:22	2	9.6	100	2783	3600	0:01:26	2	10.9	100	468	2550	0:04:45	1	0.0	100	0	2803	0:08:38	1	0	100	6048	4032	0:08:38	1	0	100	6048	4032	0:08:38	1	0	100
314940	22 May-14 18:01:23	0:00:00	2	10.6	100	5044	5300	0:00:22	2	9.6	100	2773	3600	0:01:27	2	10.9	100	528	2550	0:04:39	1	0.0	100	0	2803	0:08:33	1	0	100	6048	4032	0:08:33	1	0	100	6048	4032	0:08:33	1	0	100
314941	22 May-14 18:01:28	0:00:00	2	11.1	100	5049	5300	0:00:22	2	10.1	100	2776	3600	0:01:27	2	10.8	100	576	2550	0:04:33	1	0.0	100	0	2803	0:08:27	1	0	100	6048	4032	0:08:27	1	0	100	6048	4032	0:08:27	1	0	100
314942	22 May-14 18:01:33	0:00:00	2	11.2	100	5055	5300	0:00:21	2	10.1	100	2766	3600	0:01:26	2	11.4	100	636	2550	0:04:28	1	0.0	100	0	2803	0:08:21	1	0	100	6048	4032	0:08:21	1	0	100	6048	4032	0:08:21	1	0	100
314943	22 May-14 18:01:39	0:00:00	2	11.1	100	5059	5300	0:00:21	2	10.1	100	2757	3600	0:01:27	2	11.4	100	696	2550	0:04:22	1	0.0	100	0	2803	0:08:15	1	0	100	6048	4032	0:08:15	1	0	100	6048	4032	0:08:15	1	0	100
314944	22 May-14 18:01:44	0:00:00	2	11.2	100	5065	5300	0:00:20	2	10.1	100	2759	3600	0:01:27	2	10.8	100	744	2550	0:04:16	1	0.0	100	0	2803	0:08:10	1	0	100	6048	4032	0:08:10	1	0	100	6048	4032	0:08:10	1	0	100
314945	22 May-14 18:01:49	0:00:00	2	11.1	100	5069	5300	0:00:20	2	10.1	100	2750	3600	0:01:26	2	11.4	100	804	2550	0:04:11	1	0.0	100	0	2803	0:08:05	1	0	100	6048	4032	0:08:05	1	0	100	6048	4032	0:08:05	1	0	100
314946	22 May-14 18:01:54	0:00:00	2	11.1	100	5070	5300	0:00:19	2	10.4	100	2745	3600	0:01:27	2	11.4	100	864	2550	0:04:06	1	0.0	100	0	2803	0:07:59	1	0	100	6048	4032	0:07:59	1	0	100	6048	4032	0:07:59	1	0	100
314947	22 May-14 18:01:59	0:00:00	2	11.5	100	5079	5300	0:00:19	2	10.5	100	2738	3600	0:01:27	2	11.4	100	924	2550	0:04:00	1	0.0	100	0	2803	0:07:54	1	0	100	6048	4032	0:07:54	1	0	100	6048	4032	0:07:54	1	0	100
314948	22 May-14 18:02:04	0:00:00	2	11.5	100	5085	5300	0:00:18	2	10.5	100	2729	3600	0:01:26	2	12.0	100	984	2550	0:03:54	1	0.0	100	0	2803	0:07:48	1	0	100	6048	4032	0:07:48	1	0	100	6048	4032	0:07:48	1	0	100
314949	22 May-14 18:02:09	0:00:00	2	11.6	100	5091	5300	0:00:18	2	10.5	100	2731	3600	0:01:26	2	11.4	100	1032	2550	0:03:49	1	0.0	100	0	2803	0:07:42	1	0	100	6048	4032	0:07:42	1	0	100	6048	4032	0:07:42	1	0	100
314950	22 May-14 18:02:14	0:00:00	2	11.6	100	5096	5300	0:00:17	2	10.3	100	2722	3600	0:01:25	2	11.4	100	1092	2550	0:03:44	1	0.0	100	0	2803	0:07:37	1	0	100	6048	4032	0:07:37	1	0	100	6048	4032	0:07:37	1	0	100
314951	22 May-14 18:02:19	0:00:00	2	11.2	100	5101	5300	0:00:17	2	10.1	100	2712	3600	0:01:26	2	11.4	100	1152	2550	0:03:38	1	0.0	100	0	2803	0:07:32	1	0	100	6048	4032	0:07:32	1	0	100	6048	4032	0:07:32	1	0	100
314952	22 May-14 18:02:24	0:00:00	2	11.2	100	5106	5300	0:00:16	2	10.1	100	2715	3600	0:01:26	2	10.8	100	1200	2550	0:03:33	1	0.0	100	0	2803	0:07:27	1	0	100	6048	4032	0:07:27	1	0	100	6048	4032	0:07:27	1	0	100
314953	22 May-14 18:02:29	0:00:00	2	11.3	100	5115	5300	0:00:16	2	10.1	100	2705	3600	0:01:25	2	11.4	100	1260	2550	0:03:28	1	0.0	100	0	2803	0:07:22	1	0	100	6048	4032	0:07:22	1	0	100	6048	4032	0:07:22	1	0	100
314954	22 May-14 18:02:34	0:00:00	2	11.1	100	5116	5300	0:00:15	2	10.1	100	2696	3600	0:01:25	2	11.4	100	1320	2550	0:03:23	1	0.0	100	0	2803	0:07:16	1	0	100	6048	4032	0:07:16	1	0	100	6048	4032	0:07:16	1	0	100
314955	22 May-14 18:02:39	0:00:00	2	11.2	100	5122	5300	0:00:15	2	10.1	100	2698	3600	0:01:26	2	10.8	100	1368	2550	0:03:18	1	0.0	100	0	2803	0:07:12	1	0	100	6048	4032	0:07:12	1	0	100	6048	4032	0:07:12	1	0	100
314956	22 May-14 18:02:44	0:00:00	2	11.2	100	5127	5300	0:00:15	2	10.1	100	2689	3600	0:01:25	2	11.4	100	1428	2550	0:03:13	1	0.0	100	0	2803	0:07:07	1	0	100	6048	4032	0:07:07	1	0	100	6048	4032	0:07:07	1	0	100
314957	22 May-14 18:02:49	0:00:00	2	11.0	100	5132	5300	0:00:14	2	10.1	100	2679	3600	0:01:26	2	11.4	100	1488	2550	0:03:08	1	0.0	100	0	2803	0:07:02	1	0	100	6048	4032	0:07:02	1	0	100	6048	4032	0:07:02	1	0	100
314958	22 May-14 18:02:54	0:00:00	2	11.3	100	5140	5300	0:00:14	2	10.1	100	2670	3600	0:01:26	2	11.4	100	1548	2550	0:03:03	1	0.0	100	0	2803	0:06:57	1	0	100	6048	4032	0:06:57	1	0	100	6048	4032	0:06:57	1	0	100
314959	22 May-14 18:02:59	0:00:00	2	11.1	100	5141	5300	0:00:13	2	10.2	100	2673	3600	0:01:26	2	11.4	100	1596	2550	0:02:58	1	0.0	100	0	2803	0:06:51	1	0	100	6048	4032	0:06:51	1	0	100	6048	4032	0:06:51	1	0	100
314960	22 May-14 18:03:04	0:00:00	2	11.1	100	5147	5300	0:00:13	2	10.1	100	2663	3600	0:01:26	2	11.4	100	1656	2550	0:02:53	1	0.0	100	0	2803	0:06:47	1	0	100	6048	4032	0:06:47	1	0	100	6048	4032	0:06:47	1	0	100
314961	22 May-14 18:03:09	0:00:00	2	11.1	100	5151	5300	0:00:13	2	10.2	100	2666	3600	0:01:26	2	10.8	100	1704	2550	0:02:48	1	0.0	100	0	2803	0:06:41	1	0	100	6048	4032	0:06:41	1	0	100	6048	4032	0:06:41	1	0	100
314962	22 May-14 18:03:14	0:00:00	2	11.0	100	5157	5300	0:00:12	2	10.1	100	2656	3600	0:01:26	2	10.8	100	1764	2550	0:02:43	1	0.0	100	0	2803	0:06:36	1	0	100	6048	4032	0:06:36	1	0	100	6048	4032	0:06:36	1	0	100
314963	22 May-14 18:03:19	0:00:00	2	11.2	100	5162	5300	0:00:12	2	10.1	100	2647	3600	0:01:26	2	11.4	100	1824	2550	0:02:38	1	0.0	100	0	2803	0:06:31	1	0	100	6048	4032	0:06:31	1	0	100	6048	4032	0:06:31	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
314964	22 May-14 18:03:24	0:00:00	2	11.1	100	5167	5300	0:00:11	2	10.1	100	2649	3600	0:01:26	2	10.8	100	1872	2550	0:02:32	1	0.0	100	0	2803	0:06:26	1	0	100	6048	4032	0:06:26	1	0	100	6048	4032	0:06:26	1	0	100
314965	22 May-14 18:03:29	0:00:00	2	11.2	100	5172	5300	0:00:11	2	10.1	100	2628	3600	0:01:26	2	12.0	100	1944	2550	0:02:28	1	0.0	100	0	2803	0:06:21	1	0	100	6048	4032	0:06:21	1	0	100	6048	4032	0:06:21	1	0	100
314966	22 May-14 18:03:34	0:00:00	2	11.2	100	5178	5300	0:00:10	2	10.1	100	2630	3600	0:01:27	2	11.4	100	1992	2550	0:02:22	1	0.0	100	0	2803	0:06:16	1	0	100	6048	4032	0:06:16	1	0	100	6048	4032	0:06:16	1	0	100
314967	22 May-14 18:03:39	0:00:00	2	11.1	100	5182	5300	0:00:10	2	10.1	100	2621	3600	0:01:26	2	11.4	100	2052	2550	0:02:17	1	0.0	100	0	2803	0:06:12	1	0	100	6048	4032	0:06:11	1	0	100	6048	4032	0:06:11	1	0	100
314968	22 May-14 18:03:44	0:00:00	2	11.2	100	5188	5300	0:00:10	2	10.1	100	2623	3600	0:01:27	2	11.4	100	2100	2550	0:02:12	1	0.0	100	0	2803	0:06:12	1	0	100	6048	4032	0:06:06	1	0	100	6048	4032	0:06:06	1	0	100
314969	22 May-14 18:03:49	0:00:00	2	11.1	100	5192	5300	0:00:09	2	10.1	100	2614	3600	0:01:26	2	10.8	100	2160	2550	0:02:07	1	0.0	100	0	2803	0:06:12	1	0	100	6048	4032	0:06:01	1	0	100	6048	4032	0:06:01	1	0	100
314970	22 May-14 18:03:54	0:00:00	2	10.6	100	5197	5300	0:00:09	2	9.7	100	2617	3600	0:01:26	2	10.3	100	2208	2550	0:02:02	1	0.0	100	0	2803	0:06:12	1	0	100	6048	4032	0:05:55	1	0	100	6048	4032	0:05:55	1	0	100
314971	22 May-14 18:03:59	0:00:00	2	10.6	100	5203	5300	0:00:08	2	9.6	100	2607	3600	0:01:26	2	10.3	100	2268	2550	0:01:57	1	0.0	100	0	2803	0:06:12	1	0	100	6048	4032	0:05:51	1	0	100	6048	4032	0:05:51	1	0	100
314972	22 May-14 18:04:04	0:00:00	2	10.6	100	5208	5300	0:00:08	2	9.7	100	2598	3600	0:01:26	2	10.9	100	2328	2550	0:01:52	1	0.0	100	0	2803	0:06:12	1	0	100	6048	4032	0:05:46	1	0	100	6048	4032	0:05:46	1	0	100
314973	22 May-14 18:04:09	0:00:00	2	10.6	100	5213	5300	0:00:07	2	9.6	100	2588	3600	0:01:27	2	10.9	100	2388	2550	0:01:47	1	0.0	100	0	2803	0:06:12	1	0	100	6048	4032	0:05:40	1	0	100	6048	4032	0:05:40	1	0	100
314974	22 May-14 18:04:14	0:00:00	2	11.2	100	5218	5300	0:00:07	2	10.1	100	2591	3600	0:01:27	2	11.4	100	2436	2550	0:01:42	1	0.0	100	0	2803	0:06:12	1	0	100	6048	4032	0:05:35	1	0	100	6048	4032	0:05:35	1	0	100
314975	22 May-14 18:04:19	0:00:00	2	11.2	100	5224	5300	0:00:07	2	10.1	100	2581	3600	0:01:26	2	11.4	100	2496	2550	0:01:37	1	0.0	100	0	2803	0:06:12	1	0	100	6048	4032	0:05:30	1	0	100	6048	4032	0:05:30	1	0	100
314976	22 May-14 18:04:24	0:00:00	2	11.1	100	5228	5300	0:00:06	2	10.1	100	2572	3600	0:01:27	2	11.4	100	2508	2550	0:01:32	2	2.4	100	48	2803	0:06:12	1	0	100	6048	4032	0:05:25	1	0	100	6048	4032	0:05:25	1	0	100
314977	22 May-14 18:04:29	0:00:00	2	11.2	100	5234	5300	0:00:06	2	10.1	100	2574	3600	0:01:27	2	10.8	100	2508	2550	0:01:31	2	4.8	100	96	2803	0:06:12	1	0	100	6048	4032	0:05:20	1	0	100	6048	4032	0:05:20	1	0	100
314978	22 May-14 18:04:34	0:00:00	2	11.2	100	5239	5300	0:00:05	2	10.1	100	2565	3600	0:01:26	2	11.4	100	2496	2550	0:01:30	2	8.4	100	168	2803	0:06:12	1	0	100	6048	4032	0:05:15	1	0	100	6048	4032	0:05:15	1	0	100
314979	22 May-14 18:04:39	0:00:00	2	11.1	100	5243	5300	0:00:05	2	10.2	100	2556	3600	0:01:27	2	11.4	100	2484	2550	0:01:32	2	12.0	100	240	2803	0:06:12	1	0	100	6048	4032	0:05:10	1	0	100	6048	4032	0:05:10	1	0	100
314980	22 May-14 18:04:44	0:00:00	2	11.2	100	5249	5300	0:00:04	2	10.2	100	2559	3600	0:01:27	2	10.8	100	2484	2550	0:01:33	2	12.0	100	288	2803	0:06:12	1	0	100	6048	4032	0:05:05	1	0	100	6048	4032	0:05:05	1	0	100
314981	22 May-14 18:04:49	0:00:00	2	11.2	100	5254	5300	0:00:04	2	10.2	100	2549	3600	0:01:26	2	11.4	100	2472	2550	0:01:32	2	13.2	100	360	2803	0:06:12	1	0	100	6048	4032	0:05:00	1	0	100	6048	4032	0:05:00	1	0	100
314982	22 May-14 18:04:54	0:00:00	2	11.2	100	5259	5300	0:00:03	2	10.2	100	2540	3600	0:01:26	2	11.4	100	2484	2550	0:01:33	2	12.0	100	408	2803	0:06:12	1	0	100	6048	4032	0:04:55	1	0	100	6048	4032	0:04:55	1	0	100
314983	22 May-14 18:04:59	0:00:00	2	10.4	100	5248	5300	0:00:03	2	10.1	100	2518	3600	0:01:26	2	12.0	100	2508	2550	0:01:32	2	10.8	100	456	2803	0:06:12	1	0	100	6048	4032	0:04:50	1	0	100	6048	4032	0:04:50	1	0	100
314984	22 May-14 18:05:04	0:00:00	2	7.6	100	5198	5300	0:00:04	2	10.1	100	2533	3600	0:01:29	2	11.4	100	2472	2550	0:01:33	2	12.0	100	528	2803	0:06:12	1	0	100	6048	4032	0:04:46	1	0	100	6048	4032	0:04:46	1	0	100
314985	22 May-14 18:05:09	0:00:00	1	0.0	100	5148	5300	0:00:09	2	10.1	100	2523	3600	0:01:33	2	11.4	100	2484	2550	0:01:40	2	10.8	100	576	2803	0:06:12	1	0	100	6048	4032	0:04:47	1	0	100	6048	4032	0:04:47	1	0	100
314986	22 May-14 18:05:14	0:00:00	1	0.0	100	5097	5300	0:00:13	2	10.1	100	2526	3600	0:01:38	2	10.8	100	2484	2550	0:01:44	2	10.8	100	624	2803	0:06:12	1	0	100	6048	4032	0:04:47	1	0	100	6048	4032	0:04:47	1	0	100
314987	22 May-14 18:05:20	0:00:00	1	0.0	100	5046	5300	0:00:19	2	10.2	100	2517	3600	0:01:43	2	10.2	100	2472	2550	0:01:49	2	12.0	100	696	2803	0:06:12	1	0	100	6048	4032	0:04:49	1	0	100	6048	4032	0:04:49	1	0	100
314988	22 May-14 18:05:25	0:00:00	1	0.0	100	4996	5300	0:00:25	2	10.1	100	2519	3600	0:01:50	2	10.8	100	2472	2550	0:01:57	2	10.8	100	744	2803	0:06:12	1	0	100	6048	4032	0:04:50	1	0	100	6048	4032	0:04:50	1	0	100
314989	22 May-14 18:05:30	0:00:00	1	0.0	100	4945	5300	0:00:31	2	10.2	100	2522	3600	0:01:56	2	10.2	100	2472	2550	0:02:03	2	10.8	100	792	2803	0:06:12	1	0	100	6048	4032	0:04:52	1	0	100	6048	4032	0:04:52	1	0	100
314990	22 May-14 18:05:35	0:00:00	1	0.0	100	4895	5300	0:00:37	2	10.1	100	2512	3600	0:02:02	2	10.8	100	2460	2550	0:02:09	2	12.0	100	864	2803	0:06:12	1	0	100	6048	4032	0:04:55	1	0	100	6048	4032	0:04:55	1	0	100
314991	22 May-14 18:05:40	0:00:00	2	0.0	100	4841	5300	0:00:44	2	10.3	100	2507	3600	0:02:10	2	10.8	100	2472	2550	0:02:18	2	10.8	100	912	2803	0:06:12	1	0	100	6048	4032	0:04:58	1	0	100	6048	4032	0:04:58	1	0	100
314992	22 May-14 18:05:45	0:00:00	2	0.0	100	4795	5300	0:00:53	2	10.4	100	2498	3600	0:02:18	2	11.4	100	2460	2550	0:02:26	2	12.0	100	984	2803	0:06:12	1	0	100	6048	4032	0:05:01	1	0	100	6048	4032	0:05:01	1	0	100
314993	22 May-14 18:05:50	0:00:00	1	0.0	100	4744	5300	0:01:00	2	10.4	100	2501	3600	0:02:27	2	11.4	100	2460	2550	0:02:35	2	12.0	100	1032	2803	0:06:12	1	0	100	6048	4032	0:05:05	1	0	100	6048	4032	0:05:05	1	0	100
314994	22 May-14 18:05:55	0:00:00	2	0.0	100	4697	5300	0:01:09	2	10.4	100	2503	3600	0:02:35	2	10.8	100	2460	2550	0:02:43	2	10.8	100	1080	2803	0:06:12	1	0	100	6048	4032	0:05:09	1	0	100	6048	4032	0:05:09	1	0	100
314995	22 May-14 18:06:00	0:00:00	2	0.0	100	4649	5300	0:01:14	2	10.2	100	2494	3600	0:02:40	2	10.8	100	2448	2550	0:02:49	2	12.0	100	1152	2803	0:06:12	1	0	100	6048	4032	0:05:10	1	0	100	6048	4032	0:05:10	1	0	100
314996	22 May-14 18:06:05	0:00:00	2	0.0	100	4601	5300	0:01:20	2	10.1	100	2496	3600	0:02:47	2	10.2	100	2448	2550	0:02:56	2	10.8	100	1200	2803	0:06:12	1	0	100	6048	4032	0:05:12	1	0	100	6048	4032	0:05:12	1	0	100
314997	22 May-14 18:06:10	0:00:00	2	0.0	100	4554	5300	0:01:26	2	10.1	100	2487	3600	0:02:53	2	10.8	100	2460	2550	0:03:02	2	10.8	100	1248	2803	0:06:12	1	0	100	6048	4032	0:05:14	1	0	100	6048	4032	0:05:14	1	0	100
314998	22 May-14 18:06:15	0:00:00	1	0.0	100	4504	5300	0:01:31	2	10.1	100	2477	3600	0:02:59	2	11.4	100	2448	2550	0:03:07	2	12.0	100	1320	2803	0:06:12	1	0	100	6048	4032	0:05:15	1	0	100	6048	4032	0:05:15	1	0	100
314999	22 May-14 18:06:20	0:00:00	1	0.0	100	4453	5300	0:01:38	2	10.1	100	2492	3600	0:03:06	2	10.2	100	2436	2550	0:03:15	2	10.8	100	1368	2803	0:06:12	1	0	100	6048	4032	0:05:17	1	0	100	6048	4032	0:05:17	1	0	100
315000	22 May-14 18:06:25	0:00:00	2	0.0	100	4407	5300	0:01:44	2	10.1	100	2494	3600	0:03:11	2	10.2	100	2436	2550	0:03:21	2	10.8	100	1416	2803	0:06:12	1	0	100	6048	4032	0:05:19	1	0	100	6048	4032	0:05:19	1	0	100
315001	22 May-14 18:06:30	0:00:00	1	0.0	100	4356	5300	0:01:49	2	10.1	100	2485	3600	0:03:16	2	10.2	100	2424	2550	0:03:26	2	12.0	100	1488	2803	0:06:12	1	0	100	6048	4032	0:05:21	1	0	100	6048	4032	0:05:21	1	0	100
315002	22 May-14 18:06:35	0:00:00	2	0.0	100	4307	5300	0:01:55	2	10.1	100	2475	3600	0:03:23	2	10.2	100	2436	2550	0:03:35	2	10.8	100	1536	2803	0:06:12	1	0	100	6048	4032	0:05:23	1	0	100	6048	4032	0:05:23	1	0	100
315003	22 May-14 18:06:40	0:00:00	2	0.0	100	4257	5300	0:02:02	2	10.1	100	2466	3600	0:03:30	2	11.4	100	2448	2550	0:03:41	2	10.8	100	1584	2803	0:06:12	1	0	100	6048	4032	0:05:25	1	0	100	6048	4032	0:05:25	1	0	100
315004	22 May-14 18:06:45	0:00:00	1	0.0	100	4206	5300	0:02:08	2	10.2	100	2469	3600	0:03:37	2	11.4	100	2424	2550	0:03:47	2	12.0	100	1656	2803	0:06:12	1	0	100	6048	4032	0:05:27	1	0	100	6048	4032	0:05:27	1	0	100
315005	22 May-14 18:06:50	0:00:00	2	0.0	100	4159	5300	0:02:15	2	10.1	100	2471	3600	0:03:44	2	10.8	100	2424	2550	0:03:55	2	10.8	100	1704	2803	0:06:12	1	0	100	6048	4032	0:05:29	1	0	100	6048	4032	0:05:29	1	0	100
315006	22 May-14 18:06:55	0:00:00	2	0.0	100	4110	5300	0:02:20	2	10.1	100	2473	3600	0:03:49	2	10.2	100	2424	2550	0:04:01	2	10.8	100	1752	2803	0:06:12	1	0	100	6048	4032	0:05:31	1	0	100	6048	4032	0:05:31	1	0	100
315007	22 May-14 18:07:00	0:00:00	1	0.0	100	4059	5300	0:02:27	2	10.1	100	2464	3600	0:03:55	2	10.2	100	2412	2550	0:04:07	2	12.0	100	1824	2803	0:06:12	1	0	100	6048	4032	0:05:33	1	0	100	6048	4032	0:05:33	1	0	100
315008	22 May-14 18:07:05	0:00:00	2	0.0	100	4009	5300	0:02:33	2	10.1	100	2467	3600	0:04:03	2	10.2	100	2412	2550	0:04:15	2	10.8	100	1872	2803	0:06:12	1	0	100	6048	4032	0:05:36	1	0	100	6048	4032	0:05:36	1	0	100
315009	22 May-14 18:07:10	0:00:00	2	0.0	100	3960	5300	0:02:39	2	10.1	100	2481	3600	0:04:09	2	9.6	100	2400	2550	0:04:21	2	10.8	100	1920	2803	0:06:12	1	0	100	6048	4032	0:05:38	1	0	100	6048	4032	0:05:38	1	0	100
315010	22 May-14 18:07:15	0:00:00	2	0.0	100	3910	5300	0:02:45	2	10.2	100	2484	3600	0:04:13	2	9.6	100	2376	2550	0:04:27	2	12.0	100	1992	2803	0:06:12	1	0	100	6048	4032	0:05:40	1	0	100	6048	4032	0:05:40	1	0	100
315011	22 May-14 18:07:20	0:00:00	1	0.0	100	3860	5300	0:02:52	2	10.1	100	2474	3600	0:04:20	2	9.6	100	2388	2550	0:04:36	2	10.8	100	2040	2803	0:06:12	1	0	100	6048	4032	0:05:42	1	0	100	6048	4032	0:05:42	1	0	100
315012	22 May-14 18:07:25	0:00:00	2	0.0	100	3811	5300	0:02:58	2	10.1	100	2441	3600	0:04:27	2	11.4	100	2424	2550	0:04:42	2	10.8	100	2088	2803	0:06:12	1	0	100	6048	4032	0:05:44	1	0	100	6048	4032	0:05:44	1	0	100
315013	22 May-14 18:07:30	0:00:00	2	0.0	100	3762	5300	0:03:04	2	10.1	100	2467	3600	0:04:35	2	10.8	100	2376	2550	0:04:47	2	12.0	100	2160	2803	0:06:12	1	0	100	6048	4032	0:05:46	1	0	100	6048	4032	0:05:46	1	0	100
315014	22 May-14 18:07:35	0:00:00	1	0.0	100	3711	5300	0:03:10	2	10.1	100	2482	3600	0:04:39	2	10.2	100	2364	2550	0:04:55	2	10.8	100	2208	2803	0:06:12	1	0	100	6048	4032	0:05:48	1	0	100	6048	4032	0:05:48	1	0	100
315015	22 May-14 18:07:40	0:00:00	1	0.0	100	3661	5300	0:03:16	2	9.6	100	2484	3600	0:04:45	2	9.1	100	2364	2550	0:05:02	2	10.3	100	2256	2803	0:06:12	1	0	100	6048	4032	0:05:50	1	0	100	6048	4032	0:05:50	1	0	100
315016	22 May-14 18:07:45	0:00:00	2	0.0	100	3611	5300	0:03:23	2	9.6	100	2499	3600	0:04:52	2	6.9	100	2328	2550	0:05:09	2	11.4	100	2328	2803	0:06:12	1	0	100	6048	4032	0:05:54	1	0	100	6048	4032	0:05:54	1	0	100
315017	22 May-14 18:07:50	0:00:00	2	0.0	100	3562	5300	0:03:29	2	9.6	100	2501	3600	0:04:57	2	8.0	100	2328	2550	0:05:17	2	10.3	100	2376	2803	0:06:12	1	0	100	6048	4032	0:05:56	1	0	100	6048	4032	0:05:56	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
315018	22 May-14 18:07:55	0:00:00	2	0.0	100	3514	5300	0:03:35	2	9.6	100	2468	3600	0:05:02	2	10.3	100	2364	2550	0:05:23	2	10.3	100	2424	2803	0:06:12	1	0	100	6048	4032	0:05:58	1	0	100	6048	4032	0:05:58	1	0	100
315019	22 May-14 18:08:00	0:00:00	2	0.0	100	3464	5300	0:03:41	2	10.2	100	2447	3600	0:05:11	2	13.6	100	2364	2550	0:05:28	2	12.0	100	2496	2803	0:06:12	1	0	100	6048	4032	0:05:59	1	0	100	6048	4032	0:05:59	1	0	100
315020	22 May-14 18:08:06	0:00:00	2	0.0	100	3416	5300	0:03:47	2	10.1	100	2569	3600	0:05:18	0	0.0	100	2244	2550	0:05:35	2	10.8	100	2544	2803	0:06:12	1	0	100	6048	4032	0:06:01	1	0	100	6048	4032	0:06:01	1	0	100
315021	22 May-14 18:08:11	0:00:00	2	0.0	100	3368	5300	0:03:53	2	10.2	100	2488	3600	0:05:15	2	10.8	90	2328	2550	0:05:43	2	10.8	100	2592	2803	0:06:12	1	0	100	6048	4032	0:06:04	1	0	100	6048	4032	0:06:04	1	0	100
315022	22 May-14 18:08:16	0:00:00	2	0.0	100	3319	5300	0:03:58	2	10.1	100	2490	3600	0:05:26	2	9.0	100	2304	2550	0:05:47	2	12.0	100	2664	2803	0:06:12	1	0	100	6048	4032	0:06:04	1	0	100	6048	4032	0:06:04	1	0	100
315023	22 May-14 18:08:21	0:00:00	2	0.0	100	3267	5300	0:04:05	2	10.3	100	2485	3600	0:05:32	2	16.0	100	2316	2550	0:05:55	2	10.8	100	2712	2803	0:06:12	1	0	100	6048	4032	0:06:06	1	0	100	6048	4032	0:06:06	1	0	100
315024	22 May-14 18:08:26	0:00:00	1	0.0	100	3213	5300	0:04:11	2	10.5	100	2479	3600	0:05:39	2	9.1	100	2304	2550	0:06:00	2	12.0	100	2784	2803	0:06:12	1	0	100	6048	4032	0:06:07	1	0	100	6048	4032	0:06:07	1	0	100
315025	22 May-14 18:08:31	0:00:00	1	0.0	100	3163	5300	0:04:17	2	10.5	100	2493	3600	0:05:46	2	10.2	100	2292	2550	0:06:08	2	12.0	100	2832	2803	0:06:12	1	0	100	6048	4032	0:06:10	1	0	100	6048	4032	0:06:10	1	0	100
315026	22 May-14 18:08:36	0:00:00	1	0.0	100	3112	5300	0:04:23	2	10.5	100	2484	3600	0:05:50	2	10.8	100	2304	2550	0:06:14	2	10.8	100	2880	2803	0:06:14	1	0	100	6048	4032	0:06:14	1	0	100	6048	4032	0:06:14	1	0	100
315027	22 May-14 18:08:41	0:00:00	1	0.0	100	3062	5300	0:04:30	2	10.3	100	2486	3600	0:05:57	2	10.2	100	2280	2550	0:06:20	2	12.0	100	2952	2803	0:06:20	1	0	100	6048	4032	0:06:20	1	0	100	6048	4032	0:06:20	1	0	100
315028	22 May-14 18:08:46	0:00:00	1	0.0	100	3011	5300	0:04:36	2	10.1	100	2537	3600	0:06:04	2	10.2	100	2232	2550	0:06:28	2	10.8	100	3000	2803	0:06:28	1	0	100	6048	4032	0:06:28	1	0	100	6048	4032	0:06:28	1	0	100
315029	22 May-14 18:08:51	0:00:00	1	0.0	100	2961	5300	0:04:43	2	10.1	100	2467	3600	0:06:07	2	10.6	100	2304	2550	0:06:36	2	10.8	100	3048	2803	0:06:36	1	0	100	6048	4032	0:06:36	1	0	100	6048	4032	0:06:36	1	0	100
315030	22 May-14 18:08:56	0:00:00	1	0.0	100	2910	5300	0:04:50	2	10.1	100	2482	3600	0:06:19	2	10.6	100	2268	2550	0:06:41	2	12.0	100	3120	2803	0:06:41	1	0	100	6048	4032	0:06:41	1	0	100	6048	4032	0:06:41	1	0	100
315031	22 May-14 18:09:01	0:00:00	1	0.0	100	2860	5300	0:04:57	2	10.1	100	2484	3600	0:06:24	2	10.1	100	2268	2550	0:06:50	2	10.8	100	3168	2803	0:06:50	1	0	100	6048	4032	0:06:50	1	0	100	6048	4032	0:06:50	1	0	100
315032	22 May-14 18:09:06	0:00:00	1	0.0	100	2809	5300	0:05:03	2	10.1	100	2487	3600	0:06:31	2	10.1	100	2268	2550	0:06:57	2	10.8	100	3216	2803	0:06:57	1	0	100	6048	4032	0:06:57	1	0	100	6048	4032	0:06:57	1	0	100
315033	22 May-14 18:09:11	0:00:00	1	0.0	100	2758	5300	0:05:10	2	10.2	100	2490	3600	0:06:37	2	9.0	100	2244	2550	0:07:03	2	12.0	100	3288	2803	0:07:03	1	0	100	6048	4032	0:07:03	1	0	100	6048	4032	0:07:03	1	0	100
315034	22 May-14 18:09:16	0:00:00	2	0.0	100	2710	5300	0:05:17	2	10.1	100	2480	3600	0:06:44	2	10.2	100	2256	2550	0:07:12	2	10.8	100	3336	2803	0:07:12	1	0	100	6048	4032	0:07:12	1	0	100	6048	4032	0:07:12	1	0	100
315035	22 May-14 18:09:21	0:00:00	1	0.0	100	2659	5300	0:05:23	2	10.2	100	2483	3600	0:06:51	2	10.2	100	2256	2550	0:07:18	2	10.8	100	3384	2803	0:07:18	1	0	100	6048	4032	0:07:18	1	0	100	6048	4032	0:07:18	1	0	100
315036	22 May-14 18:09:26	0:00:00	2	0.0	100	2610	5300	0:05:29	2	10.1	100	2485	3600	0:06:57	2	10.2	100	2232	2550	0:07:24	2	12.0	100	3456	2803	0:07:24	1	0	100	6048	4032	0:07:24	1	0	100	6048	4032	0:07:24	1	0	100
315037	22 May-14 18:09:31	0:00:00	2	0.0	100	2561	5300	0:05:35	2	10.1	100	2476	3600	0:07:03	2	10.8	100	2244	2550	0:07:32	2	10.8	100	1488	2803	0:07:32	2	20	100	6048	4032	0:07:32	1	0	100	6048	4032	0:07:32	1	0	100
315038	22 May-14 18:09:36	0:00:00	2	0.0	100	2513	5300	0:05:40	2	10.1	100	2478	3600	0:07:09	2	10.2	100	2244	2550	0:07:37	2	10.8	100	1536	2803	0:09:25	1	0	100	6048	4032	0:09:25	1	0	100	6048	4032	0:09:25	1	0	100
315039	22 May-14 18:09:41	0:00:00	2	0.0	100	2468	5300	0:05:46	2	9.6	100	2481	3600	0:07:14	2	9.7	100	2220	2550	0:07:42	2	11.4	100	1608	2803	0:09:26	1	0	100	6048	4032	0:09:26	1	0	100	6048	4032	0:09:26	1	0	100
315040	22 May-14 18:09:46	0:00:00	2	0.0	100	2426	5300	0:05:50	2	9.6	100	2483	3600	0:07:18	2	9.7	100	2220	2550	0:07:48	2	10.3	100	1656	2803	0:09:27	1	0	100	6048	4032	0:09:27	1	0	100	6048	4032	0:09:27	1	0	100
315041	22 May-14 18:09:51	0:00:00	1	0.0	100	2375	5300	0:05:53	2	9.6	100	2486	3600	0:07:21	2	9.1	100	2196	2550	0:07:51	2	11.4	100	1728	2803	0:09:26	1	0	100	6048	4032	0:09:26	1	0	100	6048	4032	0:09:26	1	0	100
315042	22 May-14 18:09:56	0:00:00	1	0.0	100	2325	5300	0:05:59	2	9.6	100	2476	3600	0:07:27	2	9.7	100	2208	2550	0:07:59	2	11.4	100	1776	2803	0:09:28	1	0	100	6048	4032	0:09:28	1	0	100	6048	4032	0:09:28	1	0	100
315043	22 May-14 18:10:01	0:00:00	1	0.0	100	2274	5300	0:06:05	2	10.1	100	2479	3600	0:07:34	2	10.2	100	2208	2550	0:08:05	2	10.8	100	1824	2803	0:09:30	1	0	100	6048	4032	0:09:30	1	0	100	6048	4032	0:09:30	1	0	100
315044	22 May-14 18:10:06	0:00:00	1	0.0	100	2224	5300	0:06:11	2	10.1	100	2481	3600	0:07:40	2	10.2	100	2184	2550	0:08:11	2	12.0	100	1896	2803	0:09:32	1	0	100	6048	4032	0:09:32	1	0	100	6048	4032	0:09:32	1	0	100
315045	22 May-14 18:10:11	0:00:00	1	0.0	100	2173	5300	0:06:18	2	10.1	100	2472	3600	0:07:47	2	10.8	100	2196	2550	0:08:20	2	10.8	100	1944	2803	0:09:35	1	0	100	6048	4032	0:09:35	1	0	100	6048	4032	0:09:35	1	0	100
315046	22 May-14 18:10:16	0:00:00	1	0.0	100	2123	5300	0:06:24	2	10.1	100	2462	3600	0:07:54	2	10.8	100	2208	2550	0:08:26	2	10.8	100	1992	2803	0:09:37	1	0	100	6048	4032	0:09:37	1	0	100	6048	4032	0:09:37	1	0	100
315047	22 May-14 18:10:21	0:00:00	1	0.0	100	2072	5300	0:06:31	2	10.1	100	2477	3600	0:08:01	2	10.2	100	2172	2550	0:08:32	2	12.0	100	2064	2803	0:09:39	1	0	100	6048	4032	0:09:39	1	0	100	6048	4032	0:09:39	1	0	100
315048	22 May-14 18:10:26	0:00:00	1	0.0	100	2021	5300	0:06:38	2	10.2	100	2480	3600	0:08:07	2	10.2	100	2172	2550	0:08:41	2	10.8	100	2112	2803	0:09:42	1	0	100	6048	4032	0:09:42	1	0	100	6048	4032	0:09:42	1	0	100
315049	22 May-14 18:10:31	0:00:00	1	0.0	100	1971	5300	0:06:45	2	10.1	100	2470	3600	0:08:13	2	10.2	100	2184	2550	0:08:48	2	10.8	100	2160	2803	0:09:45	1	0	100	6048	4032	0:09:45	1	0	100	6048	4032	0:09:45	1	0	100
315050	22 May-14 18:10:36	0:00:00	1	0.0	100	1920	5300	0:06:53	2	10.2	100	2461	3600	0:08:22	2	10.2	100	2172	2550	0:08:55	2	12.0	100	2232	2803	0:09:48	1	0	100	6048	4032	0:09:48	1	0	100	6048	4032	0:09:48	1	0	100
315051	22 May-14 18:10:41	0:00:00	1	0.0	100	1870	5300	0:07:02	2	10.1	100	2451	3600	0:08:32	2	11.4	100	2184	2550	0:09:06	2	10.8	100	2280	2803	0:09:53	1	0	100	6048	4032	0:09:53	1	0	100	6048	4032	0:09:53	1	0	100
315052	22 May-14 18:10:46	0:00:00	1	0.0	100	1819	5300	0:07:08	2	10.1	100	2466	3600	0:08:39	2	10.8	100	2172	2550	0:09:12	2	10.8	100	2328	2803	0:09:55	1	0	100	6048	4032	0:09:55	1	0	100	6048	4032	0:09:55	1	0	100
315053	22 May-14 18:10:51	0:00:00	1	0.0	100	1769	5300	0:07:15	2	10.1	100	2468	3600	0:08:44	2	10.2	100	2148	2550	0:09:18	2	12.0	100	2400	2803	0:09:57	1	0	100	6048	4032	0:09:57	1	0	100	6048	4032	0:09:57	1	0	100
315054	22 May-14 18:10:56	0:00:00	1	0.0	100	1718	5300	0:07:21	2	10.1	100	2471	3600	0:08:50	2	9.6	100	2148	2550	0:09:27	2	10.8	100	2448	2803	0:10:00	1	0	100	6048	4032	0:10:00	1	0	100	6048	4032	0:10:00	1	0	100
315055	22 May-14 18:11:01	0:00:00	1	0.0	100	1668	5300	0:07:27	2	10.1	100	2461	3600	0:08:56	2	9.6	100	2160	2550	0:09:33	2	10.8	100	2496	2803	0:10:02	1	0	100	6048	4032	0:10:02	1	0	100	6048	4032	0:10:02	1	0	100
315056	22 May-14 18:11:06	0:00:00	1	0.0	100	1617	5300	0:07:34	2	10.1	100	2464	3600	0:09:03	2	10.2	100	2136	2550	0:09:39	2	12.0	100	2568	2803	0:10:04	1	0	100	6048	4032	0:10:04	1	0	100	6048	4032	0:10:04	1	0	100
315057	22 May-14 18:11:11	0:00:00	1	0.0	100	1567	5300	0:07:40	2	10.1	100	2478	3600	0:09:09	2	9.6	100	2124	2550	0:09:47	2	10.8	100	2616	2803	0:10:06	1	0	100	6048	4032	0:10:06	1	0	100	6048	4032	0:10:06	1	0	100
315058	22 May-14 18:11:16	0:00:00	1	0.0	100	1516	5300	0:07:46	2	10.1	100	2469	3600	0:09:14	2	10.2	100	2136	2550	0:09:53	2	10.8	100	2664	2803	0:10:09	1	0	100	6048	4032	0:10:09	1	0	100	6048	4032	0:10:09	1	0	100
315059	22 May-14 18:11:21	0:00:00	1	0.0	100	1472	5300	0:07:53	2	9.8	100	2453	3600	0:09:22	2	10.2	100	2124	2550	0:09:59	2	12.0	100	2736	2803	0:10:11	1	0	100	6048	4032	0:10:11	1	0	100	6048	4032	0:10:11	1	0	100
315060	22 May-14 18:11:26	0:00:00	1	0.0	100	1422	5300	0:07:58	2	9.8	100	2455	3600	0:09:29	2	10.2	100	2124	2550	0:10:07	2	10.8	100	2784	2803	0:10:13	1	0	100	6048	4032	0:10:13	1	0	100	6048	4032	0:10:13	1	0	100
315061	22 May-14 18:11:31	0:00:00	1	0.0	100	1372	5300	0:08:04	2	9.8	100	2445	3600	0:09:35	2	11.4	100	2136	2550	0:10:14	2	10.8	100	2832	2803	0:10:15	1	0	100	6048	4032	0:10:15	1	0	100	6048	4032	0:10:15	1	0	100
315062	22 May-14 18:11:36	0:00:00	1	0.0	100	1328	5300	0:08:11	2	9.4	100	2453	3600	0:09:42	2	10.2	100	2124	2550	0:10:20	2	10.8	100	2880	2803	0:10:20	1	0	100	6048	4032	0:10:20	1	0	100	6048	4032	0:10:20	1	0	100
315063	22 May-14 18:11:41	0:00:00	1	0.0	100	1288	5300	0:08:16	2	9.2	100	2445	3600	0:09:47	2	9.6	100	2172	2550	0:10:26	1	0.0	100	2880	2803	0:10:26	1	0	100	6048	4032	0:10:26	1	0	100	2016	4032	0:10:26	2	25	100
315064	22 May-14 18:11:46	0:00:00	1	0.0	100	1247	5300	0:08:21	2	8.8	100	2450	3600	0:09:53	2	9.0	100	2208	2550	0:10:28	1	0.0	100	2880	2803	0:10:28	1	0	100	6048	4032	0:10:28	1	0	100	2016	4032	0:12:34	1	0	100
315065	22 May-14 18:11:51	0:00:00	1	0.0	100	1207	5300	0:08:26	2	8.3	100	2430	3600	0:09:58	2	9.0	100	2268	2550	0:10:30	1	0.0	100	2880	2803	0:10:30	1	0	100	6048	4032	0:10:30	1	0	100	2016	4032	0:12:36	1	0	100
315066	22 May-14 18:11:56	0:00:00	2	0.0	100	1181	5300	0:08:31	2	7.8	100	2405	3600	0:10:05	2	10.2	100	2328	2550	0:10:31	1	0.0	100	2880	2803	0:10:31	1	0	100	6048	4032	0:10:31	1	0	100	2016	4032	0:12:37	1	0	100
315067	22 May-14 18:12:01	0:00:00	1	0.0	100	1173	5300	0:08:31	2	6.2	100	2365	3600	0:10:08	2	10.2	100	2376	2550	0:10:28	1	0.0	100	2880	2803	0:10:28	1	0	100	6048	4032	0:10:28	1	0	100	2016	4032	0:12:34	1	0	100
315068	22 May-14 18:12:06	0:00:00	1	0.0	100	1166	5300	0:08:32	2	4.5	100	2324	3600	0:10:14	2	10.8	100	2424	2550	0:10:30	1	0.0	100	2880	2803	0:10:30	1	0	100	6048	4032	0:10:30	1	0	100	2016	4032	0:12:36	1	0	100
315069	22 May-14 18:12:11	0:00:00	2	0.0	100	1165	5300	0:08:32	2	2.8	100	2305	3600	0:10:21	2	9.0	100	2448	2550	0:10:33	1	0.0	100	2880	2803	0:10:33	1	0	100	4032	4032	0:10:33	2	24	100	4032	4032	0:12:39	1	0	100
315070	22 May-14 18:12:16	0:00:00	2	0.0	100	1166	5300	0:08:31	2	1.3	100	2275	3600	0:10:24	2	7.8	100	2484	2550	0:10:33	1	0.0	100	2880	2803	0:10:33	1	0	100	4032	4032	0:10:33	1	0	100	4032	4032	0:10:33	1	0	100
315071	22 May-14 18:12:21	0:00:00	2	1.0	100	1170	5300	0:08:28	2	1.2	100	2256	3600	0:10:26	2	6.6	100	2508	2550	0:10:32	1	0.0	100	2880	2803	0:10:32	1	0	100	4032	4032	0:10:32	1	0	100	4032	4032	0:10:32	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
315072	22 May-14 18:12:26	0:00:00	2	1.4	100	1171	5300	0:08:24	2	1.1	100	2250	3600	0:10:27	2	4.8	100	2520	2550	0:10:31	1	0.0	100	2880	2803	0:10:31	1	0	100	2016	4032	0:10:31	2	24	100	6048	4032	0:10:31	1	0	100
315073	22 May-14 18:12:31	0:00:00	1	0.0	100	1165	5300	0:08:21	2	1.2	100	2256	3600	0:10:28	1	0.0	100	2520	2550	0:10:30	1	0.0	100	864	2803	0:10:30	2	20	100	4032	4032	0:13:02	1	0	100	6048	4032	0:13:02	1	0	100
315074	22 May-14 18:12:36	0:00:00	2	0.0	100	1163	5300	0:08:21	2	1.1	100	2261	3600	0:10:31	1	0.0	100	2520	2550	0:10:33	1	0.0	100	864	2803	0:13:15	1	0	100	4032	4032	0:13:15	1	0	100	6048	4032	0:13:15	1	0	100
315075	22 May-14 18:12:41	0:00:00	2	0.0	100	1165	5300	0:08:20	2	0.0	100	2263	3600	0:10:32	1	0.0	100	2520	2550	0:10:35	1	0.0	100	864	2803	0:13:17	1	0	100	4032	4032	0:13:17	1	0	100	6048	4032	0:13:17	1	0	100
315076	22 May-14 18:12:46	0:00:00	1	0.0	100	1165	5300	0:08:18	1	0.0	100	2263	3600	0:10:34	1	0.0	100	2520	2550	0:10:36	1	0.0	100	864	2803	0:13:18	1	0	100	4032	4032	0:13:18	1	0	100	6048	4032	0:13:18	1	0	100
315077	22 May-14 18:12:51	0:00:00	1	0.0	100	1165	5300	0:08:22	1	0.0	100	2263	3600	0:10:40	1	0.0	100	2520	2550	0:10:43	1	0.0	100	864	2803	0:13:25	1	0	100	4032	4032	0:13:25	1	0	100	6048	4032	0:13:25	1	0	100
315078	22 May-14 18:12:56	0:00:00	1	0.0	100	1165	5300	0:08:22	1	0.0	100	2263	3600	0:10:41	1	0.0	100	2520	2550	0:10:44	1	0.0	100	864	2803	0:13:26	1	0	100	4032	4032	0:13:26	1	0	100	6048	4032	0:13:26	1	0	100
315079	22 May-14 18:13:01	0:00:00	2	0.0	100	1166	5300	0:08:22	1	0.0	100	2263	3600	0:10:42	1	0.0	100	2496	2550	0:10:45	2	1.2	100	888	2803	0:13:26	1	0	100	4032	4032	0:13:26	1	0	100	6048	4032	0:13:26	1	0	100
315080	22 May-14 18:13:06	0:00:00	2	0.0	100	1171	5300	0:08:23	1	0.0	100	2263	3600	0:10:43	1	0.0	100	2424	2550	0:10:49	2	4.8	100	960	2803	0:13:28	1	0	100	4032	4032	0:13:28	1	0	100	4032	4032	0:13:28	2	25	100
315081	22 May-14 18:13:11	0:00:00	2	0.0	100	1172	5300	0:08:23	1	0.0	100	2227	3600	0:10:44	2	1.8	100	2412	2550	0:10:56	2	7.2	100	1008	2803	0:13:29	1	0	100	4032	4032	0:13:29	1	0	100	4032	4032	0:13:29	1	0	100
315082	22 May-14 18:13:16	0:00:00	1	0.0	100	1172	5300	0:08:27	1	0.0	100	2179	3600	0:10:52	2	4.2	100	2388	2550	0:11:05	2	10.8	100	1080	2803	0:13:34	1	0	100	4032	4032	0:13:34	1	0	100	4032	4032	0:13:34	1	0	100
315083	22 May-14 18:13:21	0:00:00	2	0.0	100	1174	5300	0:08:30	1	0.0	100	2131	3600	0:11:00	2	6.6	100	2364	2550	0:11:16	2	13.2	100	1152	2803	0:13:38	1	0	100	4032	4032	0:13:38	1	0	100	4032	4032	0:13:38	1	0	100
315084	22 May-14 18:13:26	0:00:00	2	0.0	100	1178	5300	0:08:28	1	0.0	100	2071	3600	0:11:05	2	9.6	100	2376	2550	0:11:22	2	12.0	100	1200	2803	0:13:39	1	0	100	4032	4032	0:13:39	1	0	100	4032	4032	0:13:39	1	0	100
315085	22 May-14 18:13:31	0:00:00	2	0.0	100	1181	5300	0:08:28	1	0.0	100	2023	3600	0:11:11	2	10.2	100	2376	2550	0:11:27	2	12.0	100	1248	2803	0:13:40	1	0	100	4032	4032	0:13:40	1	0	100	4032	4032	0:13:40	1	0	100
315086	22 May-14 18:13:36	0:00:00	1	0.0	100	1181	5300	0:08:28	1	0.0	100	1963	3600	0:11:17	2	10.8	100	2412	2550	0:11:33	2	9.6	100	1272	2803	0:13:41	1	0	100	2016	4032	0:13:41	2	24	100	6048	4032	0:13:41	1	0	100
315087	22 May-14 18:13:41	0:00:00	2	0.0	100	1187	5300	0:08:28	1	0.0	100	1903	3600	0:11:23	2	11.4	100	2424	2550	0:11:36	2	8.4	100	1320	2803	0:13:42	1	0	100	2016	4032	0:16:13	1	0	100	6048	4032	0:16:13	1	0	100
315088	22 May-14 18:13:46	0:00:00	2	0.0	100	1190	5300	0:08:24	1	0.0	100	1843	3600	0:11:26	2	11.4	100	2412	2550	0:11:38	2	9.6	100	1392	2803	0:13:40	1	0	100	2016	4032	0:16:11	1	0	100	6048	4032	0:16:11	1	0	100
315089	22 May-14 18:13:51	0:00:00	2	0.0	100	1195	5300	0:08:23	1	0.0	100	1795	3600	0:11:31	2	11.4	100	2388	2550	0:11:44	2	10.8	100	1464	2803	0:13:40	1	0	100	2016	4032	0:16:11	1	0	100	6048	4032	0:16:11	1	0	100
315090	22 May-14 18:13:56	0:00:00	2	0.0	100	1199	5300	0:08:21	1	0.0	100	1735	3600	0:11:34	2	11.4	100	2376	2550	0:11:49	2	13.2	100	1536	2803	0:13:39	1	0	100	2016	4032	0:16:10	1	0	100	6048	4032	0:16:10	1	0	100
315091	22 May-14 18:14:01	0:00:00	2	0.0	100	1200	5300	0:08:20	1	0.0	100	1675	3600	0:11:40	2	11.4	100	2388	2550	0:11:56	2	13.2	100	1584	2803	0:13:40	1	0	100	2016	4032	0:16:12	1	0	100	6048	4032	0:16:12	1	0	100
315092	22 May-14 18:14:06	0:00:00	1	0.0	100	1200	5300	0:08:20	1	0.0	100	1627	3600	0:11:47	2	10.8	100	2364	2550	0:12:01	2	13.2	100	1656	2803	0:13:42	1	0	100	2016	4032	0:16:13	1	0	100	6048	4032	0:16:13	1	0	100
315093	22 May-14 18:14:11	0:00:00	2	0.0	100	1206	5300	0:08:20	1	0.0	100	1567	3600	0:11:52	2	11.4	100	2376	2550	0:12:09	2	12.0	100	1704	2803	0:13:43	1	0	100	2016	4032	0:16:14	1	0	100	6048	4032	0:16:14	1	0	100
315094	22 May-14 18:14:16	0:00:00	2	0.0	100	1206	5300	0:08:18	2	0.0	100	1511	3600	0:11:56	2	11.4	100	2364	2550	0:12:12	2	12.0	100	1776	2803	0:13:42	1	0	100	2016	4032	0:16:13	1	0	100	6048	4032	0:16:13	1	0	100
315095	22 May-14 18:14:21	0:00:00	1	0.0	100	1156	5300	0:08:18	2	2.7	100	1513	3600	0:12:01	2	10.8	100	2340	2550	0:12:18	2	13.2	100	1848	2803	0:13:43	1	0	100	2016	4032	0:16:14	1	0	100	6048	4032	0:16:14	1	0	100
315096	22 May-14 18:14:26	0:00:00	1	0.0	100	1105	5300	0:08:25	2	5.3	100	1504	3600	0:12:01	2	11.4	100	2328	2550	0:12:20	2	13.2	100	1920	2803	0:13:38	1	0	100	2016	4032	0:16:09	1	0	100	6048	4032	0:16:09	1	0	100
315097	22 May-14 18:14:31	0:00:00	2	0.0	100	1056	5300	0:08:32	2	7.8	100	1494	3600	0:12:00	2	11.4	100	2340	2550	0:12:21	2	13.2	100	1968	2803	0:13:33	1	0	100	2016	4032	0:16:04	1	0	100	6048	4032	0:16:04	1	0	100
315098	22 May-14 18:14:36	0:00:00	2	0.0	100	1007	5300	0:08:40	2	10.1	100	1485	3600	0:12:03	2	11.4	100	2328	2550	0:12:22	2	13.2	100	2040	2803	0:13:30	1	0	100	2016	4032	0:16:02	1	0	100	6048	4032	0:16:02	1	0	100
315099	22 May-14 18:14:41	0:00:00	1	0.0	100	957	5300	0:08:46	2	10.1	100	1499	3600	0:12:04	2	10.8	100	2316	2550	0:12:24	2	12.0	100	2088	2803	0:13:26	1	0	100	2016	4032	0:15:58	1	0	100	6048	4032	0:15:58	1	0	100
315100	22 May-14 18:14:46	0:00:00	2	0.0	100	908	5300	0:08:54	2	10.1	100	1502	3600	0:12:05	2	10.2	100	2292	2550	0:12:26	2	12.0	100	2160	2803	0:13:25	1	0	100	0	4032	0:15:56	2	24	100	6048	4032	0:15:56	1	0	100
315101	22 May-14 18:14:51	0:00:00	2	0.0	100	858	5300	0:09:01	2	10.2	100	1505	3600	0:12:06	2	9.6	100	2292	2550	0:12:29	2	12.0	100	2208	2803	0:13:22	1	0	100	0	4032	0:18:24	1	0	100	6048	4032	0:18:24	1	0	100
315102	22 May-14 18:14:56	0:00:00	2	0.0	100	809	5300	0:09:07	2	10.1	100	1519	3600	0:12:06	2	8.4	100	2280	2550	0:12:30	2	10.8	100	2256	2803	0:13:19	1	0	100	0	4032	0:18:21	1	0	100	6048	4032	0:18:21	1	0	100
315103	22 May-14 18:15:01	0:00:00	1	0.0	100	758	5300	0:09:13	2	10.2	100	1522	3600	0:12:06	2	9.0	100	2256	2550	0:12:30	2	12.0	100	2328	2803	0:13:15	1	0	100	0	4032	0:18:18	1	0	100	6048	4032	0:18:18	1	0	100
315104	22 May-14 18:15:06	0:00:00	1	0.0	100	708	5300	0:09:22	2	10.1	100	1536	3600	0:12:10	2	8.4	100	2244	2550	0:12:37	2	10.8	100	2376	2803	0:13:16	1	0	100	0	4032	0:18:18	1	0	100	6048	4032	0:18:18	1	0	100
315105	22 May-14 18:15:11	0:00:00	1	0.0	100	657	5300	0:09:30	2	10.1	100	1539	3600	0:12:13	2	8.4	100	2244	2550	0:12:41	2	10.8	100	2424	2803	0:13:16	1	0	100	0	4032	0:18:18	1	0	100	6048	4032	0:18:18	1	0	100
315106	22 May-14 18:15:16	0:00:00	1	0.0	100	606	5300	0:09:37	2	10.2	100	1554	3600	0:12:19	2	8.4	100	2208	2550	0:12:47	2	12.0	100	2496	2803	0:13:18	1	0	100	0	4032	0:18:20	1	0	100	6048	4032	0:18:20	1	0	100
315107	22 May-14 18:15:21	0:00:00	1	0.0	100	556	5300	0:09:43	2	9.6	100	1556	3600	0:12:24	2	8.0	100	2208	2550	0:12:55	2	10.3	100	2544	2803	0:13:20	1	0	100	0	4032	0:18:23	1	0	100	6048	4032	0:18:23	1	0	100
315108	22 May-14 18:15:26	0:00:00	1	0.0	100	505	5300	0:09:50	2	9.7	100	1571	3600	0:12:31	2	8.0	100	2172	2550	0:13:03	2	11.4	100	2616	2803	0:13:24	1	0	100	0	4032	0:18:26	1	0	100	6048	4032	0:18:26	1	0	100
315109	22 May-14 18:15:31	0:00:00	2	0.0	100	455	5300	0:09:57	2	9.7	100	1586	3600	0:12:37	2	7.4	100	2160	2550	0:13:12	2	11.4	100	2664	2803	0:13:28	1	0	100	0	4032	0:18:30	1	0	100	6048	4032	0:18:30	1	0	100
315110	22 May-14 18:15:36	0:00:00	1	0.0	100	405	5300	0:10:03	2	9.6	100	1600	3600	0:12:42	2	7.4	100	2148	2550	0:13:18	2	10.3	100	2712	2803	0:13:29	1	0	100	0	4032	0:18:32	1	0	100	6048	4032	0:18:32	1	0	100
315111	22 May-14 18:15:41	0:00:00	2	0.0	100	355	5300	0:10:10	2	10.2	100	1603	3600	0:12:48	2	7.8	100	2124	2550	0:13:25	2	12.0	100	2784	2803	0:13:33	1	0	100	0	4032	0:18:35	1	0	100	6048	4032	0:18:35	1	0	100
315112	22 May-14 18:15:46	0:00:00	1	0.0	100	306	5300	0:10:16	2	10.1	100	1640	3600	0:12:54	2	6.6	100	2088	2550	0:13:33	2	10.8	100	2832	2803	0:13:35	1	0	100	0	4032	0:18:37	1	0	100	6048	4032	0:18:37	1	0	100
315113	22 May-14 18:15:51	0:00:00	2	0.0	100	266	5300	0:10:23	2	9.6	100	1657	3600	0:12:58	2	6.0	100	2064	2550	0:13:40	2	10.8	100	2880	2803	0:13:40	1	0	100	0	4032	0:18:43	1	0	100	6048	4032	0:18:43	1	0	100
315114	22 May-14 18:15:56	0:00:00	1	0.0	100	227	5300	0:10:27	2	9.0	100	1696	3600	0:13:02	1	0.0	100	1992	2550	0:13:47	2	12.0	100	2952	2803	0:13:47	1	0	100	0	4032	0:18:49	1	0	100	6048	4032	0:18:49	1	0	100
315115	22 May-14 18:16:01	0:00:00	1	0.0	100	215	5300	0:10:32	2	7.1	100	1708	3600	0:13:04	1	0.0	100	1944	2550	0:13:56	2	10.8	100	3000	2803	0:13:56	1	0	100	0	4032	0:18:58	1	0	100	6048	4032	0:18:58	1	0	100
315116	22 May-14 18:16:06	0:00:00	2	0.0	100	219	5300	0:10:34	2	5.0	100	1715	3600	0:13:08	1	0.0	100	1896	2550	0:14:04	2	10.8	100	3048	2803	0:14:04	1	0	100	0	4032	0:19:07	1	0	100	6048	4032	0:19:07	1	0	100
315117	22 May-14 18:16:11	0:00:00	1	0.0	100	213	5300	0:10:27	2	3.2	100	1721	3600	0:13:05	1	0.0	100	1824	2550	0:14:06	2	12.0	100	3120	2803	0:14:06	1	0	100	0	4032	0:19:08	1	0	100	6048	4032	0:19:08	1	0	100
315118	22 May-14 18:16:16	0:00:00	2	0.0	100	216	5300	0:10:28	2	1.5	100	1726	3600	0:13:08	1	0.0	100	1776	2550	0:14:16	2	10.8	100	3168	2803	0:14:16	1	0	100	0	4032	0:19:18	1	0	100	6048	4032	0:19:18	1	0	100
315119	22 May-14 18:16:21	0:00:00	2	1.1	100	213	5300	0:10:24	2	1.2	100	1732	3600	0:13:08	1	0.0	100	1728	2550	0:14:20	2	10.8	100	3216	2803	0:14:20	1	0	100	0	4032	0:19:22	1	0	100	6048	4032	0:19:22	1	0	100
315120	22 May-14 18:16:26	0:00:00	2	1.0	100	216	5300	0:10:23	2	1.2	100	1738	3600	0:13:11	1	0.0	100	1656	2550	0:14:28	2	12.0	100	3288	2803	0:14:28	1	0	100	0	4032	0:19:30	1	0	100	6048	4032	0:19:30	1	0	100
315121	22 May-14 18:16:31	0:00:00	1	0.0	100	211	5300	0:10:18	2	1.1	100	1743	3600	0:13:10	1	0.0	100	1608	2550	0:14:34	2	10.8	100	3336	2803	0:14:34	1	0	100	0	4032	0:19:36	1	0	100	6048	4032	0:19:36	1	0	100
315122	22 May-14 18:16:36	0:00:00	1	0.0	100	202	5300	0:10:19	2	1.3	100	1752	3600	0:13:16	1	0.0	100	1560	2550	0:14:44	2	10.8	100	3384	2803	0:14:44	1	0	100	0	4032	0:19:46	1	0	100	6048	4032	0:19:46	1	0	100
315123	22 May-14 18:16:41	0:00:00	1	0.0	100	166	5300	0:10:20	2	2.8	100	1788	3600	0:13:21	1	0.0	100	1488	2550	0:14:53	2	12.0	100	3456	2803	0:14:53	1	0	100	0	4032	0:19:56	1	0	100	6048	4032	0:19:56	1	0	100
315124	22 May-14 18:16:46	0:00:00	2	0.0	100	152	5300	0:10:25	2	3.4	100	1806	3600	0:13:23	1	0.0	100	1440	2550	0:15:02	2	10.8	100	3504	2803	0:15:02	1	0	100	0	4032	0:20:05	1	0	100	6048	4032	0:20:05	1	0	100
315125	22 May-14 18:16:51	0:00:00	1	0.0	100	144	5300	0:10:25	2	3.6	100	1814	3600	0:13:23	1	0.0	100	1392	2550	0:15:07	2	10.8	100	1536	2803	0:15:07	2	20	100	2016	4032	0:20:09	1	0	100	6048	4032	0:20:09	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_enthalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
315126	22 May-14 18:16:56	0:00:00	2	0.0	100	143	5300	0:10:26	2	3.4	100	1819	3600	0:13:24	1	0.0	100	1320	2550	0:15:12	2	12.0	100	1608	2803	0:16:56	1	0	100	2016	4032	0:19:28	1	0	100	6048	4032	0:19:28	1	0	100
315127	22 May-14 18:17:01	0:00:00	1	0.0	100	137	5300	0:10:29	2	1.9	100	1825	3600	0:13:27	1	0.0	100	1272	2550	0:15:22	2	10.8	100	1656	2803	0:17:01	1	0	100	2016	4032	0:19:32	1	0	100	6048	4032	0:19:32	1	0	100
315128	22 May-14 18:17:06	0:00:00	2	0.0	100	132	5300	0:10:30	2	1.3	100	1831	3600	0:13:27	1	0.0	100	1224	2550	0:15:27	2	10.8	100	1704	2803	0:17:01	1	0	100	2016	4032	0:19:33	1	0	100	6048	4032	0:19:33	1	0	100
315129	22 May-14 18:17:11	0:00:00	2	0.0	100	130	5300	0:10:34	2	1.1	100	1836	3600	0:13:31	1	0.0	100	1200	2550	0:15:35	2	9.6	100	1728	2803	0:17:05	1	0	100	2016	4032	0:19:37	1	0	100	6048	4032	0:19:37	1	0	100
315130	22 May-14 18:17:16	0:00:00	2	0.0	100	126	5300	0:10:35	2	1.2	100	1830	3600	0:13:31	2	0.0	100	1212	2550	0:15:37	1	0.0	100	1728	2803	0:17:06	1	0	100	2016	4032	0:19:37	1	0	100	6048	4032	0:19:37	1	0	100
315131	22 May-14 18:17:21	0:00:00	1	0.0	100	121	5300	0:10:39	2	1.1	100	1775	3600	0:13:35	2	3.6	100	1272	2550	0:15:41	1	0.0	100	1728	2803	0:17:09	1	0	100	2016	4032	0:19:40	1	0	100	6048	4032	0:19:40	1	0	100
315132	22 May-14 18:17:26	0:00:00	1	0.0	100	116	5300	0:10:39	2	1.1	100	1744	3600	0:13:41	2	5.4	100	1308	2550	0:15:41	1	0.0	100	1728	2803	0:17:10	1	0	100	2016	4032	0:19:41	1	0	100	6048	4032	0:19:41	1	0	100
315133	22 May-14 18:17:31	0:00:00	1	0.0	100	116	5300	0:10:40	1	0.0	100	1696	3600	0:13:46	2	7.8	100	1356	2550	0:15:41	1	0.0	100	1728	2803	0:17:10	1	0	100	2016	4032	0:19:41	1	0	100	6048	4032	0:19:41	1	0	100
315134	22 May-14 18:17:36	0:00:00	1	0.0	100	116	5300	0:10:40	1	0.0	100	1660	3600	0:13:55	2	9.0	100	1392	2550	0:15:46	1	0.0	100	1728	2803	0:17:15	1	0	100	2016	4032	0:19:46	1	0	100	6048	4032	0:19:46	1	0	100
315135	22 May-14 18:17:41	0:00:00	1	0.0	100	116	5300	0:10:42	1	0.0	100	1612	3600	0:14:03	2	8.4	100	1440	2550	0:15:51	1	0.0	100	1728	2803	0:17:20	1	0	100	2016	4032	0:19:51	1	0	100	6048	4032	0:19:51	1	0	100
315136	22 May-14 18:17:46	0:00:00	1	0.0	100	116	5300	0:10:42	1	0.0	100	1564	3600	0:14:10	2	9.0	100	1488	2550	0:15:52	1	0.0	100	1728	2803	0:17:21	1	0	100	2016	4032	0:19:53	1	0	100	6048	4032	0:19:53	1	0	100
315137	22 May-14 18:17:51	0:00:00	1	0.0	100	116	5300	0:10:44	1	0.0	100	1528	3600	0:14:17	2	8.4	100	1524	2550	0:15:55	1	0.0	100	1728	2803	0:17:25	1	0	100	2016	4032	0:19:56	1	0	100	6048	4032	0:19:56	1	0	100
315138	22 May-14 18:17:56	0:00:00	1	0.0	100	116	5300	0:10:44	1	0.0	100	1480	3600	0:14:22	2	9.0	100	1572	2550	0:15:57	1	0.0	100	1728	2803	0:17:26	1	0	100	2016	4032	0:19:57	1	0	100	6048	4032	0:19:57	1	0	100
315139	22 May-14 18:18:01	0:00:00	1	0.0	100	116	5300	0:10:45	1	0.0	100	1444	3600	0:14:29	2	8.4	100	1608	2550	0:15:59	1	0.0	100	1728	2803	0:17:28	1	0	100	2016	4032	0:19:59	1	0	100	6048	4032	0:19:59	1	0	100
315140	22 May-14 18:18:06	0:00:00	1	0.0	100	116	5300	0:10:46	1	0.0	100	1396	3600	0:14:35	2	8.4	100	1656	2550	0:16:01	1	0.0	100	1728	2803	0:17:31	1	0	100	2016	4032	0:20:02	1	0	100	6048	4032	0:20:02	1	0	100
315141	22 May-14 18:18:11	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1360	3600	0:14:42	2	8.4	100	1692	2550	0:16:04	1	0.0	100	1728	2803	0:17:33	1	0	100	2016	4032	0:20:05	1	0	100	6048	4032	0:20:05	1	0	100
315142	22 May-14 18:18:16	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1312	3600	0:14:47	2	8.4	100	1740	2550	0:16:05	1	0.0	100	1728	2803	0:17:35	1	0	100	2016	4032	0:20:06	1	0	100	6048	4032	0:20:06	1	0	100
315143	22 May-14 18:18:21	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1276	3600	0:14:53	2	8.4	100	1776	2550	0:16:07	1	0.0	100	1728	2803	0:17:36	1	0	100	2016	4032	0:20:08	1	0	100	6048	4032	0:20:08	1	0	100
315144	22 May-14 18:18:26	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1228	3600	0:14:57	2	8.4	100	1824	2550	0:16:08	1	0.0	100	1728	2803	0:17:37	1	0	100	2016	4032	0:20:08	1	0	100	6048	4032	0:20:08	1	0	100
315145	22 May-14 18:18:31	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1192	3600	0:15:02	2	8.4	100	1860	2550	0:16:08	1	0.0	100	1728	2803	0:17:38	1	0	100	2016	4032	0:20:09	1	0	100	6048	4032	0:20:09	1	0	100
315146	22 May-14 18:18:36	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1144	3600	0:15:06	2	8.4	100	1908	2550	0:16:09	1	0.0	100	1728	2803	0:17:38	1	0	100	2016	4032	0:20:10	1	0	100	6048	4032	0:20:10	1	0	100
315147	22 May-14 18:18:41	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1108	3600	0:15:11	2	8.4	100	1944	2550	0:16:10	1	0.0	100	1728	2803	0:17:39	1	0	100	2016	4032	0:20:10	1	0	100	6048	4032	0:20:10	1	0	100
315148	22 May-14 18:18:46	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1084	3600	0:15:15	2	7.2	100	1968	2550	0:16:10	1	0.0	100	1728	2803	0:17:40	1	0	100	2016	4032	0:20:11	1	0	100	6048	4032	0:20:11	1	0	100
315149	22 May-14 18:18:51	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1048	3600	0:15:17	2	7.2	100	2004	2550	0:16:11	1	0.0	100	1728	2803	0:17:40	1	0	100	2016	4032	0:20:11	1	0	100	6048	4032	0:20:11	1	0	100
315150	22 May-14 18:18:56	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1012	3600	0:15:21	2	6.6	100	1968	2550	0:16:11	2	3.6	100	1800	2803	0:17:41	1	0	100	2016	4032	0:20:12	1	0	100	6048	4032	0:20:12	1	0	100
315151	22 May-14 18:19:01	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1000	3600	0:15:25	2	5.4	100	1932	2550	0:16:18	2	6.0	100	1848	2803	0:17:42	1	0	100	2016	4032	0:20:13	1	0	100	6048	4032	0:20:13	1	0	100
315152	22 May-14 18:19:06	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1000	3600	0:15:26	1	0.0	100	1884	2550	0:16:23	2	8.4	100	1896	2803	0:17:42	1	0	100	2016	4032	0:20:14	1	0	100	6048	4032	0:20:14	1	0	100
315153	22 May-14 18:19:11	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1000	3600	0:15:26	1	0.0	100	1812	2550	0:16:28	2	12.0	100	1968	2803	0:17:43	1	0	100	2016	4032	0:20:14	1	0	100	6048	4032	0:20:14	1	0	100
315154	22 May-14 18:19:16	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1000	3600	0:15:26	1	0.0	100	1764	2550	0:16:34	2	10.8	100	2016	2803	0:17:43	1	0	100	2016	4032	0:20:15	1	0	100	6048	4032	0:20:15	1	0	100
315155	22 May-14 18:19:21	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1000	3600	0:15:26	1	0.0	100	1716	2550	0:16:39	2	10.8	100	2064	2803	0:17:44	1	0	100	2016	4032	0:20:15	1	0	100	6048	4032	0:20:15	1	0	100
315156	22 May-14 18:19:26	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1000	3600	0:15:26	1	0.0	100	1644	2550	0:16:43	2	12.0	100	2136	2803	0:17:45	1	0	100	2016	4032	0:20:16	1	0	100	4032	4032	0:20:16	2	25	100
315157	22 May-14 18:19:31	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1000	3600	0:15:26	1	0.0	100	1596	2550	0:16:50	2	10.8	100	2184	2803	0:17:45	1	0	100	2016	4032	0:20:17	1	0	100	4032	4032	0:20:17	1	0	100
315158	22 May-14 18:19:36	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1000	3600	0:15:26	1	0.0	100	1548	2550	0:16:55	2	10.8	100	2232	2803	0:17:46	1	0	100	2016	4032	0:20:17	1	0	100	4032	4032	0:20:17	1	0	100
315159	22 May-14 18:19:41	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1000	3600	0:15:26	1	0.0	100	1476	2550	0:17:00	2	12.0	100	2304	2803	0:17:47	1	0	100	2016	4032	0:20:18	1	0	100	4032	4032	0:20:18	1	0	100
315160	22 May-14 18:19:46	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1000	3600	0:15:26	1	0.0	100	1428	2550	0:17:07	2	10.8	100	336	2803	0:17:48	2	20	100	4032	4032	0:20:19	1	0	100	4032	4032	0:20:19	1	0	100
315161	22 May-14 18:19:51	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1000	3600	0:15:26	1	0.0	100	1380	2550	0:17:11	2	10.8	100	384	2803	0:20:34	1	0	100	4032	4032	0:20:34	1	0	100	4032	4032	0:20:34	1	0	100
315162	22 May-14 18:19:56	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1000	3600	0:15:26	1	0.0	100	1308	2550	0:17:16	2	12.0	100	456	2803	0:20:35	1	0	100	2016	4032	0:20:35	2	24	100	6048	4032	0:20:35	1	0	100
315163	22 May-14 18:20:01	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1000	3600	0:15:26	1	0.0	100	1260	2550	0:17:23	2	10.8	100	504	2803	0:20:36	1	0	100	2016	4032	0:23:07	1	0	100	6048	4032	0:23:07	1	0	100
315164	22 May-14 18:20:06	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1000	3600	0:15:26	1	0.0	100	1212	2550	0:17:27	2	10.8	100	552	2803	0:20:36	1	0	100	2016	4032	0:23:07	1	0	100	6048	4032	0:23:07	1	0	100
315165	22 May-14 18:20:11	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1000	3600	0:15:26	1	0.0	100	1140	2550	0:17:32	2	12.0	100	624	2803	0:20:37	1	0	100	0	4032	0:23:08	2	24	100	6048	4032	0:23:08	1	0	100
315166	22 May-14 18:20:16	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	1000	3600	0:15:26	1	0.0	100	1092	2550	0:17:38	2	10.8	100	672	2803	0:20:37	1	0	100	0	4032	0:25:40	1	0	100	6048	4032	0:25:40	1	0	100
315167	22 May-14 18:20:21	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	964	3600	0:15:26	2	1.8	100	1056	2550	0:17:43	2	12.0	100	744	2803	0:20:38	1	0	100	0	4032	0:25:40	1	0	100	6048	4032	0:25:40	1	0	100
315168	22 May-14 18:20:26	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	916	3600	0:15:30	2	4.2	100	1056	2550	0:17:50	2	12.0	100	792	2803	0:20:39	1	0	100	0	4032	0:25:41	1	0	100	6048	4032	0:25:41	1	0	100
315169	22 May-14 18:20:31	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	880	3600	0:15:35	2	6.0	100	1044	2550	0:17:55	2	10.8	100	840	2803	0:20:40	1	0	100	0	4032	0:25:42	1	0	100	6048	4032	0:25:42	1	0	100
315170	22 May-14 18:20:36	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	832	3600	0:15:39	2	8.4	100	1044	2550	0:17:59	2	10.8	100	888	2803	0:20:41	1	0	100	0	4032	0:25:43	1	0	100	6048	4032	0:25:43	1	0	100
315171	22 May-14 18:20:41	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	796	3600	0:15:44	2	8.4	100	1008	2550	0:18:04	2	10.8	100	960	2803	0:20:42	1	0	100	0	4032	0:25:44	1	0	100	6048	4032	0:25:44	1	0	100
315172	22 May-14 18:20:46	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	760	3600	0:15:48	2	7.8	100	996	2550	0:18:11	2	10.8	100	1008	2803	0:20:43	1	0	100	0	4032	0:25:45	1	0	100	6048	4032	0:25:45	1	0	100
315173	22 May-14 18:20:51	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	724	3600	0:15:52	2	7.8	100	960	2550	0:18:16	2	12.0	100	1080	2803	0:20:43	1	0	100	0	4032	0:25:46	1	0	100	6048	4032	0:25:46	1	0	100
315174	22 May-14 18:20:56	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	700	3600	0:15:56	2	6.6	100	936	2550	0:18:23	2	12.0	100	1128	2803	0:20:44	1	0	100	0	4032	0:25:47	1	0	100	6048	4032	0:25:47	1	0	100
315175	22 May-14 18:21:01	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	664	3600	0:15:58	2	6.6	100	924	2550	0:18:27	2	10.8	100	1176	2803	0:20:45	1	0	100	0	4032	0:25:47	1	0	100	6048	4032	0:25:47	1	0	100
315176	22 May-14 18:21:06	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:02	2	6.0	100	876	2550	0:18:32	2	12.0	100	1248	2803	0:20:46	1	0	100	0	4032	0:25:48	1	0	100	6048	4032	0:25:48	1	0	100
315177	22 May-14 18:21:11	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	852	2550	0:18:39	2	9.6	100	1272	2803	0:20:47	1	0	100	0	4032	0:25:49	1	0	100	6048	4032	0:25:49	1	0	100
315178	22 May-14 18:21:16	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	804	2550	0:18:41	2	9.6	100	1320	2803	0:20:47	1	0	100	0	4032	0:25:50	1	0	100	6048	4032	0:25:50	1	0	100
315179	22 May-14 18:21:21	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	756	2550	0:18:46	2	9.6	100	1368	2803	0:20:48	1	0	100	0	4032	0:25:51	1	0	100	6048	4032	0:25:51	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
315180	22 May-14 18:21:26	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	732	2550	0:18:51	2	7.2	100	1392	2803	0:20:49	1	0	100	0	4032	0:25:51	1	0	100	6048	4032	0:25:51	1	0	100
315181	22 May-14 18:21:31	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	684	2550	0:18:53	2	8.4	100	1440	2803	0:20:50	1	0	100	0	4032	0:25:52	1	0	100	6048	4032	0:25:52	1	0	100
315182	22 May-14 18:21:36	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	636	2550	0:18:58	2	8.4	100	1488	2803	0:20:51	1	0	100	0	4032	0:25:53	1	0	100	6048	4032	0:25:53	1	0	100
315183	22 May-14 18:21:41	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	636	2550	0:19:03	1	0.0	100	1488	2803	0:20:51	1	0	100	0	4032	0:25:54	1	0	100	6048	4032	0:25:54	1	0	100
315184	22 May-14 18:21:46	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	636	2550	0:19:03	1	0.0	100	1488	2803	0:20:52	1	0	100	0	4032	0:25:54	1	0	100	6048	4032	0:25:54	1	0	100
315185	22 May-14 18:21:51	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	612	2550	0:19:04	2	3.4	100	1512	2803	0:20:52	1	0	100	0	4032	0:25:55	1	0	100	4032	4032	0:25:55	2	25	100
315186	22 May-14 18:21:56	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	564	2550	0:19:06	2	3.4	100	1560	2803	0:20:53	1	0	100	0	4032	0:25:55	1	0	100	4032	4032	0:25:55	1	0	100
315187	22 May-14 18:22:01	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	540	2550	0:19:11	2	4.8	100	1584	2803	0:20:54	1	0	100	0	4032	0:25:56	1	0	100	4032	4032	0:25:56	1	0	100
315188	22 May-14 18:22:06	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:13	2	7.2	100	1632	2803	0:20:54	1	0	100	0	4032	0:25:56	1	0	100	4032	4032	0:25:56	1	0	100
315189	22 May-14 18:22:11	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	1	0.0	100	1632	2803	0:20:54	1	0	100	0	4032	0:25:57	1	0	100	4032	4032	0:25:57	1	0	100
315190	22 May-14 18:22:16	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	1	0.0	100	1632	2803	0:20:55	1	0	100	0	4032	0:25:57	1	0	100	4032	4032	0:25:57	1	0	100
315191	22 May-14 18:22:21	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	1	0.0	100	1632	2803	0:20:55	1	0	100	0	4032	0:25:57	2	24	100	6048	4032	0:25:57	1	0	100
315192	22 May-14 18:22:26	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	1	0.0	100	1632	2803	0:20:55	1	0	100	0	4032	0:25:57	1	0	100	6048	4032	0:25:57	1	0	100
315193	22 May-14 18:22:31	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	1	0.0	100	1632	2803	0:20:55	1	0	100	0	4032	0:25:57	1	0	100	6048	4032	0:25:57	1	0	100
315194	22 May-14 18:22:36	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	1	0.0	100	1632	2803	0:20:55	1	0	100	0	4032	0:25:57	1	0	100	6048	4032	0:25:57	1	0	100
315195	22 May-14 18:22:41	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	1	0.0	100	1632	2803	0:20:55	1	0	100	0	4032	0:25:57	1	0	100	6048	4032	0:25:57	1	0	100
315196	22 May-14 18:22:46	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	1	0.0	100	1632	2803	0:20:55	1	0	100	0	4032	0:25:57	1	0	100	6048	4032	0:25:57	1	0	100
315197	22 May-14 18:22:51	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	1	0.0	100	1632	2803	0:20:55	1	0	100	0	4032	0:25:57	1	0	100	6048	4032	0:25:57	1	0	100
315198	22 May-14 18:22:56	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	1	0.0	100	1632	2803	0:20:55	1	0	100	0	4032	0:25:57	1	0	100	6048	4032	0:25:57	1	0	100
315199	22 May-14 18:23:01	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	1	0.0	100	1632	2803	0:20:55	1	0	100	0	4032	0:25:58	1	0	100	6048	4032	0:25:58	1	0	100
315200	22 May-14 18:23:06	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	1	0.0	100	1632	2803	0:20:55	1	0	100	0	4032	0:25:58	1	0	100	6048	4032	0:25:58	1	0	100
315201	22 May-14 18:23:11	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	0	0.0	100	1632	2803	0:20:55	1	0	100	0	4032	0:25:58	1	0	100	4032	4032	0:25:58	2	25	100
315202	22 May-14 18:23:16	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	0	0.0	90	1632	2803	0:20:55	1	0	100	0	4032	0:25:58	1	0	100	4032	4032	0:25:58	1	0	100
315203	22 May-14 18:23:21	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	0	0.0	80	1632	2803	0:20:55	1	0	100	0	4032	0:25:58	1	0	100	4032	4032	0:25:58	1	0	100
315204	22 May-14 18:23:26	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	0	0.0	70	1632	2803	0:20:55	1	0	100	0	4032	0:25:58	1	0	100	4032	4032	0:25:58	1	0	100
315205	22 May-14 18:23:31	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	0	0.0	60	1632	2803	0:20:55	1	0	100	0	4032	0:25:58	1	0	100	4032	4032	0:25:58	1	0	100
315206	22 May-14 18:23:36	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	0	0.0	50	1632	2803	0:20:55	1	0	100	0	4032	0:25:58	1	0	100	4032	4032	0:25:58	1	0	100
315207	22 May-14 18:23:41	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	0	0.0	40	1632	2803	0:20:55	1	0	100	0	4032	0:25:58	1	0	100	4032	4032	0:25:58	1	0	100
315208	22 May-14 18:23:46	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	0	0.0	30	1632	2803	0:20:55	1	0	100	0	4032	0:25:58	1	0	100	4032	4032	0:25:58	1	0	100
315209	22 May-14 18:23:51	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	0	0.0	20	1632	2803	0:20:55	1	0	100	0	4032	0:25:58	1	0	100	4032	4032	0:25:58	1	0	100
315210	22 May-14 18:23:56	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	0	0.0	10	1632	2803	0:20:55	1	0	100	0	4032	0:25:58	1	0	100	4032	4032	0:25:58	1	0	100
315211	22 May-14 18:24:01	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	0	0.0	0	1632	2803	0:20:55	1	0	100	0	4032	0:25:58	1	0	100	4032	4032	0:25:58	1	0	100
315212	22 May-14 18:24:06	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	0	0.0	0	1632	2803	0:20:55	1	0	100	0	4032	0:25:58	1	0	100	4032	4032	0:25:58	1	0	100
315213	22 May-14 18:24:11	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	492	2550	0:19:18	0	0.0	0	1632	2803	0:20:55	1	0	100	0	4032	0:25:58	1	0	100	4032	4032	0:25:58	1	0	100
315214	22 May-14 18:24:16	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	228	2550	0:19:18	2	10.6	0	1896	2803	0:20:55	1	0	100	0	4032	0:25:58	1	0	100	4032	4032	0:25:58	1	0	100
315215	22 May-14 18:24:21	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	180	2550	0:19:42	2	12.5	10	1944	2803	0:20:57	1	0	100	0	4032	0:26:00	1	0	100	4032	4032	0:26:00	1	0	100
315216	22 May-14 18:24:26	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:47	2	14.4	20	1992	2803	0:20:58	1	0	100	0	4032	0:26:00	1	0	100	4032	4032	0:26:00	1	0	100
315217	22 May-14 18:24:31	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	30	1992	2803	0:20:58	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315218	22 May-14 18:24:36	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	40	1992	2803	0:20:58	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315219	22 May-14 18:24:41	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	50	1992	2803	0:20:58	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315220	22 May-14 18:24:46	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	60	1992	2803	0:20:58	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315221	22 May-14 18:24:51	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	70	1992	2803	0:20:58	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315222	22 May-14 18:24:56	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	80	1992	2803	0:20:58	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315223	22 May-14 18:25:01	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	90	1992	2803	0:20:58	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315224	22 May-14 18:25:06	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	100	1992	2803	0:20:58	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315225	22 May-14 18:25:11	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	100	1992	2803	0:20:59	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315226	22 May-14 18:25:16	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	100	1992	2803	0:20:59	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315227	22 May-14 18:25:21	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	100	1992	2803	0:20:59	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315228	22 May-14 18:25:26	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	100	1992	2803	0:20:59	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315229	22 May-14 18:25:31	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	100	1992	2803	0:20:59	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315230	22 May-14 18:25:36	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	100	1992	2803	0:20:59	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315231	22 May-14 18:25:41	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	100	1992	2803	0:20:59	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315232	22 May-14 18:25:46	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	100	1992	2803	0:20:59	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315233	22 May-14 18:25:52	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	100	1992	2803	0:20:59	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
315234	22 May-14 18:25:56	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	100	1992	2803	0:20:59	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315235	22 May-14 18:26:01	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	100	1992	2803	0:20:59	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315236	22 May-14 18:26:06	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	100	1992	2803	0:20:59	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315237	22 May-14 18:26:11	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	100	1992	2803	0:20:59	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315238	22 May-14 18:26:16	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	100	1992	2803	0:20:59	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315239	22 May-14 18:26:21	0:00:00	1	0.0	100	116	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	100	1992	2803	0:20:59	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315240	22 May-14 18:26:26	0:00:00	2	0.0	100	127	5300	0:10:48	1	0.0	100	640	3600	0:16:05	1	0.0	100	132	2550	0:19:51	1	0.0	100	1992	2803	0:20:59	1	0	100	0	4032	0:26:01	1	0	100	4032	4032	0:26:01	1	0	100
315241	22 May-14 18:26:31	0:00:00	2	0.0	100	131	5300	0:10:40	1	0.0	100	640	3600	0:15:58	1	0.0	100	132	2550	0:19:44	1	0.0	100	1992	2803	0:20:52	1	0	100	0	4032	0:25:54	1	0	100	4032	4032	0:25:54	1	0	100
315242	22 May-14 18:26:36	0:00:00	1	0.0	100	131	5300	0:10:38	1	0.0	100	640	3600	0:15:55	1	0.0	100	132	2550	0:19:42	1	0.0	100	1992	2803	0:20:49	1	0	100	0	4032	0:25:52	1	0	100	4032	4032	0:25:52	1	0	100
315243	22 May-14 18:26:41	0:00:00	1	0.0	100	131	5300	0:10:38	1	0.0	100	640	3600	0:15:55	1	0.0	100	132	2550	0:19:42	1	0.0	100	0	2803	0:20:49	2	20	100	2016	4032	0:25:52	1	0	100	4032	4032	0:25:52	1	0	100
315244	22 May-14 18:26:46	0:00:00	1	0.0	100	131	5300	0:10:38	1	0.0	100	640	3600	0:15:55	1	0.0	100	132	2550	0:19:42	1	0.0	100	0	2803	0:23:35	1	0	100	2016	4032	0:26:06	1	0	100	4032	4032	0:26:06	1	0	100
315245	22 May-14 18:26:51	0:00:00	1	0.0	100	131	5300	0:10:38	1	0.0	100	640	3600	0:15:55	1	0.0	100	132	2550	0:19:42	1	0.0	100	0	2803	0:23:35	1	0	100	2016	4032	0:26:06	1	0	100	4032	4032	0:26:06	1	0	100
315246	22 May-14 18:26:56	0:00:00	1	0.0	100	131	5300	0:10:38	1	0.0	100	640	3600	0:15:55	1	0.0	100	132	2550	0:19:42	1	0.0	100	0	2803	0:23:35	1	0	100	2016	4032	0:26:06	1	0	100	4032	4032	0:26:06	1	0	100
315247	22 May-14 18:27:01	0:00:00	1	0.0	100	131	5300	0:10:38	1	0.0	100	640	3600	0:15:55	1	0.0	100	132	2550	0:19:42	1	0.0	100	0	2803	0:23:35	1	0	100	2016	4032	0:26:06	1	0	100	4032	4032	0:26:06	1	0	100
315248	22 May-14 18:27:06	0:00:00	1	0.0	100	131	5300	0:10:38	1	0.0	100	640	3600	0:15:55	1	0.0	100	132	2550	0:19:42	1	0.0	100	0	2803	0:23:35	1	0	100	2016	4032	0:26:06	1	0	100	4032	4032	0:26:06	1	0	100
315249	22 May-14 18:27:11	0:00:00	1	0.0	100	131	5300	0:10:38	1	0.0	100	640	3600	0:15:55	1	0.0	100	132	2550	0:19:42	1	0.0	100	0	2803	0:23:35	1	0	100	2016	4032	0:26:06	1	0	100	4032	4032	0:26:06	1	0	100
315250	22 May-14 18:27:16	0:00:00	1	0.0	100	131	5300	0:10:38	1	0.0	100	640	3600	0:15:55	1	0.0	100	132	2550	0:19:42	1	0.0	100	0	2803	0:23:35	1	0	100	2016	4032	0:26:06	1	0	100	4032	4032	0:26:06	1	0	100
315251	22 May-14 18:27:21	0:00:00	1	0.0	100	131	5300	0:10:44	1	0.0	100	640	3600	0:16:01	1	0.0	100	132	2550	0:19:47	1	0.0	100	0	2803	0:23:41	1	0	100	2016	4032	0:26:12	1	0	100	4032	4032	0:26:12	1	0	100
315252	22 May-14 18:27:26	0:00:00	1	0.0	100	131	5300	0:10:46	1	0.0	100	640	3600	0:16:03	1	0.0	100	132	2550	0:19:49	1	0.0	100	0	2803	0:23:43	1	0	100	2016	4032	0:26:14	1	0	100	4032	4032	0:26:14	1	0	100
315253	22 May-14 18:27:31	0:00:00	1	0.0	100	131	5300	0:10:46	1	0.0	100	640	3600	0:16:03	1	0.0	100	132	2550	0:19:49	1	0.0	100	0	2803	0:23:43	1	0	100	2016	4032	0:26:14	1	0	100	4032	4032	0:26:14	1	0	100
315254	22 May-14 18:27:36	0:00:00	2	0.0	100	143	5300	0:10:46	1	0.0	100	640	3600	0:16:03	1	0.0	100	132	2550	0:19:49	1	0.0	100	0	2803	0:23:43	1	0	100	2016	4032	0:26:14	1	0	100	4032	4032	0:26:14	1	0	100
315255	22 May-14 18:27:41	0:00:00	2	1.7	100	164	5300	0:10:38	1	0.0	100	640	3600	0:15:55	1	0.0	100	132	2550	0:19:42	1	0.0	100	0	2803	0:23:35	1	0	100	2016	4032	0:26:07	1	0	100	4032	4032	0:26:07	1	0	100
315256	22 May-14 18:27:46	0:00:00	1	0.0	100	164	5300	0:10:25	1	0.0	100	640	3600	0:15:42	1	0.0	100	132	2550	0:19:29	1	0.0	100	0	2803	0:23:22	1	0	100	2016	4032	0:25:54	1	0	100	4032	4032	0:25:54	1	0	100
315257	22 May-14 18:27:51	0:00:00	1	0.0	100	164	5300	0:10:25	1	0.0	100	640	3600	0:15:42	1	0.0	100	132	2550	0:19:29	1	0.0	100	0	2803	0:23:22	1	0	100	2016	4032	0:25:54	1	0	100	4032	4032	0:25:54	1	0	100
315258	22 May-14 18:27:56	0:00:00	1	0.0	100	164	5300	0:10:25	1	0.0	100	640	3600	0:15:42	1	0.0	100	132	2550	0:19:29	1	0.0	100	0	2803	0:23:22	1	0	100	2016	4032	0:25:54	1	0	100	4032	4032	0:25:54	1	0	100
315259	22 May-14 18:28:01	0:00:00	1	0.0	100	164	5300	0:10:25	1	0.0	100	640	3600	0:15:42	1	0.0	100	132	2550	0:19:28	1	0.0	100	0	2803	0:23:22	1	0	100	2016	4032	0:25:53	1	0	100	4032	4032	0:25:53	1	0	100
315260	22 May-14 18:28:06	0:00:00	1	0.0	100	164	5300	0:10:25	1	0.0	100	640	3600	0:15:42	1	0.0	100	132	2550	0:19:28	1	0.0	100	0	2803	0:23:22	1	0	100	2016	4032	0:25:53	1	0	100	4032	4032	0:25:53	1	0	100
315261	22 May-14 18:28:11	0:00:00	1	0.0	100	164	5300	0:10:24	1	0.0	100	640	3600	0:15:41	1	0.0	100	132	2550	0:19:28	1	0.0	100	0	2803	0:23:22	1	0	100	2016	4032	0:25:53	1	0	100	4032	4032	0:25:53	1	0	100
315262	22 May-14 18:28:16	0:00:00	1	0.0	100	164	5300	0:10:24	1	0.0	100	640	3600	0:15:41	1	0.0	100	132	2550	0:19:28	1	0.0	100	0	2803	0:23:22	1	0	100	2016	4032	0:25:53	1	0	100	4032	4032	0:25:53	1	0	100
315263	22 May-14 18:28:21	0:00:00	1	0.0	100	164	5300	0:10:24	1	0.0	100	640	3600	0:15:41	1	0.0	100	132	2550	0:19:28	1	0.0	100	0	2803	0:23:22	1	0	100	0	4032	0:25:53	2	24	100	6048	4032	0:25:53	1	0	100
315264	22 May-14 18:28:26	0:00:00	1	0.0	100	163	5300	0:10:24	2	0.0	100	641	3600	0:15:41	1	0.0	100	132	2550	0:19:28	1	0.0	100	0	2803	0:23:22	1	0	100	0	4032	0:28:24	1	0	100	6048	4032	0:28:24	1	0	100
315265	22 May-14 18:28:31	0:00:00	1	0.0	100	114	5300	0:10:31	2	2.5	100	690	3600	0:15:47	1	0.0	100	132	2550	0:19:34	1	0.0	100	0	2803	0:23:28	1	0	100	0	4032	0:28:30	1	0	100	6048	4032	0:28:30	1	0	100
315266	22 May-14 18:28:36	0:00:00	1	0.0	100	64	5300	0:10:48	2	5.0	100	740	3600	0:15:49	1	0.0	100	132	2550	0:19:35	1	0.0	100	0	2803	0:23:29	1	0	100	0	4032	0:28:31	1	0	100	6048	4032	0:28:31	1	0	100
315267	22 May-14 18:28:41	0:00:00	1	0.0	100	13	5300	0:10:54	2	7.6	100	791	3600	0:15:40	1	0.0	100	132	2550	0:19:27	1	0.0	100	0	2803	0:23:20	1	0	100	0	4032	0:28:23	1	0	100	6048	4032	0:28:23	1	0	100
315268	22 May-14 18:28:46	0:00:00	1	0.0	100	0	5300	0:11:00	2	9.7	100	834	3600	0:15:32	1	0.0	100	132	2550	0:19:19	1	0.0	100	0	2803	0:23:12	1	0	100	0	4032	0:28:15	1	0	100	6048	4032	0:28:15	1	0	100
315269	22 May-14 18:28:51	0:00:00	1	0.0	100	0	5300	0:11:02	2	9.2	100	874	3600	0:15:22	1	0.0	100	132	2550	0:19:09	1	0.0	100	0	2803	0:23:03	1	0	100	0	4032	0:28:05	1	0	100	6048	4032	0:28:05	1	0	100
315270	22 May-14 18:28:57	0:00:00	1	0.0	100	0	5300	0:11:02	2	8.8	100	915	3600	0:15:12	1	0.0	100	132	2550	0:18:59	1	0.0	100	0	2803	0:22:53	1	0	100	0	4032	0:27:55	1	0	100	6048	4032	0:27:55	1	0	100
315271	22 May-14 18:29:01	0:00:00	1	0.0	100	0	5300	0:11:02	2	8.2	100	955	3600	0:15:02	1	0.0	100	132	2550	0:18:49	1	0.0	100	0	2803	0:22:43	1	0	100	0	4032	0:27:45	1	0	100	6048	4032	0:27:45	1	0	100
315272	22 May-14 18:29:06	0:00:00	1	0.0	100	0	5300	0:11:02	2	8.1	100	995	3600	0:14:53	1	0.0	100	132	2550	0:18:40	1	0.0	100	0	2803	0:22:34	1	0	100	0	4032	0:27:36	1	0	100	6048	4032	0:27:36	1	0	100
315273	22 May-14 18:29:11	0:00:00	1	0.0	100	0	5300	0:11:02	2	6.6	100	1006	3600	0:14:45	1	0.0	100	132	2550	0:18:31	1	0.0	100	0	2803	0:22:25	1	0	100	0	4032	0:27:27	1	0	100	6048	4032	0:27:27	1	0	100
315274	22 May-14 18:29:17	0:00:00	1	0.0	100	0	5300	0:11:02	2	5.0	100	1014	3600	0:14:42	1	0.0	100	132	2550	0:18:29	1	0.0	100	0	2803	0:22:23	1	0	100	0	4032	0:27:25	1	0	100	6048	4032	0:27:25	1	0	100
315275	22 May-14 18:29:21	0:00:00	1	0.0	100	0	5300	0:11:02	2	3.2	100	1019	3600	0:14:41	1	0.0	100	132	2550	0:18:27	1	0.0	100	0	2803	0:22:21	1	0	100	0	4032	0:27:23	1	0	100	6048	4032	0:27:23	1	0	100
315276	22 May-14 18:29:26	0:00:00	1	0.0	100	0	5300	0:11:02	2	1.5	100	1025	3600	0:14:46	1	0.0	100	132	2550	0:18:33	1	0.0	100	0	2803	0:22:26	1	0	100	0	4032	0:27:29	1	0	100	6048	4032	0:27:29	1	0	100
315277	22 May-14 18:29:32	0:00:00	1	0.0	100	0	5300	0:11:02	2	1.2	100	1030	3600	0:14:51	1	0.0	100	132	2550	0:18:38	1	0.0	100	0	2803	0:22:31	1	0	100	0	4032	0:27:34	1	0	100	6048	4032	0:27:34	1	0	100
315278	22 May-14 18:29:36	0:00:00	1	0.0	100	0	5300	0:11:02	2	1.1	100	1036	3600	0:14:57	1	0.0	100	132	2550	0:18:44	1	0.0	100	0	2803	0:22:37	1	0	100	0	4032	0:27:40	1	0	100	6048	4032	0:27:40	1	0	100
315279	22 May-14 18:29:42	0:00:00	1	0.0	100	0	5300	0:11:02	2	1.2	100	1042	3600	0:15:02	1	0.0	100	132	2550	0:18:49	1	0.0	100	0	2803	0:22:42	1	0	100	0	4032	0:27:45	1	0	100	6048	4032	0:27:45	1	0	100
315280	22 May-14 18:29:46	0:00:00	2	1.0	100	15	5300	0:11:02	2	1.1	100	1047	3600	0:15:07	1	0.0	100	132	2550	0:18:53	1	0.0	100	0	2803	0:22:47	1	0	100	0	4032	0:27:49	1	0	100	6048	4032	0:27:49	1	0	100
315281	22 May-14 18:29:52	0:00:00	2	3.8	100	68	5300	0:10:49	2	1.0	100	1050	3600	0:14:59	1	0.0	100	132	2550	0:18:46	1	0.0	100	0	2803	0:22:40	1	0	100	0	4032	0:27:42	1	0	100	6048	4032	0:27:42	1	0	100
315282	22 May-14 18:29:56	0:00:00	2	4.6	100	84	5300	0:10:15	1	0.0	100	1050	3600	0:14:30	1	0.0	100	132	2550	0:18:17	1	0.0	100	0	2803	0:22:11	1	0	100	0	4032	0:27:13	1	0	100	6048	4032	0:27:13	1	0	100
315283	22 May-14 18:30:01	0:00:00	1	0.0	100	84	5300	0:10:05	1	0.0	100	1050	3600	0:14:28	1	0.0	100	132	2550	0:18:15	1	0.0	100	0	2803	0:22:08	1	0	100	0	4032	0:27:11	1	0	100	6048	4032	0:27:11	1	0	100
315284	22 May-14 18:30:06	0:00:00	1	0.0	100	84	5300	0:10:05	1	0.0	100	1050	3600	0:14:30	1	0.0	100	132	2550	0:18:17	1	0.0	100	0	2803	0:22:10	1	0	100	0	4032	0:27:13	1	0	100	6048	4032	0:27:13	1	0	100
315285	22 May-14 18:30:12	0:00:00	1	0.0	100	84	5300	0:10:05	1	0.0	100	1050	3600	0:14:31	1	0.0	100	132	2550	0:18:18	1	0.0	100	0	2803	0:22:12	1	0	100	0	4032	0:27:14	1	0	100	6048	4032	0:27:14	1	0	100
315286	22 May-14 18:30:16	0:00:00	1	0.0	100	84	5300	0:10:05	1	0.0	100	1050	3600	0:14:32	1	0.0	100	132	2550	0:18:19	1	0.0	100	0	2803	0:22:13	1	0	100	0	4032	0:27:15	1	0	100	6048	4032	0:27:15	1	0	100
315287	22 May-14 18:30:22	0:00:00	1	0.0	100	84	5300	0:10:05	1	0.0	100	1050	3600	0:14:33	1	0.0	100	132	2550	0:18:20	1	0.0	100	0	2803	0:22:14	1	0	100	0	4032	0:27:16	1	0	100	6048	4032	0:27:16	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
315288	22 May-14 18:30:27	0:00:00	1	0.0	100	84	5300	0:10:05	1	0.0	100	1050	3600	0:14:34	1	0.0	100	132	2550	0:18:21	1	0.0	100	0	2803	0:22:15	1	0	100	0	4032	0:27:17	1	0	100	6048	4032	0:27:17	1	0	100
315289	22 May-14 18:30:32	0:00:00	1	0.0	100	84	5300	0:10:05	1	0.0	100	1050	3600	0:14:36	1	0.0	100	132	2550	0:18:22	1	0.0	100	0	2803	0:22:16	1	0	100	0	4032	0:27:18	1	0	100	6048	4032	0:27:18	1	0	100
315290	22 May-14 18:30:37	0:00:00	1	0.0	100	84	5300	0:10:05	1	0.0	100	1050	3600	0:14:37	1	0.0	100	132	2550	0:18:23	1	0.0	100	0	2803	0:22:17	1	0	100	0	4032	0:27:19	1	0	100	6048	4032	0:27:19	1	0	100
315291	22 May-14 18:30:42	0:00:00	2	0.0	100	85	5300	0:10:15	1	0.0	100	1050	3600	0:14:47	1	0.0	100	132	2550	0:18:34	1	0.0	100	0	2803	0:22:27	1	0	100	0	4032	0:27:30	1	0	100	6048	4032	0:27:30	1	0	100
315292	22 May-14 18:30:47	0:00:00	2	2.9	100	141	5300	0:10:42	1	0.0	100	1050	3600	0:15:15	1	0.0	100	132	2550	0:19:02	1	0.0	100	0	2803	0:22:56	1	0	100	0	4032	0:27:58	1	0	100	6048	4032	0:27:58	1	0	100
315293	22 May-14 18:30:52	0:00:00	2	5.7	100	197	5300	0:10:15	1	0.0	100	1050	3600	0:14:48	1	0.0	100	132	2550	0:18:35	1	0.0	100	0	2803	0:22:29	1	0	100	0	4032	0:27:31	1	0	100	6048	4032	0:27:31	1	0	100
315294	22 May-14 18:30:57	0:00:00	2	8.4	100	252	5300	0:09:42	1	0.0	100	1050	3600	0:14:16	1	0.0	100	132	2550	0:18:02	1	0.0	100	0	2803	0:21:56	1	0	100	0	4032	0:26:58	1	0	100	6048	4032	0:26:58	1	0	100
315295	22 May-14 18:31:02	0:00:00	2	11.2	100	308	5300	0:09:13	1	0.0	100	1050	3600	0:13:46	1	0.0	100	132	2550	0:17:33	1	0.0	100	0	2803	0:21:26	1	0	100	0	4032	0:26:29	1	0	100	6048	4032	0:26:29	1	0	100
315296	22 May-14 18:31:07	0:00:00	2	11.1	100	363	5300	0:08:45	1	0.0	100	1050	3600	0:13:19	1	0.0	100	132	2550	0:17:05	1	0.0	100	0	2803	0:20:59	1	0	100	0	4032	0:26:01	1	0	100	6048	4032	0:26:01	1	0	100
315297	22 May-14 18:31:12	0:00:00	2	11.5	100	426	5300	0:08:20	1	0.0	100	1050	3600	0:12:53	1	0.0	100	132	2550	0:16:40	1	0.0	100	0	2803	0:20:34	1	0	100	0	4032	0:25:36	1	0	100	6048	4032	0:25:36	1	0	100
315298	22 May-14 18:31:17	0:00:00	2	11.2	100	475	5300	0:07:54	1	0.0	100	1050	3600	0:12:27	1	0.0	100	132	2550	0:16:14	1	0.0	100	0	2803	0:20:07	1	0	100	0	4032	0:25:10	1	0	100	6048	4032	0:25:10	1	0	100
315299	22 May-14 18:31:21	0:00:00	2	11.2	100	531	5300	0:07:34	1	0.0	100	1050	3600	0:12:08	1	0.0	100	132	2550	0:15:54	1	0.0	100	0	2803	0:19:48	1	0	100	0	4032	0:24:50	1	0	100	6048	4032	0:24:50	1	0	100
315300	22 May-14 18:31:26	0:00:00	2	11.2	100	587	5300	0:07:14	1	0.0	100	1050	3600	0:11:47	1	0.0	100	132	2550	0:15:34	1	0.0	100	0	2803	0:19:27	1	0	100	0	4032	0:24:30	1	0	100	6048	4032	0:24:30	1	0	100
315301	22 May-14 18:31:32	0:00:00	2	11.6	100	658	5300	0:06:55	1	0.0	100	1050	3600	0:11:28	1	0.0	100	132	2550	0:15:15	1	0.0	100	0	2803	0:19:08	1	0	100	0	4032	0:24:11	1	0	100	6048	4032	0:24:11	1	0	100
315302	22 May-14 18:31:37	0:00:00	2	11.3	100	700	5300	0:06:32	1	0.0	100	1050	3600	0:11:05	1	0.0	100	132	2550	0:14:52	1	0.0	100	0	2803	0:18:46	1	0	100	0	4032	0:23:48	1	0	100	6048	4032	0:23:48	1	0	100
315303	22 May-14 18:31:42	0:00:00	2	11.2	100	754	5300	0:06:32	1	0.0	100	1050	3600	0:11:05	1	0.0	100	132	2550	0:14:52	1	0.0	100	0	2803	0:18:45	1	0	100	0	4032	0:23:48	1	0	100	6048	4032	0:23:48	1	0	100
315304	22 May-14 18:31:47	0:00:00	2	11.2	100	811	5300	0:06:28	1	0.0	100	1050	3600	0:11:01	1	0.0	100	132	2550	0:14:48	1	0.0	100	0	2803	0:18:41	1	0	100	0	4032	0:23:43	1	0	100	6048	4032	0:23:43	1	0	100
315305	22 May-14 18:31:52	0:00:00	2	10.4	100	865	5300	0:06:22	1	0.0	100	1050	3600	0:10:56	1	0.0	100	132	2550	0:14:42	1	0.0	100	0	2803	0:18:36	1	0	100	0	4032	0:23:38	1	0	100	6048	4032	0:23:38	1	0	100
315306	22 May-14 18:31:57	0:00:00	2	11.2	100	923	5300	0:06:18	1	0.0	100	1050	3600	0:10:51	1	0.0	100	132	2550	0:14:38	1	0.0	100	0	2803	0:18:32	1	0	100	0	4032	0:23:34	1	0	100	6048	4032	0:23:34	1	0	100
315307	22 May-14 18:32:02	0:00:00	2	11.2	100	977	5300	0:06:13	1	0.0	100	1050	3600	0:10:46	1	0.0	100	132	2550	0:14:32	1	0.0	100	0	2803	0:18:26	1	0	100	0	4032	0:23:28	1	0	100	6048	4032	0:23:28	1	0	100
315308	22 May-14 18:32:07	0:00:00	2	11.1	100	1033	5300	0:06:10	1	0.0	100	1050	3600	0:10:43	1	0.0	100	132	2550	0:14:30	1	0.0	100	0	2803	0:18:23	1	0	100	0	4032	0:23:26	1	0	100	6048	4032	0:23:26	1	0	100
315309	22 May-14 18:32:12	0:00:00	2	11.2	100	1088	5300	0:06:04	1	0.0	100	1050	3600	0:10:37	1	0.0	100	132	2550	0:14:23	1	0.0	100	0	2803	0:18:17	1	0	100	0	4032	0:23:19	1	0	100	6048	4032	0:23:19	1	0	100
315310	22 May-14 18:32:17	0:00:00	2	11.1	100	1145	5300	0:05:59	1	0.0	100	1050	3600	0:10:32	1	0.0	100	132	2550	0:14:19	1	0.0	100	0	2803	0:18:13	1	0	100	0	4032	0:23:15	1	0	100	6048	4032	0:23:15	1	0	100
315311	22 May-14 18:32:22	0:00:00	2	11.2	100	1200	5300	0:05:54	1	0.0	100	1050	3600	0:10:27	1	0.0	100	132	2550	0:14:14	1	0.0	100	0	2803	0:18:08	1	0	100	0	4032	0:23:10	1	0	100	6048	4032	0:23:10	1	0	100
315312	22 May-14 18:32:27	0:00:00	2	11.2	100	1256	5300	0:05:53	1	0.0	100	1050	3600	0:10:26	1	0.0	100	132	2550	0:14:12	1	0.0	100	0	2803	0:18:06	1	0	100	0	4032	0:23:08	1	0	100	6048	4032	0:23:08	1	0	100
315313	22 May-14 18:32:32	0:00:00	2	11.2	100	1312	5300	0:05:45	1	0.0	100	1050	3600	0:10:18	1	0.0	100	132	2550	0:14:05	1	0.0	100	0	2803	0:17:58	1	0	100	0	4032	0:23:01	1	0	100	6048	4032	0:23:01	1	0	100
315314	22 May-14 18:32:37	0:00:00	2	11.1	100	1367	5300	0:05:40	1	0.0	100	1050	3600	0:10:13	1	0.0	100	132	2550	0:14:00	1	0.0	100	0	2803	0:17:53	1	0	100	0	4032	0:22:56	1	0	100	6048	4032	0:22:56	1	0	100
315315	22 May-14 18:32:42	0:00:00	2	11.3	100	1425	5300	0:05:35	1	0.0	100	1014	3600	0:10:09	2	1.8	100	168	2550	0:13:55	1	0.0	100	0	2803	0:17:49	1	0	100	0	4032	0:22:51	1	0	100	6048	4032	0:22:51	1	0	100
315316	22 May-14 18:32:47	0:00:00	2	11.1	100	1478	5300	0:05:30	1	0.0	100	978	3600	0:10:07	2	3.6	100	204	2550	0:13:50	1	0.0	100	0	2803	0:17:43	1	0	100	0	4032	0:22:46	1	0	100	6048	4032	0:22:46	1	0	100
315317	22 May-14 18:32:52	0:00:00	2	11.1	100	1534	5300	0:05:26	1	0.0	100	942	3600	0:10:07	2	5.4	100	240	2550	0:13:46	1	0.0	100	0	2803	0:17:40	1	0	100	0	4032	0:22:42	1	0	100	6048	4032	0:22:42	1	0	100
315318	22 May-14 18:32:57	0:00:00	2	11.2	100	1590	5300	0:05:21	1	0.0	100	894	3600	0:10:06	2	7.8	100	288	2550	0:13:41	1	0.0	100	0	2803	0:17:35	1	0	100	0	4032	0:22:37	1	0	100	6048	4032	0:22:37	1	0	100
315319	22 May-14 18:33:02	0:00:00	2	11.2	100	1648	5300	0:05:16	1	0.0	100	858	3600	0:10:06	2	7.8	100	324	2550	0:13:37	1	0.0	100	0	2803	0:17:30	1	0	100	0	4032	0:22:32	1	0	100	6048	4032	0:22:32	1	0	100
315320	22 May-14 18:33:07	0:00:00	2	11.2	100	1701	5300	0:05:11	1	0.0	100	810	3600	0:10:05	2	8.4	100	372	2550	0:13:31	1	0.0	100	0	2803	0:17:25	1	0	100	0	4032	0:22:27	1	0	100	6048	4032	0:22:27	1	0	100
315321	22 May-14 18:33:12	0:00:00	2	11.2	100	1757	5300	0:05:07	1	0.0	100	774	3600	0:10:06	2	8.4	100	408	2550	0:13:28	1	0.0	100	0	2803	0:17:21	1	0	100	0	4032	0:22:24	1	0	100	6048	4032	0:22:24	1	0	100
315322	22 May-14 18:33:17	0:00:00	2	11.1	100	1812	5300	0:05:02	1	0.0	100	726	3600	0:10:05	2	8.4	100	456	2550	0:13:23	1	0.0	100	0	2803	0:17:16	1	0	100	0	4032	0:22:19	1	0	100	6048	4032	0:22:19	1	0	100
315323	22 May-14 18:33:22	0:00:00	2	10.5	100	1868	5300	0:04:57	1	0.0	100	690	3600	0:10:05	2	8.0	100	492	2550	0:13:18	1	0.0	100	0	2803	0:17:12	1	0	100	0	4032	0:22:14	1	0	100	6048	4032	0:22:14	1	0	100
315324	22 May-14 18:33:27	0:00:00	2	10.6	100	1924	5300	0:04:54	1	0.0	100	666	3600	0:10:06	2	6.9	100	516	2550	0:13:16	1	0.0	100	0	2803	0:17:09	1	0	100	0	4032	0:22:12	1	0	100	6048	4032	0:22:12	1	0	100
315325	22 May-14 18:33:32	0:00:00	2	10.6	100	1980	5300	0:04:50	1	0.0	100	642	3600	0:10:04	2	6.3	100	540	2550	0:13:11	1	0.0	100	0	2803	0:17:04	1	0	100	0	4032	0:22:07	1	0	100	6048	4032	0:22:07	1	0	100
315326	22 May-14 18:33:37	0:00:00	2	10.6	100	2035	5300	0:04:45	1	0.0	100	606	3600	0:10:02	2	5.7	100	576	2550	0:13:07	1	0.0	100	0	2803	0:17:00	1	0	100	0	4032	0:22:03	1	0	100	6048	4032	0:22:03	1	0	100
315327	22 May-14 18:33:42	0:00:00	2	11.2	100	2091	5300	0:04:40	1	0.0	100	594	3600	0:10:01	2	4.8	100	588	2550	0:13:02	1	0.0	100	0	2803	0:16:56	1	0	100	0	4032	0:21:58	1	0	100	6048	4032	0:21:58	1	0	100
315328	22 May-14 18:33:47	0:00:00	2	11.2	100	2147	5300	0:04:35	1	0.0	100	594	3600	0:09:57	1	0.0	100	588	2550	0:12:58	1	0.0	100	0	2803	0:16:52	1	0	100	0	4032	0:21:54	1	0	100	6048	4032	0:21:54	1	0	100
315329	22 May-14 18:33:52	0:00:00	2	11.1	100	2202	5300	0:04:30	1	0.0	100	594	3600	0:09:52	1	0.0	100	588	2550	0:12:54	1	0.0	100	0	2803	0:16:47	1	0	100	0	4032	0:21:50	1	0	100	6048	4032	0:21:50	1	0	100
315330	22 May-14 18:33:57	0:00:00	2	11.2	100	2258	5300	0:04:26	1	0.0	100	594	3600	0:09:48	1	0.0	100	588	2550	0:12:50	1	0.0	100	0	2803	0:16:43	1	0	100	0	4032	0:21:46	1	0	100	6048	4032	0:21:46	1	0	100
315331	22 May-14 18:34:02	0:00:00	2	11.2	100	2314	5300	0:04:21	1	0.0	100	594	3600	0:09:43	1	0.0	100	588	2550	0:12:45	1	0.0	100	0	2803	0:16:38	1	0	100	0	4032	0:21:41	1	0	100	6048	4032	0:21:41	1	0	100
315332	22 May-14 18:34:07	0:00:00	2	11.1	100	2369	5300	0:04:16	1	0.0	100	594	3600	0:09:38	1	0.0	100	588	2550	0:12:40	1	0.0	100	0	2803	0:16:34	1	0	100	0	4032	0:21:36	1	0	100	6048	4032	0:21:36	1	0	100
315333	22 May-14 18:34:12	0:00:00	2	11.2	100	2425	5300	0:04:11	1	0.0	100	594	3600	0:09:33	1	0.0	100	588	2550	0:12:36	1	0.0	100	0	2803	0:16:30	1	0	100	0	4032	0:21:32	1	0	100	6048	4032	0:21:32	1	0	100
315334	22 May-14 18:34:17	0:00:00	2	11.2	100	2481	5300	0:04:05	1	0.0	100	594	3600	0:09:27	1	0.0	100	588	2550	0:12:30	1	0.0	100	0	2803	0:16:24	1	0	100	0	4032	0:21:26	1	0	100	6048	4032	0:21:26	1	0	100
315335	22 May-14 18:34:22	0:00:00	2	11.1	100	2536	5300	0:04:00	1	0.0	100	594	3600	0:09:22	1	0.0	100	588	2550	0:12:25	1	0.0	100	0	2803	0:16:19	1	0	100	0	4032	0:21:21	1	0	100	6048	4032	0:21:21	1	0	100
315336	22 May-14 18:34:27	0:00:00	2	11.2	100	2592	5300	0:03:56	1	0.0	100	594	3600	0:09:18	1	0.0	100	588	2550	0:12:21	1	0.0	100	0	2803	0:16:15	1	0	100	0	4032	0:21:17	1	0	100	6048	4032	0:21:17	1	0	100
315337	22 May-14 18:34:32	0:00:00	2	11.2	100	2648	5300	0:03:51	1	0.0	100	594	3600	0:09:13	1	0.0	100	588	2550	0:12:17	1	0.0	100	0	2803	0:16:10	1	0	100	0	4032	0:21:13	1	0	100	6048	4032	0:21:13	1	0	100
315338	22 May-14 18:34:37	0:00:00	2	11.2	100	2704	5300	0:03:46	1	0.0	100	594	3600	0:09:08	1	0.0	100	588	2550	0:12:12	1	0.0	100	0	2803	0:16:06	1	0	100	0	4032	0:21:08	1	0	100	6048	4032	0:21:08	1	0	100
315339	22 May-14 18:34:42	0:00:00	2	11.2	100	2759	5300	0:03:41	1	0.0	100	594	3600	0:09:03	1	0.0	100	588	2550	0:12:07	1	0.0	100	0	2803	0:16:01	1	0	100	0	4032	0:21:03	1	0	100	6048	4032	0:21:03	1	0	100
315340	22 May-14 18:34:47	0:00:00	2	11.2	100	2815	5300	0:03:36	1	0.0	100	594	3600	0:08:59	1	0.0	100	588	2550	0:12:02	1	0.0	100	0	2803	0:15:56	1	0	100	0	4032	0:20:58	1	0	100	6048	4032	0:20:58	1	0	100
315341	22 May-14 18:34:52	0:00:00	2	11.2	100	2871	5300	0:03:32	1	0.0	100	594	3600	0:08:54	1	0.0	100	588	2550	0:11:58	1	0.0	100	0	2803	0:15:51	1	0	100	0	4032	0:20:54	1	0	100	6048	4032	0:20:54	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
315342	22 May-14 18:34:57	0:00:00	2	11.1	100	2926	5300	0:03:27	1	0.0	100	594	3600	0:08:49	1	0.0	100	588	2550	0:11:53	1	0.0	100	0	2803	0:15:46	1	0	100	0	4032	0:20:49	1	0	100	6048	4032	0:20:49	1	0	100
315343	22 May-14 18:35:02	0:00:00	2	11.1	100	2981	5300	0:03:22	1	0.0	100	594	3600	0:08:44	1	0.0	100	588	2550	0:11:48	1	0.0	100	0	2803	0:15:42	1	0	100	0	4032	0:20:44	1	0	100	6048	4032	0:20:44	1	0	100
315344	22 May-14 18:35:07	0:00:00	2	11.1	100	3037	5300	0:03:18	1	0.0	100	594	3600	0:08:40	1	0.0	100	588	2550	0:11:44	1	0.0	100	0	2803	0:15:37	1	0	100	0	4032	0:20:40	1	0	100	6048	4032	0:20:40	1	0	100
315345	22 May-14 18:35:12	0:00:00	2	11.1	100	3093	5300	0:03:13	1	0.0	100	594	3600	0:08:35	1	0.0	100	588	2550	0:11:39	1	0.0	100	0	2803	0:15:32	1	0	100	0	4032	0:20:35	1	0	100	6048	4032	0:20:35	1	0	100
315346	22 May-14 18:35:17	0:00:00	2	11.5	100	3155	5300	0:03:08	1	0.0	100	594	3600	0:08:30	1	0.0	100	588	2550	0:11:34	1	0.0	100	0	2803	0:15:28	1	0	100	0	4032	0:20:30	1	0	100	6048	4032	0:20:30	1	0	100
315347	22 May-14 18:35:22	0:00:00	2	11.2	100	3205	5300	0:03:02	1	0.0	100	594	3600	0:08:24	1	0.0	100	588	2550	0:11:28	1	0.0	100	0	2803	0:15:22	1	0	100	0	4032	0:20:24	1	0	100	6048	4032	0:20:24	1	0	100
315348	22 May-14 18:35:27	0:00:00	2	11.3	100	3262	5300	0:02:58	1	0.0	100	594	3600	0:08:20	1	0.0	100	588	2550	0:11:24	1	0.0	100	0	2803	0:15:18	1	0	100	0	4032	0:20:20	1	0	100	6048	4032	0:20:20	1	0	100
315349	22 May-14 18:35:32	0:00:00	2	11.2	100	3316	5300	0:02:53	1	0.0	100	594	3600	0:08:15	1	0.0	100	588	2550	0:11:19	1	0.0	100	0	2803	0:15:13	1	0	100	0	4032	0:20:15	1	0	100	6048	4032	0:20:15	1	0	100
315350	22 May-14 18:35:37	0:00:00	2	11.0	100	3374	5300	0:02:49	1	0.0	100	594	3600	0:08:11	1	0.0	100	588	2550	0:11:15	1	0.0	100	0	2803	0:15:08	1	0	100	0	4032	0:20:11	1	0	100	6048	4032	0:20:11	1	0	100
315351	22 May-14 18:35:42	0:00:00	2	11.1	100	3427	5300	0:02:44	1	0.0	100	594	3600	0:08:06	1	0.0	100	588	2550	0:11:10	1	0.0	100	0	2803	0:15:03	1	0	100	0	4032	0:20:06	1	0	100	6048	4032	0:20:06	1	0	100
315352	22 May-14 18:35:47	0:00:00	2	11.2	100	3485	5300	0:02:39	1	0.0	100	594	3600	0:08:02	1	0.0	100	588	2550	0:11:06	1	0.0	100	0	2803	0:14:59	1	0	100	0	4032	0:20:01	1	0	100	6048	4032	0:20:01	1	0	100
315353	22 May-14 18:35:52	0:00:00	2	11.1	100	3538	5300	0:02:34	1	0.0	100	594	3600	0:07:56	1	0.0	100	588	2550	0:11:00	1	0.0	100	0	2803	0:14:54	1	0	100	0	4032	0:19:56	1	0	100	6048	4032	0:19:56	1	0	100
315354	22 May-14 18:35:57	0:00:00	2	11.0	100	3594	5300	0:02:30	1	0.0	100	594	3600	0:07:52	1	0.0	100	588	2550	0:10:56	1	0.0	100	0	2803	0:14:50	1	0	100	0	4032	0:19:52	1	0	100	6048	4032	0:19:52	1	0	100
315355	22 May-14 18:36:02	0:00:00	2	11.2	100	3650	5300	0:02:25	1	0.0	100	594	3600	0:07:47	1	0.0	100	588	2550	0:10:51	1	0.0	100	0	2803	0:14:45	1	0	100	0	4032	0:19:47	1	0	100	6048	4032	0:19:47	1	0	100
315356	22 May-14 18:36:07	0:00:00	2	11.4	100	3712	5300	0:02:20	1	0.0	100	594	3600	0:07:42	1	0.0	100	588	2550	0:10:46	1	0.0	100	0	2803	0:14:40	1	0	100	0	4032	0:19:42	1	0	100	6048	4032	0:19:42	1	0	100
315357	22 May-14 18:36:12	0:00:00	2	11.3	100	3763	5300	0:02:15	1	0.0	100	594	3600	0:07:37	1	0.0	100	588	2550	0:10:41	1	0.0	100	0	2803	0:14:35	1	0	100	0	4032	0:19:37	1	0	100	6048	4032	0:19:37	1	0	100
315358	22 May-14 18:36:17	0:00:00	2	11.1	100	3816	5300	0:02:11	1	0.0	100	594	3600	0:07:33	1	0.0	100	564	2550	0:10:37	2	1.2	100	24	2803	0:14:30	1	0	100	0	4032	0:19:33	1	0	100	6048	4032	0:19:33	1	0	100
315359	22 May-14 18:36:22	0:00:00	2	11.1	100	3871	5300	0:02:06	1	0.0	100	594	3600	0:07:28	1	0.0	100	516	2550	0:10:35	2	3.6	100	72	2803	0:14:26	1	0	100	0	4032	0:19:29	1	0	100	6048	4032	0:19:29	1	0	100
315360	22 May-14 18:36:27	0:00:00	2	10.9	100	3929	5300	0:02:02	1	0.0	100	594	3600	0:07:24	1	0.0	100	468	2550	0:10:34	2	6.0	100	120	2803	0:14:22	1	0	100	0	4032	0:19:24	1	0	100	6048	4032	0:19:24	1	0	100
315361	22 May-14 18:36:32	0:00:00	2	11.1	100	3985	5300	0:01:57	1	0.0	100	594	3600	0:07:19	1	0.0	100	396	2550	0:10:34	2	9.6	100	192	2803	0:14:17	1	0	100	0	4032	0:19:19	1	0	100	6048	4032	0:19:19	1	0	100
315362	22 May-14 18:36:37	0:00:00	2	11.1	100	4038	5300	0:01:52	1	0.0	100	594	3600	0:07:14	1	0.0	100	348	2550	0:10:36	2	10.8	100	240	2803	0:14:12	1	0	100	0	4032	0:19:15	1	0	100	6048	4032	0:19:15	1	0	100
315363	22 May-14 18:36:42	0:00:00	2	11.2	100	4094	5300	0:01:47	1	0.0	100	594	3600	0:07:10	1	0.0	100	300	2550	0:10:36	2	10.8	100	288	2803	0:14:08	1	0	100	0	4032	0:19:11	1	0	100	6048	4032	0:19:11	1	0	100
315364	22 May-14 18:36:47	0:00:00	2	11.1	100	4150	5300	0:01:43	1	0.0	100	594	3600	0:07:05	1	0.0	100	228	2550	0:10:36	2	12.0	100	360	2803	0:14:04	1	0	100	0	4032	0:19:06	1	0	100	6048	4032	0:19:06	1	0	100
315365	22 May-14 18:36:52	0:00:00	2	11.1	100	4206	5300	0:01:38	1	0.0	100	594	3600	0:07:00	1	0.0	100	180	2550	0:10:37	2	10.8	100	408	2803	0:13:59	1	0	100	0	4032	0:19:02	1	0	100	6048	4032	0:19:02	1	0	100
315366	22 May-14 18:36:57	0:00:00	2	11.2	100	4261	5300	0:01:33	1	0.0	100	594	3600	0:06:55	1	0.0	100	132	2550	0:10:37	2	10.8	100	456	2803	0:13:55	1	0	100	0	4032	0:18:57	1	0	100	6048	4032	0:18:57	1	0	100
315367	22 May-14 18:37:02	0:00:00	2	11.2	100	4317	5300	0:01:29	1	0.0	100	594	3600	0:06:51	1	0.0	100	132	2550	0:10:37	1	0.0	100	456	2803	0:13:51	1	0	100	0	4032	0:18:53	1	0	100	6048	4032	0:18:53	1	0	100
315368	22 May-14 18:37:07	0:00:00	2	11.1	100	4372	5300	0:01:24	1	0.0	100	594	3600	0:06:46	1	0.0	100	132	2550	0:10:32	1	0.0	100	456	2803	0:13:46	1	0	100	0	4032	0:18:48	1	0	100	6048	4032	0:18:48	1	0	100
315369	22 May-14 18:37:12	0:00:00	2	11.1	100	4428	5300	0:01:19	1	0.0	100	594	3600	0:06:41	1	0.0	100	132	2550	0:10:28	1	0.0	100	456	2803	0:13:41	1	0	100	0	4032	0:18:44	1	0	100	6048	4032	0:18:44	1	0	100
315370	22 May-14 18:37:17	0:00:00	2	11.2	100	4484	5300	0:01:14	1	0.0	100	594	3600	0:06:36	1	0.0	100	132	2550	0:10:23	1	0.0	100	456	2803	0:13:37	1	0	100	0	4032	0:18:39	1	0	100	6048	4032	0:18:39	1	0	100
315371	22 May-14 18:37:22	0:00:00	2	11.1	100	4539	5300	0:01:09	1	0.0	100	594	3600	0:06:31	1	0.0	100	132	2550	0:10:18	1	0.0	100	456	2803	0:13:32	1	0	100	0	4032	0:18:34	1	0	100	6048	4032	0:18:34	1	0	100
315372	22 May-14 18:37:27	0:00:00	2	11.2	100	4595	5300	0:01:05	1	0.0	100	594	3600	0:06:27	1	0.0	100	132	2550	0:10:13	1	0.0	100	456	2803	0:13:28	1	0	100	0	4032	0:18:30	1	0	100	6048	4032	0:18:30	1	0	100
315373	22 May-14 18:37:32	0:00:00	2	11.2	100	4651	5300	0:01:00	1	0.0	100	594	3600	0:06:22	1	0.0	100	132	2550	0:10:08	1	0.0	100	456	2803	0:13:23	1	0	100	0	4032	0:18:25	1	0	100	6048	4032	0:18:25	1	0	100
315374	22 May-14 18:37:37	0:00:00	2	11.2	100	4707	5300	0:00:55	1	0.0	100	594	3600	0:06:17	1	0.0	100	132	2550	0:10:04	1	0.0	100	456	2803	0:13:18	1	0	100	0	4032	0:18:21	1	0	100	6048	4032	0:18:21	1	0	100
315375	22 May-14 18:37:42	0:00:00	2	11.2	100	4762	5300	0:00:50	1	0.0	100	594	3600	0:06:12	1	0.0	100	132	2550	0:09:59	1	0.0	100	456	2803	0:13:14	1	0	100	0	4032	0:18:16	1	0	100	6048	4032	0:18:16	1	0	100
315376	22 May-14 18:37:47	0:00:00	2	11.3	100	4820	5300	0:00:45	1	0.0	100	594	3600	0:06:08	1	0.0	100	132	2550	0:09:54	1	0.0	100	456	2803	0:13:10	1	0	100	0	4032	0:18:12	1	0	100	6048	4032	0:18:12	1	0	100
315377	22 May-14 18:37:52	0:00:00	2	11.1	100	4873	5300	0:00:40	1	0.0	100	594	3600	0:06:03	1	0.0	100	132	2550	0:09:49	1	0.0	100	456	2803	0:13:05	1	0	100	0	4032	0:18:07	1	0	100	6048	4032	0:18:07	1	0	100
315378	22 May-14 18:37:57	0:00:00	2	11.1	100	4929	5300	0:00:36	1	0.0	100	594	3600	0:05:58	1	0.0	100	132	2550	0:09:45	1	0.0	100	456	2803	0:13:00	1	0	100	0	4032	0:18:03	1	0	100	6048	4032	0:18:03	1	0	100
315379	22 May-14 18:38:02	0:00:00	2	11.2	100	4985	5300	0:00:31	1	0.0	100	594	3600	0:05:53	1	0.0	100	132	2550	0:09:40	1	0.0	100	456	2803	0:12:56	1	0	100	0	4032	0:17:58	1	0	100	6048	4032	0:17:58	1	0	100
315380	22 May-14 18:38:07	0:00:00	2	11.0	100	5040	5300	0:00:26	1	0.0	100	594	3600	0:05:48	1	0.0	100	132	2550	0:09:35	1	0.0	100	456	2803	0:12:51	1	0	100	0	4032	0:17:53	1	0	100	6048	4032	0:17:53	1	0	100
315381	22 May-14 18:38:12	0:00:00	2	11.2	100	5096	5300	0:00:22	1	0.0	100	594	3600	0:05:44	1	0.0	100	132	2550	0:09:30	1	0.0	100	456	2803	0:12:46	1	0	100	0	4032	0:17:48	1	0	100	6048	4032	0:17:48	1	0	100
315382	22 May-14 18:38:17	0:00:00	2	11.3	100	5154	5300	0:00:17	1	0.0	100	594	3600	0:05:39	1	0.0	100	132	2550	0:09:26	1	0.0	100	456	2803	0:12:41	1	0	100	0	4032	0:17:44	1	0	100	6048	4032	0:17:44	1	0	100
315383	22 May-14 18:38:22	0:00:00	2	11.2	100	5208	5300	0:00:12	1	0.0	100	594	3600	0:05:34	1	0.0	100	132	2550	0:09:21	1	0.0	100	456	2803	0:12:36	1	0	100	0	4032	0:17:39	1	0	100	6048	4032	0:17:39	1	0	100
315384	22 May-14 18:38:27	0:00:00	2	11.2	100	5264	5300	0:00:07	1	0.0	100	594	3600	0:05:29	1	0.0	100	132	2550	0:09:16	1	0.0	100	456	2803	0:12:32	1	0	100	0	4032	0:17:34	1	0	100	6048	4032	0:17:34	1	0	100
315385	22 May-14 18:38:32	0:00:00	2	11.3	100	5321	5300	0:00:03	1	0.0	100	594	3600	0:05:25	1	0.0	100	132	2550	0:09:11	1	0.0	100	456	2803	0:12:27	1	0	100	0	4032	0:17:29	1	0	100	6048	4032	0:17:29	1	0	100
315386	22 May-14 18:38:37	0:00:02	2	10.5	100	5375	5300	0:00:00	1	0.0	100	594	3600	0:05:22	1	0.0	100	132	2550	0:09:08	1	0.0	100	456	2803	0:12:24	1	0	100	0	4032	0:17:26	1	0	100	6048	4032	0:17:26	1	0	100
315387	22 May-14 18:38:42	0:00:08	2	10.6	100	5430	5300	0:00:00	1	0.0	100	594	3600	0:05:22	1	0.0	100	132	2550	0:09:08	1	0.0	100	456	2803	0:12:24	1	0	100	0	4032	0:17:26	1	0	100	6048	4032	0:17:26	1	0	100
315388	22 May-14 18:38:47	0:00:13	2	10.6	100	5487	5300	0:00:00	1	0.0	100	594	3600	0:05:22	1	0.0	100	132	2550	0:09:08	1	0.0	100	456	2803	0:12:24	1	0	100	0	4032	0:17:26	1	0	100	6048	4032	0:17:26	1	0	100
315389	22 May-14 18:38:52	0:00:20	2	10.6	100	5543	5300	0:00:00	1	0.0	100	594	3600	0:05:22	1	0.0	100	132	2550	0:09:08	1	0.0	100	456	2803	0:12:24	1	0	100	0	4032	0:17:26	1	0	100	6048	4032	0:17:26	1	0	100
315390	22 May-14 18:38:57	0:00:26	2	11.2	100	5598	5300	0:00:00	1	0.0	100	594	3600	0:05:22	1	0.0	100	132	2550	0:09:08	1	0.0	100	456	2803	0:12:24	1	0	100	0	4032	0:17:26	1	0	100	6048	4032	0:17:26	1	0	100
315391	22 May-14 18:39:02	0:00:31	2	11.2	100	5627	5300	0:00:00	2	1.4	100	621	3600	0:05:22	1	0.0	100	132	2550	0:09:08	1	0.0	100	456	2803	0:12:24	1	0	100	0	4032	0:17:26	1	0	100	6048	4032	0:17:26	1	0	100
315392	22 May-14 18:39:07	0:00:34	2	11.1	100	5632	5300	0:00:00	2	3.9	100	671	3600	0:05:13	1	0.0	100	132	2550	0:08:59	1	0.0	100	456	2803	0:12:15	1	0	100	0	4032	0:17:17	1	0	100	6048	4032	0:17:17	1	0	100
315393	22 May-14 18:39:12	0:00:33	2	11.1	100	5637	5300	0:00:00	2	6.4	100	722	3600	0:04:57	1	0.0	100	132	2550	0:08:44	1	0.0	100	456	2803	0:12:00	1	0	100	0	4032	0:17:02	1	0	100	6048	4032	0:17:02	1	0	100
315394	22 May-14 18:39:17	0:00:33	2	11.2	100	5643	5300	0:00:00	2	8.9	100	772	3600	0:04:42	1	0.0	100	132	2550	0:08:29	1	0.0	100	456	2803	0:11:45	1	0	100	0	4032	0:16:47	1	0	100	6048	4032	0:16:47	1	0	100
315395	22 May-14 18:39:22	0:00:32	2	11.1	100	5647	5300	0:00:00	2	10.1	100	823	3600	0:04:29	1	0.0	100	132	2550	0:08:16	1	0.0	100	456	2803	0:11:31	1	0	100	0	4032	0:16:34	1	0	100	6048	4032	0:16:34	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_enthalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
315396	22 May-14 18:39:27	0:00:32	2	11.2	100	5653	5300	0:00:00	2	10.1	100	873	3600	0:04:16	1	0.0	100	132	2550	0:08:03	1	0.0	100	456	2803	0:11:18	1	0	100	0	4032	0:16:21	1	0	100	6048	4032	0:16:21	1	0	100
315397	22 May-14 18:39:32	0:00:31	2	11.2	100	5658	5300	0:00:00	2	10.1	100	924	3600	0:04:03	1	0.0	100	132	2550	0:07:50	1	0.0	100	456	2803	0:11:05	1	0	100	0	4032	0:16:08	1	0	100	6048	4032	0:16:08	1	0	100
315398	22 May-14 18:39:37	0:00:31	2	11.1	100	5662	5300	0:00:00	2	10.2	100	975	3600	0:03:52	1	0.0	100	132	2550	0:07:38	1	0.0	100	456	2803	0:10:54	1	0	100	0	4032	0:15:56	1	0	100	6048	4032	0:15:56	1	0	100
315399	22 May-14 18:39:42	0:00:30	2	11.2	100	5668	5300	0:00:00	2	10.1	100	1025	3600	0:03:41	1	0.0	100	132	2550	0:07:27	1	0.0	100	456	2803	0:10:43	1	0	100	0	4032	0:15:45	1	0	100	6048	4032	0:15:45	1	0	100
315400	22 May-14 18:39:47	0:00:30	2	11.1	100	5672	5300	0:00:00	2	10.2	100	1076	3600	0:03:30	1	0.0	100	132	2550	0:07:17	1	0.0	100	456	2803	0:10:33	1	0	100	0	4032	0:15:35	1	0	100	6048	4032	0:15:35	1	0	100
315401	22 May-14 18:39:52	0:00:29	2	11.1	100	5678	5300	0:00:00	2	10.1	100	1126	3600	0:03:21	1	0.0	100	132	2550	0:07:07	1	0.0	100	456	2803	0:10:23	1	0	100	0	4032	0:15:25	1	0	100	6048	4032	0:15:25	1	0	100
315402	22 May-14 18:39:57	0:00:29	2	11.2	100	5683	5300	0:00:00	2	10.1	100	1177	3600	0:03:14	1	0.0	100	132	2550	0:07:01	1	0.0	100	456	2803	0:10:17	1	0	100	0	4032	0:15:19	1	0	100	6048	4032	0:15:19	1	0	100
315403	22 May-14 18:40:02	0:00:30	2	11.1	100	5688	5300	0:00:00	2	10.1	100	1227	3600	0:03:10	1	0.0	100	132	2550	0:06:57	1	0.0	100	456	2803	0:10:12	1	0	100	0	4032	0:15:15	1	0	100	6048	4032	0:15:15	1	0	100
315404	22 May-14 18:40:07	0:00:30	2	11.3	100	5695	5300	0:00:00	2	10.1	100	1278	3600	0:03:06	1	0.0	100	132	2550	0:06:53	1	0.0	100	456	2803	0:10:09	1	0	100	0	4032	0:15:11	1	0	100	6048	4032	0:15:11	1	0	100
315405	22 May-14 18:40:12	0:00:31	2	11.2	100	5700	5300	0:00:00	2	10.1	100	1328	3600	0:03:02	1	0.0	100	132	2550	0:06:49	1	0.0	100	456	2803	0:10:05	1	0	100	0	4032	0:15:07	1	0	100	6048	4032	0:15:07	1	0	100
315406	22 May-14 18:40:17	0:00:31	2	11.1	100	5702	5300	0:00:00	2	10.1	100	1379	3600	0:02:58	1	0.0	100	132	2550	0:06:45	0	0.0	100	456	2803	0:10:01	1	0	100	0	4032	0:15:03	1	0	100	6048	4032	0:15:03	1	0	100
315407	22 May-14 18:40:22	0:00:31	2	11.1	100	5708	5300	0:00:00	2	10.1	100	1429	3600	0:02:54	1	0.0	100	132	2550	0:06:41	0	0.0	90	456	2803	0:09:57	1	0	100	0	4032	0:14:59	1	0	100	6048	4032	0:14:59	1	0	100
315408	22 May-14 18:40:27	0:00:32	2	11.0	100	5712	5300	0:00:00	2	10.1	100	1480	3600	0:02:50	1	0.0	100	132	2550	0:06:37	0	0.0	80	456	2803	0:09:53	1	0	100	0	4032	0:14:55	1	0	100	6048	4032	0:14:55	1	0	100
315409	22 May-14 18:40:32	0:00:32	2	11.3	100	5724	5300	0:00:00	2	10.1	100	1530	3600	0:02:46	1	0.0	100	132	2550	0:06:33	0	0.0	70	456	2803	0:09:49	1	0	100	0	4032	0:14:51	1	0	100	6048	4032	0:14:51	1	0	100
315410	22 May-14 18:40:37	0:00:33	2	11.1	100	5722	5300	0:00:00	2	10.1	100	1581	3600	0:02:42	1	0.0	100	132	2550	0:06:29	0	0.0	60	456	2803	0:09:45	1	0	100	0	4032	0:14:47	1	0	100	6048	4032	0:14:47	1	0	100
315411	22 May-14 18:40:42	0:00:33	2	11.1	100	5728	5300	0:00:00	2	10.1	100	1631	3600	0:02:38	1	0.0	100	132	2550	0:06:25	0	0.0	50	456	2803	0:09:41	1	0	100	0	4032	0:14:43	1	0	100	6048	4032	0:14:43	1	0	100
315412	22 May-14 18:40:47	0:00:33	2	11.2	100	5733	5300	0:00:00	2	10.1	100	1682	3600	0:02:35	1	0.0	100	132	2550	0:06:21	0	0.0	40	456	2803	0:09:37	1	0	100	0	4032	0:14:39	1	0	100	6048	4032	0:14:39	1	0	100
315413	22 May-14 18:40:52	0:00:34	2	11.0	100	5741	5300	0:00:00	2	10.1	100	1732	3600	0:02:31	1	0.0	100	132	2550	0:06:17	0	0.0	30	456	2803	0:09:33	1	0	100	0	4032	0:14:35	1	0	100	6048	4032	0:14:35	1	0	100
315414	22 May-14 18:40:57	0:00:34	2	11.2	100	5743	5300	0:00:00	2	10.1	100	1783	3600	0:02:27	1	0.0	100	132	2550	0:06:13	0	0.0	20	456	2803	0:09:29	1	0	100	0	4032	0:14:31	1	0	100	6048	4032	0:14:31	1	0	100
315415	22 May-14 18:41:02	0:00:34	2	11.2	100	5749	5300	0:00:00	2	10.1	100	1833	3600	0:02:23	1	0.0	100	132	2550	0:06:09	0	0.0	10	456	2803	0:09:25	1	0	100	0	4032	0:14:27	1	0	100	6048	4032	0:14:27	1	0	100
315416	22 May-14 18:41:07	0:00:35	2	11.1	100	5753	5300	0:00:00	2	10.1	100	1884	3600	0:02:19	1	0.0	100	132	2550	0:06:05	0	0.0	0	456	2803	0:09:21	1	0	100	0	4032	0:14:23	1	0	100	6048	4032	0:14:23	1	0	100
315417	22 May-14 18:41:12	0:00:35	2	11.0	100	5758	5300	0:00:00	2	10.2	100	1935	3600	0:02:15	1	0.0	100	132	2550	0:06:01	0	0.0	0	456	2803	0:09:17	1	0	100	0	4032	0:14:19	1	0	100	6048	4032	0:14:19	1	0	100
315418	22 May-14 18:41:17	0:00:36	2	11.0	100	5758	5300	0:00:00	2	10.2	100	1935	3600	0:02:11	1	0.0	100	132	2550	0:05:57	0	0.0	0	456	2803	0:09:13	1	0	100	0	4032	0:14:15	1	0	100	6048	4032	0:14:15	1	0	100
315419	22 May-14 18:41:22	0:00:36	2	11.4	100	5769	5300	0:00:00	2	10.3	100	2041	3600	0:02:11	1	0.0	100	132	2550	0:05:57	1	0.0	0	456	2803	0:09:13	1	0	100	0	4032	0:14:15	1	0	100	6048	4032	0:14:15	1	0	100
315420	22 May-14 18:41:27	0:00:36	2	11.4	100	5775	5300	0:00:00	2	10.3	100	2091	3600	0:02:02	1	0.0	100	132	2550	0:05:49	1	0.0	10	456	2803	0:09:04	1	0	100	0	4032	0:14:07	1	0	100	6048	4032	0:14:07	1	0	100
315421	22 May-14 18:41:32	0:00:37	2	11.4	100	5781	5300	0:00:00	2	10.3	100	2142	3600	0:01:58	1	0.0	100	132	2550	0:05:45	1	0.0	20	456	2803	0:09:00	1	0	100	0	4032	0:14:03	1	0	100	6048	4032	0:14:03	1	0	100
315422	22 May-14 18:41:37	0:00:37	2	11.4	100	5785	5300	0:00:00	2	10.3	100	2192	3600	0:01:54	1	0.0	100	132	2550	0:05:41	1	0.0	30	456	2803	0:08:56	1	0	100	0	4032	0:13:59	1	0	100	6048	4032	0:13:59	1	0	100
315423	22 May-14 18:41:42	0:00:38	2	11.2	100	5791	5300	0:00:00	2	10.1	100	2243	3600	0:01:50	1	0.0	100	132	2550	0:05:37	1	0.0	40	456	2803	0:08:52	1	0	100	0	4032	0:13:55	1	0	100	6048	4032	0:13:55	1	0	100
315424	22 May-14 18:41:47	0:00:38	2	11.1	100	5795	5300	0:00:00	2	10.1	100	2293	3600	0:01:46	1	0.0	100	132	2550	0:05:33	1	0.0	50	456	2803	0:08:48	1	0	100	0	4032	0:13:51	1	0	100	6048	4032	0:13:51	1	0	100
315425	22 May-14 18:41:52	0:00:38	2	11.1	100	5800	5300	0:00:00	2	10.1	100	2344	3600	0:01:42	1	0.0	100	132	2550	0:05:29	1	0.0	60	456	2803	0:08:44	1	0	100	0	4032	0:13:47	1	0	100	6048	4032	0:13:47	1	0	100
315426	22 May-14 18:41:57	0:00:39	2	11.1	100	5805	5300	0:00:00	2	10.1	100	2394	3600	0:01:38	1	0.0	100	132	2550	0:05:25	1	0.0	70	456	2803	0:08:40	1	0	100	0	4032	0:13:43	1	0	100	6048	4032	0:13:43	1	0	100
315427	22 May-14 18:42:02	0:00:39	2	11.1	100	5810	5300	0:00:00	2	10.1	100	2445	3600	0:01:34	1	0.0	100	132	2550	0:05:21	1	0.0	80	456	2803	0:08:36	1	0	100	0	4032	0:13:39	1	0	100	6048	4032	0:13:39	1	0	100
315428	22 May-14 18:42:07	0:00:40	2	11.1	100	5815	5300	0:00:00	2	10.1	100	2495	3600	0:01:30	1	0.0	100	132	2550	0:05:17	1	0.0	90	456	2803	0:08:32	1	0	100	0	4032	0:13:35	1	0	100	6048	4032	0:13:35	1	0	100
315429	22 May-14 18:42:12	0:00:40	2	11.1	100	5820	5300	0:00:00	2	10.1	100	2546	3600	0:01:26	1	0.0	100	132	2550	0:05:13	1	0.0	100	456	2803	0:08:29	1	0	100	0	4032	0:13:31	1	0	100	6048	4032	0:13:31	1	0	100
315430	22 May-14 18:42:17	0:00:40	2	11.2	100	5825	5300	0:00:00	2	10.2	100	2597	3600	0:01:22	1	0.0	100	132	2550	0:05:09	1	0.0	100	456	2803	0:08:25	1	0	100	0	4032	0:13:27	1	0	100	6048	4032	0:13:27	1	0	100
315431	22 May-14 18:42:22	0:00:41	2	11.1	100	5830	5300	0:00:00	2	10.1	100	2647	3600	0:01:18	1	0.0	100	132	2550	0:05:05	1	0.0	100	456	2803	0:08:21	1	0	100	0	4032	0:13:23	1	0	100	6048	4032	0:13:23	1	0	100
315432	22 May-14 18:42:27	0:00:41	2	11.2	100	5836	5300	0:00:00	2	10.1	100	2697	3600	0:01:15	1	0.0	100	132	2550	0:05:01	1	0.0	100	456	2803	0:08:17	1	0	100	0	4032	0:13:19	1	0	100	6048	4032	0:13:19	1	0	100
315433	22 May-14 18:42:32	0:00:42	2	11.1	100	5840	5300	0:00:00	2	10.1	100	2748	3600	0:01:11	1	0.0	100	132	2550	0:04:57	1	0.0	100	456	2803	0:08:13	1	0	100	0	4032	0:13:15	1	0	100	6048	4032	0:13:15	1	0	100
315434	22 May-14 18:42:37	0:00:42	2	11.1	100	5845	5300	0:00:00	2	10.1	100	2799	3600	0:01:07	1	0.0	100	132	2550	0:04:53	1	0.0	100	456	2803	0:08:09	1	0	100	0	4032	0:13:11	1	0	100	6048	4032	0:13:11	1	0	100
315435	22 May-14 18:42:42	0:00:42	2	11.2	100	5851	5300	0:00:00	2	10.1	100	2825	3600	0:01:03	2	1.2	100	156	2550	0:04:49	1	0.0	100	456	2803	0:08:05	1	0	100	0	4032	0:13:07	1	0	100	6048	4032	0:13:07	1	0	100
315436	22 May-14 18:42:47	0:00:43	2	11.2	100	5856	5300	0:00:00	2	10.2	100	2816	3600	0:01:01	2	4.2	100	216	2550	0:04:45	1	0.0	100	456	2803	0:08:00	1	0	100	0	4032	0:13:03	1	0	100	6048	4032	0:13:03	1	0	100
315437	22 May-14 18:42:52	0:00:43	2	10.7	100	5861	5300	0:00:00	2	9.7	100	2819	3600	0:01:01	2	6.3	100	264	2550	0:04:39	1	0.0	100	456	2803	0:07:55	1	0	100	0	4032	0:12:57	1	0	100	6048	4032	0:12:57	1	0	100
315438	22 May-14 18:42:57	0:00:44	2	10.6	100	5866	5300	0:00:00	2	9.6	100	2809	3600	0:01:01	2	9.1	100	324	2550	0:04:34	1	0.0	100	456	2803	0:07:50	1	0	100	0	4032	0:12:52	1	0	100	6048	4032	0:12:52	1	0	100
315439	22 May-14 18:43:02	0:00:44	2	10.0	100	5859	5300	0:00:00	2	9.7	100	2800	3600	0:01:02	2	10.9	100	384	2550	0:04:29	1	0.0	100	456	2803	0:07:44	1	0	100	0	4032	0:12:47	1	0	100	6048	4032	0:12:47	1	0	100
315440	22 May-14 18:43:07	0:00:44	1	0.0	100	5809	5300	0:00:00	2	9.6	100	2802	3600	0:01:03	2	10.3	100	432	2550	0:04:23	1	0.0	100	456	2803	0:07:39	1	0	100	0	4032	0:12:41	1	0	100	6048	4032	0:12:41	1	0	100
315441	22 May-14 18:43:12	0:00:40	1	0.0	100	5758	5300	0:00:00	2	10.1	100	2781	3600	0:01:03	2	12.0	100	504	2550	0:04:18	1	0.0	100	456	2803	0:07:34	1	0	100	0	4032	0:12:36	1	0	100	6048	4032	0:12:36	1	0	100
315442	22 May-14 18:43:17	0:00:36	1	0.0	100	5707	5300	0:00:00	2	10.2	100	2784	3600	0:01:04	2	11.4	100	552	2550	0:04:13	1	0.0	100	456	2803	0:07:28	1	0	100	0	4032	0:12:31	1	0	100	6048	4032	0:12:31	1	0	100
315443	22 May-14 18:43:22	0:00:32	1	0.0	100	5657	5300	0:00:00	2	10.1	100	2786	3600	0:01:04	2	10.8	100	600	2550	0:04:07	1	0.0	100	456	2803	0:07:23	1	0	100	0	4032	0:12:25	1	0	100	6048	4032	0:12:25	1	0	100
315444	22 May-14 18:43:27	0:00:28	1	0.0	100	5607	5300	0:00:00	2	10.1	100	2776	3600	0:01:04	2	11.4	100	660	2550	0:04:02	1	0.0	100	456	2803	0:07:18	1	0	100	0	4032	0:12:20	1	0	100	6048	4032	0:12:20	1	0	100
315445	22 May-14 18:43:32	0:00:24	1	0.0	100	5556	5300	0:00:00	2	10.1	100	2767	3600	0:01:05	2	10.8	100	720	2550	0:03:57	1	0.0	100	456	2803	0:07:13	1	0	100	0	4032	0:12:15	1	0	100	6048	4032	0:12:15	1	0	100
315446	22 May-14 18:43:37	0:00:20	1	0.0	100	5505	5300	0:00:00	2	10.1	100	2758	3600	0:01:05	2	11.4	100	780	2550	0:03:52	1	0.0	100	456	2803	0:07:08	1	0	100	0	4032	0:12:10	1	0	100	6048	4032	0:12:10	1	0	100
315447	22 May-14 18:43:42	0:00:16	1	0.0	100	5455	5300	0:00:00	2	10.1	100	2760	3600	0:01:06	2	11.4	100	828	2550	0:03:47	1	0.0	100	456	2803	0:07:03	1	0	100	0	4032	0:12:05	1	0	100	6048	4032	0:12:05	1	0	100
315448	22 May-14 18:43:47	0:00:12	1	0.0	100	5404	5300	0:00:00	2	10.2	100	2775	3600	0:01:06	2	10.2	100	864	2550	0:03:42	1	0.0	100	456	2803	0:06:58	1	0	100	0	4032	0:12:00	1	0	100	6048	4032	0:12:00	1	0	100
315449	22 May-14 18:43:52	0:00:08	1	0.0	100	5349	5300	0:00:00	2	10.4	100	2818	3600	0:01:04	2	7.8	100	876	2550	0:03:38	1	0.0	100	456	2803	0:06:54	1	0	100	0	4032	0:11:56	1	0	100	6048	4032	0:11:56	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
315450	22 May-14 18:43:57	0:00:03	1	0.0	100	5299	5300	0:00:00	2	10.3	100	2844	3600	0:01:01	2	6.0	100	900	2550	0:03:34	1	0.0	100	456	2803	0:06:50	1	0	100	0	4032	0:11:52	1	0	100	6048	4032	0:11:52	1	0	100
315451	22 May-14 18:44:02	0:00:00	1	0.0	100	5248	5300	0:00:00	2	10.4	100	2847	3600	0:00:59	2	6.0	100	948	2550	0:03:30	1	0.0	100	456	2803	0:06:46	1	0	100	0	4032	0:11:48	1	0	100	6048	4032	0:11:48	1	0	100
315452	22 May-14 18:44:07	0:00:00	1	0.0	100	5198	5300	0:00:06	2	10.3	100	2837	3600	0:01:05	2	7.2	100	1008	2550	0:03:32	1	0.0	100	456	2803	0:06:48	1	0	100	0	4032	0:11:50	1	0	100	6048	4032	0:11:50	1	0	100
315453	22 May-14 18:44:12	0:00:00	1	0.0	100	5147	5300	0:00:12	2	10.1	100	2840	3600	0:01:12	2	9.0	100	1056	2550	0:03:33	1	0.0	100	456	2803	0:06:49	1	0	100	0	4032	0:11:51	1	0	100	6048	4032	0:11:51	1	0	100
315454	22 May-14 18:44:17	0:00:00	1	0.0	100	5094	5300	0:00:19	2	10.3	100	2833	3600	0:01:18	2	10.8	100	1116	2550	0:03:35	1	0.0	100	456	2803	0:06:51	1	0	100	0	4032	0:11:53	1	0	100	6048	4032	0:11:53	1	0	100
315455	22 May-14 18:44:22	0:00:00	1	0.0	100	5044	5300	0:00:25	2	10.2	100	2823	3600	0:01:25	2	11.4	100	1176	2550	0:03:37	1	0.0	100	456	2803	0:06:52	1	0	100	0	4032	0:11:55	1	0	100	6048	4032	0:11:55	1	0	100
315456	22 May-14 18:44:27	0:00:00	1	0.0	100	4993	5300	0:00:32	2	10.3	100	2814	3600	0:01:32	2	11.4	100	1236	2550	0:03:38	1	0.0	100	456	2803	0:06:54	1	0	100	0	4032	0:11:56	1	0	100	6048	4032	0:11:56	1	0	100
315457	22 May-14 18:44:32	0:00:00	1	0.0	100	4943	5300	0:00:38	2	10.2	100	2816	3600	0:01:40	2	11.4	100	1284	2550	0:03:40	1	0.0	100	456	2803	0:06:55	1	0	100	0	4032	0:11:58	1	0	100	6048	4032	0:11:58	1	0	100
315458	22 May-14 18:44:37	0:00:00	1	0.0	100	4892	5300	0:00:44	2	10.1	100	2807	3600	0:01:46	2	11.4	100	1344	2550	0:03:42	1	0.0	100	456	2803	0:06:57	1	0	100	0	4032	0:12:00	1	0	100	6048	4032	0:12:00	1	0	100
315459	22 May-14 18:44:42	0:00:00	1	0.0	100	4842	5300	0:00:51	2	10.1	100	2809	3600	0:01:53	2	10.8	100	1392	2550	0:03:43	1	0.0	100	456	2803	0:06:59	1	0	100	0	4032	0:12:01	1	0	100	6048	4032	0:12:01	1	0	100
315460	22 May-14 18:44:47	0:00:00	1	0.0	100	4791	5300	0:00:57	2	10.1	100	2800	3600	0:01:59	2	10.8	100	1452	2550	0:03:45	1	0.0	100	456	2803	0:07:00	1	0	100	0	4032	0:12:03	1	0	100	6048	4032	0:12:03	1	0	100
315461	22 May-14 18:44:52	0:00:00	1	0.0	100	4741	5300	0:01:03	2	10.1	100	2790	3600	0:02:06	2	11.4	100	1512	2550	0:03:46	1	0.0	100	456	2803	0:07:02	1	0	100	0	4032	0:12:04	1	0	100	6048	4032	0:12:04	1	0	100
315462	22 May-14 18:44:57	0:00:00	1	0.0	100	4690	5300	0:01:09	2	10.1	100	2781	3600	0:02:13	2	11.4	100	1572	2550	0:03:48	1	0.0	100	456	2803	0:07:03	1	0	100	0	4032	0:12:06	1	0	100	6048	4032	0:12:06	1	0	100
315463	22 May-14 18:45:02	0:00:00	1	0.0	100	4640	5300	0:01:16	2	10.1	100	2783	3600	0:02:20	2	11.4	100	1620	2550	0:03:49	1	0.0	100	456	2803	0:07:05	1	0	100	0	4032	0:12:07	1	0	100	6048	4032	0:12:07	1	0	100
315464	22 May-14 18:45:07	0:00:00	1	0.0	100	4589	5300	0:01:22	2	10.1	100	2810	3600	0:02:26	2	9.6	100	1644	2550	0:03:51	1	0.0	100	456	2803	0:07:07	1	0	100	0	4032	0:12:09	1	0	100	6048	4032	0:12:09	1	0	100
315465	22 May-14 18:45:12	0:00:00	2	0.0	100	4540	5300	0:01:28	2	10.1	100	2860	3600	0:02:31	1	0.0	100	1644	2550	0:03:53	1	0.0	100	456	2803	0:07:09	1	0	100	0	4032	0:12:11	1	0	100	6048	4032	0:12:11	1	0	100
315466	22 May-14 18:45:17	0:00:00	2	0.0	100	4505	5300	0:01:34	2	10.1	100	2911	3600	0:02:33	1	0.0	100	1644	2550	0:03:56	1	0.0	100	456	2803	0:07:11	1	0	100	0	4032	0:12:14	1	0	100	6048	4032	0:12:14	1	0	100
315467	22 May-14 18:45:22	0:00:00	2	2.1	100	4479	5300	0:01:37	2	10.1	100	2961	3600	0:02:32	1	0.0	100	1644	2550	0:03:55	1	0.0	100	456	2803	0:07:10	1	0	100	0	4032	0:12:13	1	0	100	6048	4032	0:12:13	1	0	100
315468	22 May-14 18:45:27	0:00:00	2	3.9	100	4464	5300	0:01:39	2	10.1	100	3012	3600	0:02:29	1	0.0	100	1644	2550	0:03:52	1	0.0	100	456	2803	0:07:08	1	0	100	0	4032	0:12:10	1	0	100	6048	4032	0:12:10	1	0	100
315469	22 May-14 18:45:32	0:00:00	1	0.0	100	4414	5300	0:01:38	2	10.1	100	3038	3600	0:02:24	2	1.2	100	1668	2550	0:03:48	1	0.0	100	456	2803	0:07:03	1	0	100	0	4032	0:12:06	1	0	100	6048	4032	0:12:06	1	0	100
315470	22 May-14 18:45:37	0:00:00	1	0.0	100	4414	5300	0:01:44	2	10.1	100	3038	3600	0:02:28	2	1.2	100	1668	2550	0:03:49	1	0.0	100	456	2803	0:07:05	1	0	100	0	4032	0:12:07	1	0	100	6048	4032	0:12:07	1	0	100
315471	22 May-14 18:45:42	0:00:00	2	3.5	100	4376	5300	0:01:44	2	9.7	100	3030	3600	0:02:28	2	4.0	100	1728	2550	0:03:49	1	0.0	100	456	2803	0:07:05	1	0	100	0	4032	0:12:07	1	0	100	6048	4032	0:12:07	1	0	100
315472	22 May-14 18:45:47	0:00:00	1	0.0	100	4325	5300	0:01:47	2	9.7	100	3021	3600	0:02:32	2	6.9	100	1788	2550	0:03:48	1	0.0	100	456	2803	0:07:04	1	0	100	0	4032	0:12:06	1	0	100	6048	4032	0:12:06	1	0	100
315473	22 May-14 18:45:52	0:00:00	1	0.0	100	4274	5300	0:01:53	2	9.7	100	3012	3600	0:02:39	2	9.7	100	1848	2550	0:03:49	1	0.0	100	456	2803	0:07:05	1	0	100	0	4032	0:12:07	1	0	100	6048	4032	0:12:07	1	0	100
315474	22 May-14 18:45:57	0:00:00	1	0.0	100	4224	5300	0:01:59	2	9.7	100	3014	3600	0:02:45	2	10.9	100	1896	2550	0:03:50	1	0.0	100	456	2803	0:07:06	1	0	100	0	4032	0:12:08	1	0	100	6048	4032	0:12:08	1	0	100
315475	22 May-14 18:46:02	0:00:00	1	0.0	100	4224	5300	0:02:05	2	9.7	100	2954	3600	0:02:51	2	11.4	100	1956	2550	0:03:51	1	0.0	100	456	2803	0:07:07	1	0	100	0	4032	0:12:09	1	0	100	6048	4032	0:12:09	1	0	100
315476	22 May-14 18:46:07	0:00:00	2	0.0	100	4227	5300	0:02:05	0	0.0	100	2906	3600	0:02:56	2	10.8	100	2004	2550	0:03:51	1	0.0	100	456	2803	0:07:06	1	0	100	0	4032	0:12:09	1	0	100	6048	4032	0:12:09	1	0	100
315477	22 May-14 18:46:12	0:00:00	2	0.0	100	4229	5300	0:02:04	0	0.0	90	2846	3600	0:03:02	2	10.8	100	2064	2550	0:03:52	1	0.0	100	456	2803	0:07:08	1	0	100	0	4032	0:12:10	1	0	100	6048	4032	0:12:10	1	0	100
315478	22 May-14 18:46:17	0:00:00	2	0.0	100	4232	5300	0:02:05	0	0.0	80	2786	3600	0:03:09	2	11.4	100	2124	2550	0:03:54	1	0.0	100	456	2803	0:07:10	1	0	100	0	4032	0:12:12	1	0	100	6048	4032	0:12:12	1	0	100
315479	22 May-14 18:46:22	0:00:00	2	0.0	100	4236	5300	0:02:07	0	0.0	70	2738	3600	0:03:18	2	10.8	100	2148	2550	0:03:57	2	1.2	100	480	2803	0:07:13	1	0	100	0	4032	0:12:15	1	0	100	6048	4032	0:12:15	1	0	100
315480	22 May-14 18:46:27	0:00:00	1	0.0	100	4236	5300	0:02:10	0	0.0	60	2678	3600	0:03:27	2	11.4	100	2160	2550	0:04:04	2	3.6	100	528	2803	0:07:17	1	0	100	0	4032	0:12:20	1	0	100	6048	4032	0:12:20	1	0	100
315481	22 May-14 18:46:32	0:00:00	1	0.0	100	4236	5300	0:02:10	0	0.0	50	2618	3600	0:03:35	2	11.4	100	2148	2550	0:04:10	2	7.2	100	600	2803	0:07:20	1	0	100	0	4032	0:12:22	1	0	100	6048	4032	0:12:22	1	0	100
315482	22 May-14 18:46:37	0:00:00	1	0.0	100	4236	5300	0:02:11	0	0.0	40	2558	3600	0:03:44	2	11.4	100	2160	2550	0:04:21	2	9.6	100	648	2803	0:07:24	1	0	100	0	4032	0:12:26	1	0	100	6048	4032	0:12:26	1	0	100
315483	22 May-14 18:46:42	0:00:00	2	0.0	100	4253	5300	0:02:11	0	0.0	30	2510	3600	0:03:53	2	11.4	100	2160	2550	0:04:28	2	10.8	100	696	2803	0:07:27	1	0	100	0	4032	0:12:30	1	0	100	6048	4032	0:12:30	1	0	100
315484	22 May-14 18:46:47	0:00:00	2	1.8	100	4271	5300	0:02:07	0	0.0	20	2450	3600	0:03:57	2	11.4	100	2148	2550	0:04:32	2	12.0	100	768	2803	0:07:27	1	0	100	0	4032	0:12:29	1	0	100	6048	4032	0:12:29	1	0	100
315485	22 May-14 18:46:52	0:00:00	2	1.8	100	4272	5300	0:02:03	0	0.0	10	2390	3600	0:04:03	2	11.4	100	2160	2550	0:04:39	2	10.8	100	816	2803	0:07:28	1	0	100	0	4032	0:12:30	1	0	100	6048	4032	0:12:30	1	0	100
315486	22 May-14 18:46:57	0:00:00	1	0.0	100	4272	5300	0:02:03	0	0.0	0	2342	3600	0:04:13	2	10.8	100	2160	2550	0:04:48	2	10.8	100	864	2803	0:07:32	1	0	100	0	4032	0:12:35	1	0	100	6048	4032	0:12:35	1	0	100
315487	22 May-14 18:47:02	0:00:00	1	0.0	100	4272	5300	0:02:03	0	0.0	0	2282	3600	0:04:18	2	11.4	100	2148	2550	0:04:54	2	12.0	100	936	2803	0:07:34	1	0	100	0	4032	0:12:36	1	0	100	6048	4032	0:12:36	1	0	100
315488	22 May-14 18:47:07	0:00:00	1	0.0	100	4272	5300	0:02:04	0	0.0	0	2282	3600	0:04:25	2	11.4	100	2148	2550	0:05:01	2	12.0	100	936	2803	0:07:35	1	0	100	0	4032	0:12:38	1	0	100	6048	4032	0:12:38	1	0	100
315489	22 May-14 18:47:12	0:00:00	2	1.2	100	3537	5300	0:02:04	2	30.6	0	2927	3600	0:04:25	2	11.5	100	2148	2550	0:05:01	2	11.5	100	1056	2803	0:07:35	1	0	100	0	4032	0:12:38	1	0	100	6048	4032	0:12:38	1	0	100
315490	22 May-14 18:47:17	0:00:00	2	2.0	100	3506	5300	0:03:29	2	32.6	10	2918	3600	0:04:17	2	11.5	100	2160	2550	0:04:54	2	11.5	100	1104	2803	0:07:17	1	0	100	0	4032	0:12:20	1	0	100	6048	4032	0:12:20	1	0	100
315491	22 May-14 18:47:22	0:00:00	2	3.1	100	3483	5300	0:03:30	2	34.6	20	2920	3600	0:04:18	2	11.5	100	2160	2550	0:04:53	2	11.5	100	1152	2803	0:07:13	1	0	100	0	4032	0:12:15	1	0	100	6048	4032	0:12:15	1	0	100
315492	22 May-14 18:47:27	0:00:00	2	3.1	100	3432	5300	0:03:29	2	36.7	30	2971	3600	0:04:15	2	11.5	100	2088	2550	0:04:51	2	11.5	100	1224	2803	0:07:07	1	0	100	0	4032	0:12:09	1	0	100	6048	4032	0:12:09	1	0	100
315493	22 May-14 18:47:32	0:00:00	2	3.1	100	3379	5300	0:03:35	2	9.8	40	3024	3600	0:04:17	2	11.5	100	2040	2550	0:04:59	2	10.3	100	1272	2803	0:07:09	1	0	100	0	4032	0:12:11	1	0	100	6048	4032	0:12:11	1	0	100
315494	22 May-14 18:47:37	0:00:00	0	0.0	90	3328	5300	0:03:41	2	9.8	50	3075	3600	0:04:19	0	0.0	90	1992	2550	0:05:05	2	10.3	100	1320	2803	0:07:11	1	0	100	0	4032	0:12:14	1	0	100	6048	4032	0:12:14	1	0	100
315495	22 May-14 18:47:42	0:00:00	0	0.0	70	3277	5300	0:03:47	2	9.8	60	3126	3600	0:04:21	0	0.0	70	1920	2550	0:05:12	2	11.4	100	1392	2803	0:07:14	1	0	100	0	4032	0:12:16	1	0	100	6048	4032	0:12:16	1	0	100
315496	22 May-14 18:47:47	0:00:00	0	0.0	50	3227	5300	0:03:53	2	9.8	70	3176	3600	0:04:23	0	0.0	50	1872	2550	0:05:21	2	10.3	100	1440	2803	0:07:17	1	0	100	0	4032	0:12:19	1	0	100	6048	4032	0:12:19	1	0	100
315497	22 May-14 18:47:52	0:00:00	0	0.0	30	3176	5300	0:04:01	2	10.2	80	2843	3600	0:04:28	2	19.2	40	2208	2550	0:05:30	2	10.8	100	1488	2803	0:07:22	1	0	100	0	4032	0:12:25	1	0	100	6048	4032	0:12:25	1	0	100
315498	22 May-14 18:47:57	0:00:00	0	0.0	10	3125	5300	0:04:10	2	10.2	90	3278	3600	0:04:57	0	0.0	50	1752	2550	0:05:28	2	12.0	100	1560	2803	0:07:16	1	0	100	0	4032	0:12:19	1	0	100	6048	4032	0:12:19	1	0	100
315499	22 May-14 18:48:02	0:00:00	1	0.0	0	3075	5300	0:04:19	2	10.1	100	2872	3600	0:04:38	2	18.2	40	2160	2550	0:05:52	2	10.8	100	1608	2803	0:07:34	1	0	100	0	4032	0:12:37	1	0	100	6048	4032	0:12:37	1	0	100
315500	22 May-14 18:48:07	0:00:00	0	0.0	10	3024	5300	0:04:27	2	10.2	100	2863	3600	0:05:25	2	51.6	50	2172	2550	0:06:00	2	10.8	100	1656	2803	0:07:39	1	0	100	0	4032	0:12:41	1	0	100	6048	4032	0:12:41	1	0	100
315501	22 May-14 18:48:12	0:00:00	1	0.0	0	2974	5300	0:04:31	2	10.1	100	2865	3600	0:05:29	2	9.0	60	2148	2550	0:06:03	2	12.0	100	1728	2803	0:07:38	1	0	100	0	4032	0:12:40	1	0	100	6048	4032	0:12:40	1	0	100
315502	22 May-14 18:48:17	0:00:00	1	0.0	10	2923	5300	0:04:50	2	10.1	100	2820	3600	0:05:48	2	7.9	70	2196	2550	0:06:25	2	10.8	100	1776	2803	0:07:53	1	0	100	0	4032	0:12:56	1	0	100	6048	4032	0:12:56	1	0	100
315503	22 May-14 18:48:22	0:00:00	2	1.7	20	2907	5300	0:04:57	2	10.1	100	2870	3600	0:05:58	0	0.0	80	2148	2550	0:06:30	2	10.8	100	1824	2803	0:07:55	1	0	100	0	4032	0:12:57	1	0	100	6048	4032	0:12:57	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
315504	22 May-14 18:48:27	0:00:00	2	2.1	30	2894	5300	0:04:50	2	10.1	100	2849	3600	0:05:48	2	10.8	70	2148	2550	0:06:24	2	12.0	100	1896	2803	0:07:45	1	0	100	0	4032	0:12:47	1	0	100	6048	4032	0:12:47	1	0	100
315505	22 May-14 18:48:32	0:00:00	1	0.0	40	2844	5300	0:04:43	2	10.1	100	2839	3600	0:05:42	2	11.4	80	2208	2550	0:06:18	1	0.0	100	1896	2803	0:07:33	1	0	100	0	4032	0:12:35	1	0	100	6048	4032	0:12:35	1	0	100
315506	22 May-14 18:48:37	0:00:00	1	0.0	50	2793	5300	0:04:49	2	10.1	100	2830	3600	0:05:49	2	9.6	90	2268	2550	0:06:20	1	0.0	100	1896	2803	0:07:35	1	0	100	0	4032	0:12:37	1	0	100	6048	4032	0:12:37	1	0	100
315507	22 May-14 18:48:42	0:00:00	1	0.0	60	2743	5300	0:04:51	2	10.1	100	2820	3600	0:05:52	2	12.6	100	2328	2550	0:06:17	1	0.0	100	1896	2803	0:07:31	1	0	100	0	4032	0:12:34	1	0	100	6048	4032	0:12:34	1	0	100
315508	22 May-14 18:48:47	0:00:00	1	0.0	70	2692	5300	0:05:03	2	10.1	100	2823	3600	0:06:04	2	11.4	100	2376	2550	0:06:24	1	0.0	100	1896	2803	0:07:39	1	0	100	0	4032	0:12:42	1	0	100	6048	4032	0:12:42	1	0	100
315509	22 May-14 18:48:52	0:00:00	1	0.0	80	2642	5300	0:05:03	2	10.1	100	2813	3600	0:06:04	2	11.4	100	2388	2550	0:06:20	2	2.4	100	1944	2803	0:07:35	1	0	100	0	4032	0:12:37	1	0	100	6048	4032	0:12:37	1	0	100
315510	22 May-14 18:48:57	0:00:00	1	0.0	90	2591	5300	0:05:13	2	10.1	100	2816	3600	0:06:15	2	10.8	100	2412	2550	0:06:30	2	3.6	100	1968	2803	0:07:41	1	0	100	0	4032	0:12:43	1	0	100	6048	4032	0:12:43	1	0	100
315511	22 May-14 18:49:02	0:00:00	1	0.0	100	2541	5300	0:05:23	2	10.1	100	2806	3600	0:06:25	2	10.8	100	2472	2550	0:06:37	1	0.0	100	1968	2803	0:07:47	1	0	100	0	4032	0:12:49	1	0	100	6048	4032	0:12:49	1	0	100
315512	22 May-14 18:49:07	0:00:00	1	0.0	100	2490	5300	0:05:25	2	10.1	100	2797	3600	0:06:27	2	11.4	100	2532	2550	0:06:34	1	0.0	100	1968	2803	0:07:44	1	0	100	0	4032	0:12:46	1	0	100	6048	4032	0:12:46	1	0	100
315513	22 May-14 18:49:12	0:00:00	1	0.0	100	2440	5300	0:05:31	2	10.1	100	2799	3600	0:06:34	2	10.8	100	2556	2550	0:06:36	2	2.4	100	1992	2803	0:07:45	1	0	100	0	4032	0:12:47	1	0	100	6048	4032	0:12:47	1	0	100
315514	22 May-14 18:49:17	0:00:00	2	0.0	100	2401	5300	0:05:46	2	10.1	100	2790	3600	0:06:49	2	11.4	100	2544	2550	0:06:49	2	4.8	100	2064	2803	0:07:56	1	0	100	0	4032	0:12:59	1	0	100	6048	4032	0:12:59	1	0	100
315515	22 May-14 18:49:22	0:00:00	2	3.5	100	2407	5300	0:05:58	2	10.2	100	2781	3600	0:07:02	2	11.4	100	2556	2550	0:07:03	2	7.2	100	2112	2803	0:08:04	1	0	100	0	4032	0:13:06	1	0	100	6048	4032	0:13:06	1	0	100
315516	22 May-14 18:49:27	0:00:00	2	6.2	100	2412	5300	0:05:41	2	10.1	100	2783	3600	0:06:46	2	10.8	100	2532	2550	0:06:46	2	10.8	100	2184	2803	0:07:43	1	0	100	0	4032	0:12:46	1	0	100	6048	4032	0:12:46	1	0	100
315517	22 May-14 18:49:32	0:00:00	2	9.0	100	2416	5300	0:05:27	2	10.2	100	2774	3600	0:06:31	2	11.4	100	2520	2550	0:06:33	2	13.2	100	2256	2803	0:07:24	1	0	100	0	4032	0:12:26	1	0	100	6048	4032	0:12:26	1	0	100
315518	22 May-14 18:49:37	0:00:00	2	11.2	100	2422	5300	0:05:13	2	10.1	100	2764	3600	0:06:18	2	11.4	100	2532	2550	0:06:21	2	12.0	100	2304	2803	0:07:06	1	0	100	0	4032	0:12:09	1	0	100	6048	4032	0:12:09	1	0	100
315519	22 May-14 18:49:42	0:00:00	2	11.1	100	2427	5300	0:05:00	2	10.1	100	2767	3600	0:06:06	2	10.8	100	2508	2550	0:06:08	2	13.2	100	2376	2803	0:06:49	1	0	100	0	4032	0:11:51	1	0	100	6048	4032	0:11:51	1	0	100
315520	22 May-14 18:49:47	0:00:00	2	11.1	100	2432	5300	0:04:49	2	10.1	100	2757	3600	0:05:54	2	11.4	100	2520	2550	0:05:58	2	12.0	100	2424	2803	0:06:33	1	0	100	0	4032	0:11:36	1	0	100	6048	4032	0:11:36	1	0	100
315521	22 May-14 18:49:52	0:00:00	2	11.2	100	2437	5300	0:04:38	2	10.1	100	2748	3600	0:05:44	2	11.4	100	2508	2550	0:05:47	2	12.0	100	2496	2803	0:06:18	1	0	100	0	4032	0:11:21	1	0	100	6048	4032	0:11:21	1	0	100
315522	22 May-14 18:49:57	0:00:00	2	11.2	100	2443	5300	0:04:28	2	10.1	100	2750	3600	0:05:35	2	10.8	100	2484	2550	0:05:38	2	13.2	100	2568	2803	0:06:12	1	0	100	0	4032	0:11:06	1	0	100	6048	4032	0:11:06	1	0	100
315523	22 May-14 18:50:02	0:00:00	2	11.2	100	2448	5300	0:04:18	2	10.1	100	2741	3600	0:05:25	2	11.4	100	2496	2550	0:05:31	2	12.0	100	2616	2803	0:06:12	1	0	100	0	4032	0:10:53	1	0	100	6048	4032	0:10:53	1	0	100
315524	22 May-14 18:50:07	0:00:00	2	11.2	100	2453	5300	0:04:09	2	10.1	100	2731	3600	0:05:17	2	11.4	100	2484	2550	0:05:22	2	13.2	100	2688	2803	0:06:12	1	0	100	0	4032	0:10:39	1	0	100	6048	4032	0:10:39	1	0	100
315525	22 May-14 18:50:12	0:00:00	2	11.2	100	2458	5300	0:04:03	2	10.1	100	2722	3600	0:05:11	2	11.4	100	2472	2550	0:05:17	2	13.2	100	2760	2803	0:06:12	1	0	100	0	4032	0:10:29	1	0	100	6048	4032	0:10:29	1	0	100
315526	22 May-14 18:50:17	0:00:00	2	11.1	100	2463	5300	0:04:02	2	10.1	100	2724	3600	0:05:11	2	11.4	100	2472	2550	0:05:19	2	12.0	100	2808	2803	0:06:12	1	0	100	0	4032	0:10:24	1	0	100	6048	4032	0:10:24	1	0	100
315527	22 May-14 18:50:22	0:00:00	2	11.1	100	2468	5300	0:04:02	2	10.1	100	2715	3600	0:05:11	2	11.4	100	2460	2550	0:05:18	2	13.2	100	2880	2803	0:06:12	1	0	100	0	4032	0:10:20	1	0	100	6048	4032	0:10:20	1	0	100
315528	22 May-14 18:50:27	0:00:00	2	11.2	100	2483	5300	0:04:01	2	9.7	100	2708	3600	0:05:11	2	10.8	100	2460	2550	0:05:19	2	12.0	100	2928	2803	0:06:12	1	0	100	0	4032	0:10:22	1	0	100	6048	4032	0:10:22	1	0	100
315529	22 May-14 18:50:32	0:00:00	2	11.1	100	2498	5300	0:04:00	2	9.1	100	2688	3600	0:05:11	2	10.8	100	2448	2550	0:05:19	2	12.0	100	3000	2803	0:06:12	1	0	100	0	4032	0:10:21	1	0	100	6048	4032	0:10:21	1	0	100
315530	22 May-14 18:50:37	0:00:00	2	11.2	100	2513	5300	0:03:59	2	8.7	100	2669	3600	0:05:11	2	11.4	100	2436	2550	0:05:21	2	13.2	100	3072	2803	0:06:12	1	0	100	0	4032	0:10:23	1	0	100	6048	4032	0:10:23	1	0	100
315531	22 May-14 18:50:42	0:00:00	2	11.1	100	2528	5300	0:03:57	2	8.1	100	2661	3600	0:05:12	2	10.8	100	2436	2550	0:05:22	2	12.0	100	3120	2803	0:06:12	1	0	100	0	4032	0:10:25	1	0	100	6048	4032	0:10:25	1	0	100
315532	22 May-14 18:50:47	0:00:00	2	11.2	100	2569	5300	0:03:56	2	6.9	100	2617	3600	0:05:12	2	11.4	100	2424	2550	0:05:22	2	13.2	100	3192	2803	0:06:12	1	0	100	0	4032	0:10:25	1	0	100	6048	4032	0:10:25	1	0	100
315533	22 May-14 18:50:52	0:00:00	2	11.3	100	2618	5300	0:03:53	2	5.3	100	2553	3600	0:05:13	2	12.0	100	2448	2550	0:05:25	2	12.0	100	1224	2803	0:06:12	2	20	100	2016	4032	0:10:27	1	0	100	6048	4032	0:10:27	1	0	100
315534	22 May-14 18:50:57	0:00:00	2	11.1	100	2665	5300	0:03:48	2	3.5	100	2523	3600	0:05:16	2	10.8	100	2436	2550	0:05:25	2	10.8	100	1272	2803	0:07:35	1	0	100	2016	4032	0:10:06	1	0	100	6048	4032	0:10:06	1	0	100
315535	22 May-14 18:51:02	0:00:00	2	11.3	100	2718	5300	0:03:45	2	1.8	100	2456	3600	0:05:17	2	12.0	100	2436	2550	0:05:28	2	12.0	100	1344	2803	0:07:33	1	0	100	2016	4032	0:10:05	1	0	100	6048	4032	0:10:05	1	0	100
315536	22 May-14 18:51:07	0:00:00	2	11.1	100	2765	5300	0:03:40	2	1.3	100	2414	3600	0:05:21	2	11.4	100	2436	2550	0:05:31	2	10.8	100	1392	2803	0:07:31	1	0	100	2016	4032	0:10:02	1	0	100	6048	4032	0:10:02	1	0	100
315537	22 May-14 18:51:12	0:00:00	2	11.0	100	2816	5300	0:03:36	2	1.1	100	2371	3600	0:05:24	2	10.2	100	2436	2550	0:05:34	2	10.8	100	1440	2803	0:07:30	1	0	100	2016	4032	0:10:01	1	0	100	6048	4032	0:10:01	1	0	100
315538	22 May-14 18:51:17	0:00:00	2	11.2	100	2866	5300	0:03:32	2	1.1	100	2317	3600	0:05:26	2	11.4	100	2424	2550	0:05:37	2	12.0	100	1512	2803	0:07:29	1	0	100	2016	4032	0:10:00	1	0	100	6048	4032	0:10:00	1	0	100
315539	22 May-14 18:51:22	0:00:00	2	11.0	100	2915	5300	0:03:27	2	1.2	100	2263	3600	0:05:30	2	10.8	100	2436	2550	0:05:41	2	10.8	100	1560	2803	0:07:27	1	0	100	2016	4032	0:09:58	1	0	100	6048	4032	0:09:58	1	0	100
315540	22 May-14 18:51:27	0:00:00	2	11.2	100	2967	5300	0:03:23	2	1.1	100	2219	3600	0:05:34	2	10.8	100	2436	2550	0:05:44	2	10.8	100	1608	2803	0:07:26	1	0	100	2016	4032	0:09:57	1	0	100	6048	4032	0:09:57	1	0	100
315541	22 May-14 18:51:32	0:00:00	2	11.2	100	3023	5300	0:03:19	1	0.0	100	2159	3600	0:05:37	2	11.4	100	2424	2550	0:05:47	2	12.0	100	1680	2803	0:07:25	1	0	100	2016	4032	0:09:57	1	0	100	6048	4032	0:09:57	1	0	100
315542	22 May-14 18:51:37	0:00:00	2	11.1	100	3078	5300	0:03:14	1	0.0	100	2099	3600	0:05:42	2	11.4	100	2436	2550	0:05:53	2	10.8	100	1728	2803	0:07:26	1	0	100	2016	4032	0:09:57	1	0	100	6048	4032	0:09:57	1	0	100
315543	22 May-14 18:51:42	0:00:00	2	11.2	100	3134	5300	0:03:09	1	0.0	100	2099	3600	0:05:45	2	11.4	100	2388	2550	0:05:56	2	10.8	100	1776	2803	0:07:24	1	0	100	2016	4032	0:09:55	1	0	100	6048	4032	0:09:55	1	0	100
315544	22 May-14 18:51:47	0:00:00	2	11.3	100	3193	5300	0:03:05	1	0.0	100	1991	3600	0:05:41	2	11.0	100	2424	2550	0:05:56	2	12.0	100	1848	2803	0:07:21	1	0	100	2016	4032	0:09:52	1	0	100	6048	4032	0:09:52	1	0	100
315545	22 May-14 18:51:52	0:00:00	2	11.1	100	3245	5300	0:02:59	1	0.0	100	1931	3600	0:05:48	2	11.5	100	2436	2550	0:05:59	2	10.8	100	1896	2803	0:07:18	1	0	100	2016	4032	0:09:49	1	0	100	6048	4032	0:09:49	1	0	100
315546	22 May-14 18:51:57	0:00:00	2	11.2	100	3301	5300	0:02:55	1	0.0	100	1871	3600	0:05:51	2	11.5	100	2448	2550	0:06:01	2	10.8	100	1944	2803	0:07:16	1	0	100	2016	4032	0:09:47	1	0	100	6048	4032	0:09:47	1	0	100
315547	22 May-14 18:52:02	0:00:00	2	11.2	100	3357	5300	0:02:50	1	0.0	100	1871	3600	0:05:53	2	11.5	100	2376	2550	0:06:02	2	12.0	100	2016	2803	0:07:13	1	0	100	2016	4032	0:09:44	1	0	100	6048	4032	0:09:44	1	0	100
315548	22 May-14 18:52:07	0:00:00	2	11.0	100	3412	5300	0:02:45	1	0.0	100	1775	3600	0:05:49	2	10.8	100	2424	2550	0:06:04	2	10.8	100	2064	2803	0:07:09	1	0	100	2016	4032	0:09:40	1	0	100	6048	4032	0:09:40	1	0	100
315549	22 May-14 18:52:12	0:00:00	2	11.2	100	3468	5300	0:02:41	1	0.0	100	1715	3600	0:05:55	2	11.0	100	2436	2550	0:06:06	2	10.8	100	2112	2803	0:07:07	1	0	100	2016	4032	0:09:38	1	0	100	6048	4032	0:09:38	1	0	100
315550	22 May-14 18:52:17	0:00:00	2	11.1	100	3523	5300	0:02:36	1	0.0	100	1667	3600	0:05:57	2	10.6	100	2412	2550	0:06:08	2	12.0	100	2184	2803	0:07:05	1	0	100	2016	4032	0:09:36	1	0	100	6048	4032	0:09:36	1	0	100
315551	22 May-14 18:52:22	0:00:00	2	11.1	100	3579	5300	0:02:31	1	0.0	100	1607	3600	0:05:58	2	10.6	100	2424	2550	0:06:11	2	10.8	100	2232	2803	0:07:02	1	0	100	2016	4032	0:09:33	1	0	100	6048	4032	0:09:33	1	0	100
315552	22 May-14 18:52:27	0:00:00	2	11.2	100	3635	5300	0:02:27	1	0.0	100	1559	3600	0:06:00	2	10.8	100	2424	2550	0:06:12	2	10.8	100	2280	2803	0:06:59	1	0	100	2016	4032	0:09:30	1	0	100	6048	4032	0:09:30	1	0	100
315553	22 May-14 18:52:32	0:00:00	2	11.2	100	3691	5300	0:02:22	1	0.0	100	1523	3600	0:06:00	2	9.6	100	2388	2550	0:06:12	2	12.0	100	2352	2803	0:06:55	1	0	100	0	4032	0:09:26	2	24	100	6048	4032	0:09:26	1	0	100
315554	22 May-14 18:52:37	0:00:00	2	11.2	100	3746	5300	0:02:17	1	0.0	100	1475	3600	0:05:59	2	9.6	100	2388	2550	0:06:14	2	10.8	100	2400	2803	0:06:51	1	0	100	0	4032	0:11:54	1	0	100	6048	4032	0:11:54	1	0	100
315555	22 May-14 18:52:42	0:00:00	2	11.1	100	3801	5300	0:02:12	1	0.0	100	1439	3600	0:06:00	2	8.4	100	2376	2550	0:06:15	2	10.8	100	2448	2803	0:06:48	1	0	100	0	4032	0:11:50	1	0	100	6048	4032	0:11:50	1	0	100
315556	22 May-14 18:52:47	0:00:00	2	11.2	100	3858	5300	0:02:08	1	0.0	100	1391	3600	0:05:59	2	8.4	100	2352	2550	0:06:15	2	12.0	100	2520	2803	0:06:44	1	0	100	0	4032	0:11:47	1	0	100	6048	4032	0:11:47	1	0	100
315557	22 May-14 18:52:52	0:00:00	2	11.1	100	3912	5300	0:02:03	1	0.0	100	1355	3600	0:05:59	2	8.4	100	2340	2550	0:06:17	2	10.8	100	2568	2803	0:06:41	1	0	100	0	4032	0:11:43	1	0	100	6048	4032	0:11:43	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
315558	22 May-14 18:52:57	0:00:00	2	11.1	100	3968	5300	0:01:58	1	0.0	100	1307	3600	0:05:59	2	8.4	100	2340	2550	0:06:18	2	10.8	100	2616	2803	0:06:37	1	0	100	0	4032	0:11:40	1	0	100	6048	4032	0:11:40	1	0	100
315559	22 May-14 18:53:02	0:00:00	2	11.2	100	4024	5300	0:01:53	1	0.0	100	1259	3600	0:05:59	2	9.0	100	2316	2550	0:06:18	2	12.0	100	2688	2803	0:06:34	1	0	100	0	4032	0:11:36	1	0	100	6048	4032	0:11:36	1	0	100
315560	22 May-14 18:53:07	0:00:00	2	11.1	100	4079	5300	0:01:48	1	0.0	100	1223	3600	0:05:59	2	8.4	100	2304	2550	0:06:21	2	10.8	100	2736	2803	0:06:30	1	0	100	0	4032	0:11:33	1	0	100	6048	4032	0:11:33	1	0	100
315561	22 May-14 18:53:12	0:00:00	2	10.7	100	4137	5300	0:01:44	1	0.0	100	1187	3600	0:05:58	2	8.0	100	2292	2550	0:06:21	2	10.3	100	2784	2803	0:06:27	1	0	100	0	4032	0:11:29	1	0	100	6048	4032	0:11:29	1	0	100
315562	22 May-14 18:53:17	0:00:00	2	10.7	100	4193	5300	0:01:39	1	0.0	100	1139	3600	0:05:58	2	8.0	100	2268	2550	0:06:22	2	11.4	100	2856	2803	0:06:23	1	0	100	0	4032	0:11:26	1	0	100	6048	4032	0:11:26	1	0	100
315563	22 May-14 18:53:22	0:00:00	2	10.6	100	4247	5300	0:01:35	1	0.0	100	1103	3600	0:05:58	2	7.4	100	2256	2550	0:06:24	2	10.3	100	2904	2803	0:06:24	1	0	100	0	4032	0:11:27	1	0	100	6048	4032	0:11:27	1	0	100
315564	22 May-14 18:53:27	0:00:00	2	10.6	100	4270	5300	0:01:30	2	1.5	100	1087	3600	0:05:58	2	8.0	100	2256	2550	0:06:25	2	10.3	100	2952	2803	0:06:25	1	0	100	0	4032	0:11:27	1	0	100	6048	4032	0:11:27	1	0	100
315565	22 May-14 18:53:32	0:00:00	2	11.0	100	4278	5300	0:01:28	2	4.0	100	1098	3600	0:05:51	2	8.4	100	2220	2550	0:06:18	2	12.0	100	3024	2803	0:06:18	1	0	100	0	4032	0:11:21	1	0	100	6048	4032	0:11:21	1	0	100
315566	22 May-14 18:53:37	0:00:00	2	11.0	100	4293	5300	0:01:27	2	6.0	100	1091	3600	0:05:41	2	8.4	100	2220	2550	0:06:12	2	10.8	100	3072	2803	0:06:12	1	0	100	0	4032	0:11:14	1	0	100	6048	4032	0:11:14	1	0	100
315567	22 May-14 18:53:42	0:00:00	2	11.1	100	4309	5300	0:01:26	2	8.0	100	1107	3600	0:05:34	2	7.8	100	2196	2550	0:06:04	2	10.8	100	3120	2803	0:06:12	1	0	100	0	4032	0:11:07	1	0	100	6048	4032	0:11:07	1	0	100
315568	22 May-14 18:53:47	0:00:00	2	11.2	100	4326	5300	0:01:25	2	8.4	100	1122	3600	0:05:25	2	6.6	100	2148	2550	0:05:57	2	12.0	100	3192	2803	0:06:12	1	0	100	0	4032	0:11:00	1	0	100	6048	4032	0:11:00	1	0	100
315569	22 May-14 18:53:52	0:00:00	2	11.2	100	4372	5300	0:01:23	2	6.5	100	1096	3600	0:05:16	2	6.6	100	2136	2550	0:05:53	2	10.8	100	3240	2803	0:06:12	1	0	100	0	4032	0:10:56	1	0	100	6048	4032	0:10:56	1	0	100
315570	22 May-14 18:53:57	0:00:00	2	11.2	100	4420	5300	0:01:19	2	4.8	100	1079	3600	0:05:13	2	5.4	100	2112	2550	0:05:51	2	10.8	100	3288	2803	0:06:12	1	0	100	0	4032	0:10:54	1	0	100	6048	4032	0:10:54	1	0	100
315571	22 May-14 18:54:02	0:00:00	2	11.2	100	4470	5300	0:01:15	2	3.1	100	1085	3600	0:05:10	1	0.0	100	2040	2550	0:05:50	2	12.0	100	3360	2803	0:06:12	1	0	100	0	4032	0:10:52	1	0	100	6048	4032	0:10:52	1	0	100
315572	22 May-14 18:54:07	0:00:00	2	11.3	100	4522	5300	0:01:10	2	1.5	100	1091	3600	0:05:03	1	0.0	100	1992	2550	0:05:50	2	10.8	100	3408	2803	0:06:12	1	0	100	0	4032	0:10:52	1	0	100	6048	4032	0:10:52	1	0	100
315573	22 May-14 18:54:12	0:00:00	2	11.3	100	4573	5300	0:01:06	2	1.2	100	1096	3600	0:04:57	1	0.0	100	1944	2550	0:05:49	2	10.8	100	3456	2803	0:06:12	1	0	100	0	4032	0:10:51	1	0	100	6048	4032	0:10:51	1	0	100
315574	22 May-14 18:54:17	0:00:00	2	11.2	100	4620	5300	0:01:01	2	1.2	100	1102	3600	0:04:52	1	0.0	100	1872	2550	0:05:48	2	12.0	100	1512	2803	0:06:12	2	20	100	2016	4032	0:10:50	1	0	100	6048	4032	0:10:50	1	0	100
315575	22 May-14 18:54:22	0:00:00	2	11.2	100	4671	5300	0:00:58	2	1.1	100	1107	3600	0:04:51	1	0.0	100	1824	2550	0:05:54	2	10.8	100	1560	2803	0:07:40	1	0	100	2016	4032	0:10:11	1	0	100	6048	4032	0:10:11	1	0	100
315576	22 May-14 18:54:27	0:00:00	2	11.0	100	4720	5300	0:00:53	2	1.1	100	1113	3600	0:04:52	1	0.0	100	1776	2550	0:06:00	2	10.8	100	1608	2803	0:07:42	1	0	100	2016	4032	0:10:13	1	0	100	6048	4032	0:10:13	1	0	100
315577	22 May-14 18:54:32	0:00:00	2	11.0	100	4774	5300	0:00:49	2	0.0	100	1115	3600	0:04:53	1	0.0	100	1704	2550	0:06:05	2	12.0	100	1680	2803	0:07:43	1	0	100	2016	4032	0:10:14	1	0	100	6048	4032	0:10:14	1	0	100
315578	22 May-14 18:54:37	0:00:00	2	11.2	100	4830	5300	0:00:44	1	0.0	100	1115	3600	0:04:54	1	0.0	100	1656	2550	0:06:13	2	10.8	100	1728	2803	0:07:46	1	0	100	2016	4032	0:10:17	1	0	100	6048	4032	0:10:17	1	0	100
315579	22 May-14 18:54:42	0:00:00	2	11.3	100	4888	5300	0:00:40	1	0.0	100	1115	3600	0:04:56	1	0.0	100	1584	2550	0:06:20	2	12.0	100	1800	2803	0:07:48	1	0	100	2016	4032	0:10:19	1	0	100	6048	4032	0:10:19	1	0	100
315580	22 May-14 18:54:47	0:00:00	2	11.3	100	4943	5300	0:00:35	1	0.0	100	1115	3600	0:04:53	1	0.0	100	1536	2550	0:06:23	2	12.0	100	1848	2803	0:07:46	1	0	100	2016	4032	0:10:17	1	0	100	6048	4032	0:10:17	1	0	100
315581	22 May-14 18:54:52	0:00:00	2	11.3	100	4971	5300	0:00:30	2	1.4	100	1143	3600	0:04:50	1	0.0	100	1488	2550	0:06:25	2	10.8	100	1896	2803	0:07:43	1	0	100	2016	4032	0:10:14	1	0	100	6048	4032	0:10:14	1	0	100
315582	22 May-14 18:54:57	0:00:00	2	11.3	100	4976	5300	0:00:28	2	4.0	100	1194	3600	0:04:40	1	0.0	100	1416	2550	0:06:20	2	12.0	100	1968	2803	0:07:35	1	0	100	2016	4032	0:10:06	1	0	100	6048	4032	0:10:06	1	0	100
315583	22 May-14 18:55:02	0:00:00	2	11.0	100	4978	5300	0:00:27	2	6.5	100	1245	3600	0:04:27	1	0.0	100	1368	2550	0:06:14	2	10.8	100	2016	2803	0:07:22	1	0	100	2016	4032	0:09:53	1	0	100	6048	4032	0:09:53	1	0	100
315584	22 May-14 18:55:07	0:00:00	2	11.1	100	4983	5300	0:00:27	2	9.1	100	1296	3600	0:04:15	1	0.0	100	1320	2550	0:06:06	2	10.8	100	2064	2803	0:07:11	1	0	100	2016	4032	0:09:42	1	0	100	6048	4032	0:09:42	1	0	100
315585	22 May-14 18:55:12	0:00:00	2	11.2	100	4991	5300	0:00:27	2	10.2	100	1346	3600	0:04:03	1	0.0	100	1248	2550	0:05:59	2	12.0	100	2136	2803	0:06:59	1	0	100	2016	4032	0:09:31	1	0	100	6048	4032	0:09:31	1	0	100
315586	22 May-14 18:55:17	0:00:00	2	11.1	100	4994	5300	0:00:26	2	10.2	100	1397	3600	0:03:52	1	0.0	100	1200	2550	0:05:54	2	10.8	100	2184	2803	0:06:49	1	0	100	2016	4032	0:09:20	1	0	100	6048	4032	0:09:20	1	0	100
315587	22 May-14 18:55:22	0:00:00	0	0.0	100	4943	5300	0:00:26	2	10.2	100	1448	3600	0:03:42	1	0.0	100	1152	2550	0:05:48	2	10.8	100	2232	2803	0:06:39	1	0	100	2016	4032	0:09:11	1	0	100	6048	4032	0:09:11	1	0	100
315588	22 May-14 18:55:27	0:00:00	2	11.2	90	5004	5300	0:00:31	2	10.1	100	1498	3600	0:03:37	1	0.0	100	1080	2550	0:05:48	2	12.0	100	2304	2803	0:06:35	1	0	100	2016	4032	0:09:06	1	0	100	6048	4032	0:09:06	1	0	100
315589	22 May-14 18:55:32	0:00:00	2	11.1	100	5009	5300	0:00:25	2	10.2	100	1549	3600	0:03:22	1	0.0	100	1032	2550	0:05:39	2	10.8	100	2352	2803	0:06:20	1	0	100	2016	4032	0:08:52	1	0	100	6048	4032	0:08:52	1	0	100
315590	22 May-14 18:55:37	0:00:00	2	11.2	100	5015	5300	0:00:24	2	10.1	100	1551	3600	0:03:12	2	2.4	100	1032	2550	0:05:34	2	10.8	100	2400	2803	0:06:12	1	0	100	2016	4032	0:08:43	1	0	100	6048	4032	0:08:43	1	0	100
315591	22 May-14 18:55:42	0:00:00	2	13.9	100	5019	5300	0:00:24	2	10.1	100	1566	3600	0:03:07	2	4.2	100	996	2550	0:05:29	2	12.0	100	2472	2803	0:06:12	1	0	100	2016	4032	0:08:33	1	0	100	6048	4032	0:08:33	1	0	100
315592	22 May-14 18:55:47	0:00:00	2	11.3	100	5027	5300	0:00:24	2	10.1	100	1568	3600	0:03:04	2	6.6	100	996	2550	0:05:29	2	10.8	100	2520	2803	0:06:12	1	0	100	2016	4032	0:08:27	1	0	100	6048	4032	0:08:27	1	0	100
315593	22 May-14 18:55:52	0:00:00	2	11.2	100	5030	5300	0:00:23	2	10.1	100	1583	3600	0:03:03	2	8.4	100	984	2550	0:05:27	2	10.8	100	2568	2803	0:06:12	1	0	100	2016	4032	0:08:22	1	0	100	6048	4032	0:08:22	1	0	100
315594	22 May-14 18:55:57	0:00:00	2	11.1	100	5035	5300	0:00:23	2	10.1	100	1585	3600	0:03:01	2	8.4	100	960	2550	0:05:27	2	12.0	100	2640	2803	0:06:12	1	0	100	0	4032	0:08:17	2	24	100	6048	4032	0:08:17	1	0	100
315595	22 May-14 18:56:02	0:00:00	2	11.3	100	5042	5300	0:00:22	2	10.1	100	1600	3600	0:03:01	2	8.4	100	948	2550	0:05:28	2	10.8	100	2688	2803	0:06:12	1	0	100	0	4032	0:10:44	1	0	100	6048	4032	0:10:44	1	0	100
315596	22 May-14 18:56:07	0:00:00	2	11.0	100	5044	5300	0:00:22	2	10.2	100	1627	3600	0:02:59	2	7.2	100	924	2550	0:05:27	2	10.8	100	2736	2803	0:06:12	1	0	100	0	4032	0:10:39	1	0	100	6048	4032	0:10:39	1	0	100
315597	22 May-14 18:56:12	0:00:00	2	11.3	100	5053	5300	0:00:21	2	10.1	100	1641	3600	0:02:57	2	7.2	100	888	2550	0:05:27	2	12.0	100	2808	2803	0:06:12	1	0	100	0	4032	0:10:35	1	0	100	6048	4032	0:10:35	1	0	100
315598	22 May-14 18:56:17	0:00:00	2	11.2	100	5055	5300	0:00:20	2	10.2	100	1656	3600	0:02:54	2	6.6	100	876	2550	0:05:27	2	10.8	100	2856	2803	0:06:12	1	0	100	0	4032	0:10:30	1	0	100	6048	4032	0:10:30	1	0	100
315599	22 May-14 18:56:22	0:00:00	2	11.1	100	5061	5300	0:00:20	2	10.1	100	1670	3600	0:02:53	2	6.6	100	864	2550	0:05:28	2	10.8	100	2904	2803	0:06:12	1	0	100	0	4032	0:10:30	1	0	100	6048	4032	0:10:30	1	0	100
315600	22 May-14 18:56:27	0:00:00	2	11.2	100	5066	5300	0:00:20	2	10.1	100	1721	3600	0:02:52	1	0.0	100	792	2550	0:05:27	2	12.0	100	2976	2803	0:06:12	1	0	100	0	4032	0:10:29	1	0	100	6048	4032	0:10:29	1	0	100
315601	22 May-14 18:56:32	0:00:00	2	11.0	100	5070	5300	0:00:19	2	10.2	100	1772	3600	0:02:47	1	0.0	100	744	2550	0:05:29	2	10.8	100	3024	2803	0:06:12	1	0	100	0	4032	0:10:32	1	0	100	6048	4032	0:10:32	1	0	100
315602	22 May-14 18:56:37	0:00:00	2	11.2	100	5076	5300	0:00:19	2	10.1	100	1822	3600	0:02:43	1	0.0	100	696	2550	0:05:30	2	10.8	100	3072	2803	0:06:12	1	0	100	0	4032	0:10:32	1	0	100	4032	4032	0:10:32	2	25	100
315603	22 May-14 18:56:42	0:00:00	2	11.2	100	5081	5300	0:00:19	2	10.2	100	1873	3600	0:02:39	1	0.0	100	624	2550	0:05:30	2	12.0	100	3144	2803	0:05:30	1	0	100	0	4032	0:10:33	1	0	100	4032	4032	0:10:33	1	0	100
315604	22 May-14 18:56:47	0:00:00	2	11.1	100	5085	5300	0:00:18	2	10.2	100	1924	3600	0:02:34	1	0.0	100	576	2550	0:05:33	2	10.8	100	3192	2803	0:05:33	1	0	100	0	4032	0:10:35	1	0	100	4032	4032	0:10:35	1	0	100
315605	22 May-14 18:56:52	0:00:00	2	11.2	100	5091	5300	0:00:18	2	10.1	100	1974	3600	0:02:30	1	0.0	100	528	2550	0:05:33	2	10.8	100	3240	2803	0:05:33	1	0	100	0	4032	0:10:36	1	0	100	4032	4032	0:10:36	1	0	100
315606	22 May-14 18:56:57	0:00:00	2	11.2	100	5096	5300	0:00:17	2	10.2	100	2025	3600	0:02:25	1	0.0	100	504	2550	0:05:34	2	9.6	100	3264	2803	0:05:34	1	0	100	0	4032	0:10:36	1	0	100	4032	4032	0:10:36	1	0	100
315607	22 May-14 18:57:02	0:00:00	2	11.3	100	5104	5300	0:00:17	2	10.1	100	2075	3600	0:02:21	1	0.0	100	504	2550	0:05:32	1	0.0	100	3264	2803	0:05:32	1	0	100	0	4032	0:10:34	1	0	100	4032	4032	0:10:34	1	0	100
315608	22 May-14 18:57:07	0:00:00	2	11.2	100	5106	5300	0:00:16	2	10.1	100	2126	3600	0:02:16	1	0.0	100	504	2550	0:05:27	1	0.0	100	3264	2803	0:05:27	1	0	100	0	4032	0:10:30	1	0	100	4032	4032	0:10:30	1	0	100
315609	22 May-14 18:57:12	0:00:00	2	11.2	100	5112	5300	0:00:16	2	10.2	100	2177	3600	0:02:12	1	0.0	100	504	2550	0:05:24	1	0.0	100	1248	2803	0:05:24	2	20	100	2016	4032	0:10:26	1	0	100	4032	4032	0:10:26	1	0	100
315610	22 May-14 18:57:17	0:00:00	2	11.2	100	5118	5300	0:00:16	2	10.1	100	2227	3600	0:02:07	1	0.0	100	504	2550	0:05:19	1	0.0	100	1248	2803	0:07:28	1	0	100	2016	4032	0:09:59	1	0	100	4032	4032	0:09:59	1	0	100
315611	22 May-14 18:57:22	0:00:00	2	11.2	100	5124	5300	0:00:15	2	10.2	100	2278	3600	0:02:03	1	0.0	100	504	2550	0:05:15	1	0.0	100	1248	2803	0:07:24	1	0	100	2016	4032	0:09:55	1	0	100	4032	4032	0:09:55	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
315612	22 May-14 18:57:27	0:00:00	2	11.2	100	5127	5300	0:00:15	2	10.1	100	2328	3600	0:01:59	1	0.0	100	504	2550	0:05:10	1	0.0	100	1248	2803	0:07:19	1	0	100	2016	4032	0:09:50	1	0	100	4032	4032	0:09:50	1	0	100
315613	22 May-14 18:57:32	0:00:00	2	11.2	100	5133	5300	0:00:14	2	10.1	100	2379	3600	0:01:54	1	0.0	100	504	2550	0:05:06	1	0.0	100	1248	2803	0:07:15	1	0	100	2016	4032	0:09:46	1	0	100	4032	4032	0:09:46	1	0	100
315614	22 May-14 18:57:37	0:00:00	2	11.1	100	5137	5300	0:00:14	2	10.1	100	2429	3600	0:01:50	1	0.0	100	504	2550	0:05:02	1	0.0	100	1248	2803	0:07:11	1	0	100	2016	4032	0:09:42	1	0	100	4032	4032	0:09:42	1	0	100
315615	22 May-14 18:57:42	0:00:00	2	11.0	100	5142	5300	0:00:13	2	10.1	100	2480	3600	0:01:46	1	0.0	100	504	2550	0:04:57	1	0.0	100	1248	2803	0:07:07	1	0	100	2016	4032	0:09:38	1	0	100	4032	4032	0:09:38	1	0	100
315616	22 May-14 18:57:47	0:00:00	2	11.2	100	5148	5300	0:00:13	2	10.1	100	2494	3600	0:01:41	2	1.8	100	540	2550	0:04:53	1	0.0	100	1248	2803	0:07:02	1	0	100	2016	4032	0:09:34	1	0	100	4032	4032	0:09:34	1	0	100
315617	22 May-14 18:57:52	0:00:00	2	11.2	100	5154	5300	0:00:12	2	10.1	100	2497	3600	0:01:40	2	4.2	100	588	2550	0:04:48	1	0.0	100	1248	2803	0:06:57	1	0	100	2016	4032	0:09:28	1	0	100	4032	4032	0:09:28	1	0	100
315618	22 May-14 18:57:57	0:00:00	2	11.2	100	5158	5300	0:00:12	2	10.1	100	2499	3600	0:01:39	2	6.6	100	636	2550	0:04:42	1	0.0	100	1248	2803	0:06:51	1	0	100	2016	4032	0:09:23	1	0	100	4032	4032	0:09:23	1	0	100
315619	22 May-14 18:58:02	0:00:00	2	11.1	100	5162	5300	0:00:12	2	10.1	100	2514	3600	0:01:38	2	8.4	100	672	2550	0:04:37	1	0.0	100	1248	2803	0:06:46	1	0	100	2016	4032	0:09:17	1	0	100	4032	4032	0:09:17	1	0	100
315620	22 May-14 18:58:07	0:00:00	2	11.1	100	5168	5300	0:00:11	2	10.1	100	2504	3600	0:01:37	2	9.6	100	732	2550	0:04:31	1	0.0	100	1248	2803	0:06:41	1	0	100	2016	4032	0:09:12	1	0	100	4032	4032	0:09:12	1	0	100
315621	22 May-14 18:58:12	0:00:00	2	11.0	100	5172	5300	0:00:11	2	10.1	100	2507	3600	0:01:37	2	9.6	100	780	2550	0:04:26	1	0.0	100	1248	2803	0:06:35	1	0	100	2016	4032	0:09:06	1	0	100	4032	4032	0:09:06	1	0	100
315622	22 May-14 18:58:17	0:00:00	2	11.2	100	5178	5300	0:00:10	2	10.2	100	2498	3600	0:01:37	2	10.2	100	840	2550	0:04:20	1	0.0	100	1248	2803	0:06:30	1	0	100	2016	4032	0:09:01	1	0	100	4032	4032	0:09:01	1	0	100
315623	22 May-14 18:58:22	0:00:00	2	11.1	100	5182	5300	0:00:10	2	10.1	100	2488	3600	0:01:37	2	11.4	100	900	2550	0:04:14	1	0.0	100	1248	2803	0:06:24	1	0	100	2016	4032	0:08:55	1	0	100	4032	4032	0:08:55	1	0	100
315624	22 May-14 18:58:27	0:00:00	2	11.2	100	5189	5300	0:00:10	2	10.2	100	2503	3600	0:01:37	2	10.2	100	936	2550	0:04:09	1	0.0	100	1248	2803	0:06:18	1	0	100	2016	4032	0:08:49	1	0	100	4032	4032	0:08:49	1	0	100
315625	22 May-14 18:58:32	0:00:00	2	11.2	100	5193	5300	0:00:09	2	10.1	100	2493	3600	0:01:35	2	10.8	100	996	2550	0:04:03	1	0.0	100	1248	2803	0:06:13	1	0	100	2016	4032	0:08:44	1	0	100	4032	4032	0:08:44	1	0	100
315626	22 May-14 18:58:37	0:00:00	2	11.2	100	5199	5300	0:00:09	2	10.1	100	2472	3600	0:01:36	2	11.4	100	1068	2550	0:03:58	1	0.0	100	1248	2803	0:06:07	1	0	100	2016	4032	0:08:39	1	0	100	4032	4032	0:08:39	1	0	100
315627	22 May-14 18:58:42	0:00:00	2	11.1	100	5202	5300	0:00:08	2	10.1	100	2486	3600	0:01:37	2	10.2	100	1104	2550	0:03:52	1	0.0	100	1248	2803	0:06:02	1	0	100	2016	4032	0:08:33	1	0	100	4032	4032	0:08:33	1	0	100
315628	22 May-14 18:58:47	0:00:00	2	11.4	100	5214	5300	0:00:08	2	10.1	100	2477	3600	0:01:36	2	11.4	100	1164	2550	0:03:48	1	0.0	100	1248	2803	0:05:57	1	0	100	2016	4032	0:08:28	1	0	100	4032	4032	0:08:28	1	0	100
315629	22 May-14 18:58:52	0:00:00	2	11.1	100	5213	5300	0:00:07	2	10.1	100	2479	3600	0:01:35	2	10.8	100	1212	2550	0:03:42	1	0.0	100	1248	2803	0:05:51	1	0	100	0	4032	0:08:22	2	24	100	6048	4032	0:08:22	1	0	100
315630	22 May-14 18:58:57	0:00:00	2	11.0	100	5217	5300	0:00:07	2	10.1	100	2482	3600	0:01:35	2	9.6	100	1260	2550	0:03:37	1	0.0	100	1248	2803	0:06:12	1	0	100	0	4032	0:10:49	1	0	100	6048	4032	0:10:49	1	0	100
315631	22 May-14 18:59:02	0:00:00	2	11.1	100	5222	5300	0:00:07	2	10.1	100	2484	3600	0:01:35	2	10.2	100	1308	2550	0:03:32	1	0.0	100	1248	2803	0:06:12	1	0	100	0	4032	0:10:44	1	0	100	6048	4032	0:10:44	1	0	100
315632	22 May-14 18:59:07	0:00:00	2	10.8	100	5227	5300	0:00:06	2	10.1	100	2463	3600	0:01:34	2	10.8	100	1356	2550	0:03:27	2	1.2	100	1272	2803	0:06:12	1	0	100	0	4032	0:10:39	1	0	100	6048	4032	0:10:39	1	0	100
315633	22 May-14 18:59:12	0:00:00	2	11.1	100	5233	5300	0:00:06	2	10.1	100	2477	3600	0:01:35	2	10.2	100	1320	2550	0:03:24	2	4.8	100	1344	2803	0:06:12	1	0	100	0	4032	0:10:34	1	0	100	6048	4032	0:10:34	1	0	100
315634	22 May-14 18:59:17	0:00:00	2	11.2	100	5238	5300	0:00:05	2	10.1	100	2492	3600	0:01:34	2	9.6	100	1308	2550	0:03:26	2	7.2	100	1392	2803	0:06:12	1	0	100	0	4032	0:10:30	1	0	100	6048	4032	0:10:30	1	0	100
315635	22 May-14 18:59:22	0:00:00	2	10.6	100	5242	5300	0:00:05	2	9.7	100	2483	3600	0:01:32	2	9.7	100	1320	2550	0:03:25	2	9.1	100	1440	2803	0:06:12	1	0	100	0	4032	0:10:25	1	0	100	6048	4032	0:10:25	1	0	100
315636	22 May-14 18:59:27	0:00:00	2	10.8	100	5250	5300	0:00:04	2	9.7	100	2474	3600	0:01:33	2	9.1	100	1308	2550	0:03:25	2	11.4	100	1512	2803	0:06:12	1	0	100	0	4032	0:10:21	1	0	100	6048	4032	0:10:21	1	0	100
315637	22 May-14 18:59:32	0:00:00	2	10.6	100	5253	5300	0:00:04	2	9.7	100	2464	3600	0:01:33	2	10.3	100	1320	2550	0:03:26	2	10.3	100	1560	2803	0:06:12	1	0	100	0	4032	0:10:16	1	0	100	6048	4032	0:10:16	1	0	100
315638	22 May-14 18:59:37	0:00:00	2	10.6	100	5258	5300	0:00:04	2	9.7	100	2467	3600	0:01:33	2	10.9	100	1368	2550	0:03:26	1	0.0	100	1560	2803	0:06:12	1	0	100	0	4032	0:10:11	1	0	100	6048	4032	0:10:11	1	0	100
315639	22 May-14 18:59:42	0:00:00	2	11.3	100	5266	5300	0:00:03	2	10.1	100	2457	3600	0:01:33	2	11.4	100	1428	2550	0:03:21	1	0.0	100	1560	2803	0:06:12	1	0	100	0	4032	0:10:06	1	0	100	6048	4032	0:10:06	1	0	100
315640	22 May-14 18:59:47	0:00:00	2	11.0	100	5268	5300	0:00:02	2	10.1	100	2460	3600	0:01:33	2	10.8	100	1476	2550	0:03:15	1	0.0	100	1560	2803	0:06:12	1	0	100	0	4032	0:10:01	1	0	100	6048	4032	0:10:01	1	0	100
315641	22 May-14 18:59:52	0:00:00	2	11.2	100	5273	5300	0:00:02	2	10.2	100	2475	3600	0:01:32	2	9.6	100	1512	2550	0:03:10	1	0.0	100	1560	2803	0:06:12	1	0	100	0	4032	0:09:56	1	0	100	6048	4032	0:09:56	1	0	100
315642	22 May-14 18:59:57	0:00:00	2	11.2	100	5279	5300	0:00:02	2	10.1	100	2477	3600	0:01:31	2	9.6	100	1560	2550	0:03:06	1	0.0	100	1560	2803	0:06:12	1	0	100	0	4032	0:09:51	1	0	100	6048	4032	0:09:51	1	0	100
315643	22 May-14 19:00:02	0:00:00	2	11.0	100	5283	5300	0:00:01	2	10.2	100	2468	3600	0:01:30	2	9.6	100	1620	2550	0:03:01	1	0.0	100	1560	2803	0:06:12	1	0	100	0	4032	0:09:46	1	0	100	6048	4032	0:09:46	1	0	100
315644	22 May-14 19:00:07	0:00:00	2	11.2	100	5289	5300	0:00:01	2	10.2	100	2459	3600	0:01:30	2	10.2	100	1680	2550	0:02:55	1	0.0	100	1560	2803	0:06:12	1	0	100	0	4032	0:09:41	1	0	100	6048	4032	0:09:41	1	0	100
315645	22 May-14 19:00:12	0:00:00	2	11.2	100	5294	5300	0:00:00	2	10.1	100	2461	3600	0:01:31	2	10.8	100	1728	2550	0:02:50	1	0.0	100	1560	2803	0:06:12	1	0	100	0	4032	0:09:36	1	0	100	6048	4032	0:09:36	1	0	100
315646	22 May-14 19:00:17	0:00:00	2	11.3	100	5301	5300	0:00:00	2	10.2	100	2452	3600	0:01:30	2	11.4	100	1788	2550	0:02:45	1	0.0	100	1560	2803	0:06:12	1	0	100	0	4032	0:09:30	1	0	100	6048	4032	0:09:30	1	0	100
315647	22 May-14 19:00:22	0:00:00	2	11.2	100	5303	5300	0:00:00	2	10.2	100	2443	3600	0:01:30	2	11.4	100	1848	2550	0:02:39	1	0.0	100	1560	2803	0:06:12	1	0	100	0	4032	0:09:25	1	0	100	6048	4032	0:09:25	1	0	100
315648	22 May-14 19:00:27	0:00:00	2	11.1	100	5309	5300	0:00:00	2	10.1	100	2433	3600	0:01:31	2	11.4	100	1908	2550	0:02:35	1	0.0	100	1560	2803	0:06:12	1	0	100	0	4032	0:09:21	1	0	100	6048	4032	0:09:21	1	0	100
315649	22 May-14 19:00:32	0:00:00	2	11.3	100	5316	5300	0:00:00	2	10.2	100	2436	3600	0:01:31	2	11.4	100	1956	2550	0:02:30	1	0.0	100	1560	2803	0:06:12	1	0	100	0	4032	0:09:16	1	0	100	6048	4032	0:09:16	1	0	100
315650	22 May-14 19:00:37	0:00:01	2	11.0	100	5319	5300	0:00:00	2	10.1	100	2426	3600	0:01:31	2	11.4	100	2016	2550	0:02:25	1	0.0	100	1560	2803	0:06:12	1	0	100	0	4032	0:09:11	1	0	100	6048	4032	0:09:11	1	0	100
315651	22 May-14 19:00:42	0:00:01	2	11.2	100	5324	5300	0:00:00	2	10.1	100	2453	3600	0:01:32	2	9.6	100	2040	2550	0:02:21	1	0.0	100	1560	2803	0:06:12	1	0	100	0	4032	0:09:07	1	0	100	6048	4032	0:09:07	1	0	100
315652	22 May-14 19:00:47	0:00:01	2	11.2	100	5330	5300	0:00:00	2	10.2	100	2468	3600	0:01:30	2	8.4	100	2076	2550	0:02:16	1	0.0	100	1560	2803	0:06:12	1	0	100	0	4032	0:09:02	1	0	100	6048	4032	0:09:02	1	0	100
315653	22 May-14 19:00:52	0:00:02	2	11.1	100	5335	5300	0:00:00	2	10.1	100	2458	3600	0:01:29	2	9.0	100	2136	2550	0:02:12	1	0.0	100	1560	2803	0:06:12	1	0	100	0	4032	0:08:58	1	0	100	6048	4032	0:08:58	1	0	100
315654	22 May-14 19:00:57	0:00:02	2	11.2	100	5340	5300	0:00:00	2	10.2	100	2449	3600	0:01:29	2	9.0	100	2196	2550	0:02:07	1	0.0	100	1560	2803	0:06:12	1	0	100	0	4032	0:08:53	1	0	100	6048	4032	0:08:53	1	0	100
315655	22 May-14 19:01:02	0:00:03	2	11.2	100	5345	5300	0:00:00	2	10.2	100	2452	3600	0:01:30	2	10.2	100	2244	2550	0:02:02	1	0.0	100	1560	2803	0:06:12	1	0	100	0	4032	0:08:48	1	0	100	6048	4032	0:08:48	1	0	100
315656	22 May-14 19:01:07	0:00:03	2	11.3	100	5353	5300	0:00:00	2	10.1	100	2466	3600	0:01:30	2	10.2	100	2280	2550	0:01:58	1	0.0	100	1560	2803	0:06:12	1	0	100	0	4032	0:08:44	1	0	100	6048	4032	0:08:44	1	0	100
315657	22 May-14 19:01:12	0:00:04	2	11.2	100	5355	5300	0:00:00	2	10.2	100	2469	3600	0:01:29	2	9.6	100	2328	2550	0:01:53	1	0.0	100	1560	2803	0:06:12	1	0	100	0	4032	0:08:39	1	0	100	6048	4032	0:08:39	1	0	100
315658	22 May-14 19:01:17	0:00:04	2	11.1	100	5360	5300	0:00:00	2	10.1	100	2483	3600	0:01:29	2	8.4	100	2316	2550	0:01:49	2	2.4	100	1608	2803	0:06:12	1	0	100	0	4032	0:08:35	1	0	100	6048	4032	0:08:35	1	0	100
315659	22 May-14 19:01:22	0:00:04	2	11.1	100	5365	5300	0:00:00	2	10.1	100	2474	3600	0:01:27	2	9.0	100	2304	2550	0:01:49	2	6.0	100	1680	2803	0:06:12	1	0	100	0	4032	0:08:31	1	0	100	6048	4032	0:08:31	1	0	100
315660	22 May-14 19:01:27	0:00:05	2	11.0	100	5370	5300	0:00:00	2	10.2	100	2477	3600	0:01:28	2	9.6	100	2304	2550	0:01:51	2	8.4	100	1728	2803	0:06:12	1	0	100	0	4032	0:08:26	1	0	100	6048	4032	0:08:26	1	0	100
315661	22 May-14 19:01:32	0:00:05	2	11.2	100	5375	5300	0:00:00	2	10.2	100	2468	3600	0:01:28	2	10.2	100	2316	2550	0:01:50	2	10.8	100	1776	2803	0:06:12	1	0	100	0	4032	0:08:22	1	0	100	6048	4032	0:08:22	1	0	100
315662	22 May-14 19:01:37	0:00:05	2	11.2	100	5381	5300	0:00:00	2	10.2	100	2482	3600	0:01:29	2	10.2	100	2280	2550	0:01:50	2	12.0	100	1848	2803	0:06:12	1	0	100	0	4032	0:08:17	1	0	100	6048	4032	0:08:17	1	0	100
315663	22 May-14 19:01:42	0:00:06	2	11.2	100	5386	5300	0:00:00	2	10.2	100	2485	3600	0:01:27	2	9.6	100	2280	2550	0:01:52	2	10.8	100	1896	2803	0:06:12	1	0	100	0	4032	0:08:14	1	0	100	6048	4032	0:08:14	1	0	100
315664	22 May-14 19:01:47	0:00:06	2	11.4	100	5394	5300	0:00:00	2	10.2	100	2536	3600	0:01:27	2	9.6	100	2232	2550	0:01:52	2	10.8	100	1944	2803	0:06:12	1	0	100	0	4032	0:08:09	1	0	100	6048	4032	0:08:09	1	0	100
315665	22 May-14 19:01:52	0:00:07	2	11.2	100	5396	5300	0:00:00	2	10.1	100	2454	3600	0:01:23	2	11.0	100	2292	2550	0:01:52	2	12.0	100	2016	2803	0:06:12	1	0	100	0	4032	0:08:06	1	0	100	6048	4032	0:08:06	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
315666	22 May-14 19:01:57	0:00:07	2	11.2	100	5400	5300	0:00:00	2	10.2	100	2470	3600	0:01:30	2	10.1	100	2280	2550	0:01:53	2	10.8	100	2064	2803	0:06:12	1	0	100	0	4032	0:08:01	1	0	100	6048	4032	0:08:01	1	0	100
315667	22 May-14 19:02:02	0:00:07	2	11.5	100	5412	5300	0:00:00	2	10.2	100	2485	3600	0:01:28	2	10.1	100	2268	2550	0:01:53	2	10.8	100	2112	2803	0:06:12	1	0	100	0	4032	0:07:56	1	0	100	6048	4032	0:07:56	1	0	100
315668	22 May-14 19:02:07	0:00:08	2	11.1	100	5412	5300	0:00:00	2	10.2	100	2487	3600	0:01:27	2	10.1	100	2244	2550	0:01:53	2	12.0	100	2184	2803	0:06:12	1	0	100	0	4032	0:07:52	1	0	100	6048	4032	0:07:52	1	0	100
315669	22 May-14 19:02:12	0:00:08	2	11.2	100	5415	5300	0:00:00	2	10.2	100	2478	3600	0:01:27	2	9.0	100	2256	2550	0:01:55	2	10.8	100	2232	2803	0:06:12	1	0	100	0	4032	0:07:48	1	0	100	6048	4032	0:07:48	1	0	100
315670	22 May-14 19:02:17	0:00:09	2	11.2	100	5420	5300	0:00:00	2	10.2	100	2469	3600	0:01:28	2	10.2	100	2268	2550	0:01:55	2	10.8	100	2280	2803	0:06:12	1	0	100	0	4032	0:07:44	1	0	100	6048	4032	0:07:44	1	0	100
315671	22 May-14 19:02:22	0:00:09	2	10.9	100	5428	5300	0:00:00	2	10.1	100	2483	3600	0:01:28	2	10.2	100	2232	2550	0:01:54	2	12.0	100	2352	2803	0:06:12	1	0	100	0	4032	0:07:40	1	0	100	6048	4032	0:07:40	1	0	100
315672	22 May-14 19:02:27	0:00:10	2	11.2	100	5433	5300	0:00:00	2	10.2	100	2474	3600	0:01:27	2	10.8	100	2244	2550	0:01:56	2	10.8	100	2400	2803	0:06:12	1	0	100	0	4032	0:07:36	1	0	100	6048	4032	0:07:36	1	0	100
315673	22 May-14 19:02:32	0:00:10	2	11.3	100	5438	5300	0:00:00	2	10.2	100	2465	3600	0:01:28	2	10.8	100	2256	2550	0:01:56	2	10.8	100	2448	2803	0:06:12	1	0	100	0	4032	0:07:32	1	0	100	6048	4032	0:07:32	1	0	100
315674	22 May-14 19:02:37	0:00:10	2	11.2	100	5441	5300	0:00:00	2	10.2	100	2468	3600	0:01:29	2	10.2	100	2232	2550	0:01:56	2	12.0	100	2520	2803	0:06:12	1	0	100	0	4032	0:07:27	1	0	100	6048	4032	0:07:27	1	0	100
315675	22 May-14 19:02:42	0:00:11	2	11.1	100	5446	5300	0:00:00	2	10.2	100	2482	3600	0:01:28	2	10.2	100	2220	2550	0:01:58	2	10.8	100	2568	2803	0:06:12	1	0	100	0	4032	0:07:23	1	0	100	6048	4032	0:07:23	1	0	100
315676	22 May-14 19:02:47	0:00:11	2	11.4	100	5458	5300	0:00:00	2	10.2	100	2473	3600	0:01:27	2	10.2	100	2232	2550	0:01:58	2	10.8	100	2616	2803	0:06:12	1	0	100	0	4032	0:07:19	1	0	100	6048	4032	0:07:19	1	0	100
315677	22 May-14 19:02:52	0:00:12	2	11.0	100	5456	5300	0:00:00	2	10.1	100	2475	3600	0:01:28	2	9.6	100	2208	2550	0:01:57	2	12.0	100	2688	2803	0:06:12	1	0	100	0	4032	0:07:15	1	0	100	6048	4032	0:07:15	1	0	100
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315680	22 May-14 19:03:07	0:00:13	2	10.8	100	5472	5300	0:00:00	2	10.1	100	2483	3600	0:01:28	2	9.6	100	2184	2550	0:01:59	2	12.0	100	2856	2803	0:06:12	1	0	100	0	4032	0:07:03	1	0	100	6048	4032	0:07:03	1	0	100
315681	22 May-14 19:03:12	0:00:13	2	10.7	100	5477	5300	0:00:00	2	9.7	100	2486	3600	0:01:27	2	9.1	100	2184	2550	0:02:01	2	10.3	100	2904	2803	0:06:12	1	0	100	0	4032	0:07:03	1	0	100	6048	4032	0:07:03	1	0	100
315682	22 May-14 19:03:17	0:00:13	2	10.6	100	5519	5300	0:00:00	2	7.9	100	2439	3600	0:01:28	2	9.7	100	2196	2550	0:02:01	2	10.3	100	2952	2803	0:06:12	1	0	100	0	4032	0:07:03	1	0	100	6048	4032	0:07:03	1	0	100
315683	22 May-14 19:03:22	0:00:17	2	10.6	100	5573	5300	0:00:00	2	5.5	100	2381	3600	0:01:33	2	9.7	100	2184	2550	0:02:05	2	11.4	100	3024	2803	0:06:12	1	0	100	0	4032	0:07:08	1	0	100	6048	4032	0:07:08	1	0	100
315684	22 May-14 19:03:27	0:00:22	2	10.6	100	5629	5300	0:00:00	1	0.0	100	2333	3600	0:01:40	2	10.3	100	2184	2550	0:02:14	2	10.3	100	3072	2803	0:06:12	1	0	100	0	4032	0:07:16	1	0	100	6048	4032	0:07:16	1	0	100
315685	22 May-14 19:03:32	0:00:28	2	11.1	100	5684	5300	0:00:00	1	0.0	100	2285	3600	0:01:47	2	10.8	100	2160	2550	0:02:21	2	12.0	100	3144	2803	0:06:12	1	0	100	0	4032	0:07:23	1	0	100	6048	4032	0:07:23	1	0	100
315686	22 May-14 19:03:37	0:00:33	2	11.2	100	5740	5300	0:00:00	1	0.0	100	2225	3600	0:01:55	2	10.8	100	2172	2550	0:02:30	2	12.0	100	3192	2803	0:06:12	1	0	100	0	4032	0:07:33	1	0	100	6048	4032	0:07:33	1	0	100
315687	22 May-14 19:03:42	0:00:39	2	11.1	100	5795	5300	0:00:00	1	0.0	100	2189	3600	0:02:04	2	9.6	100	2160	2550	0:02:38	2	10.8	100	3240	2803	0:06:12	1	0	100	0	4032	0:07:40	1	0	100	6048	4032	0:07:40	1	0	100
315688	22 May-14 19:03:47	0:00:46	2	11.1	100	5851	5300	0:00:00	1	0.0	100	2141	3600	0:02:11	2	9.6	100	2136	2550	0:02:46	2	12.0	100	3312	2803	0:06:12	1	0	100	0	4032	0:07:49	1	0	100	6048	4032	0:07:49	1	0	100
315689	22 May-14 19:03:52	0:00:52	2	11.2	100	5907	5300	0:00:00	1	0.0	100	2081	3600	0:02:19	2	10.2	100	2148	2550	0:02:57	2	10.8	100	3360	2803	0:06:12	1	0	100	0	4032	0:08:00	1	0	100	6048	4032	0:08:00	1	0	100
315690	22 May-14 19:03:57	0:01:00	2	11.2	100	5963	5300	0:00:00	1	0.0	100	2021	3600	0:02:30	2	10.2	100	2160	2550	0:03:07	2	10.8	100	3408	2803	0:06:12	1	0	100	0	4032	0:08:09	1	0	100	6048	4032	0:08:09	1	0	100
315691	22 May-14 19:04:02	0:01:07	2	11.2	100	6018	5300	0:00:00	1	0.0	100	1961	3600	0:02:41	2	11.4	100	2148	2550	0:03:17	2	12.0	100	3480	2803	0:06:12	1	0	100	0	4032	0:08:19	1	0	100	6048	4032	0:08:19	1	0	100
315692	22 May-14 19:04:07	0:01:16	2	11.2	100	6074	5300	0:00:00	1	0.0	100	1913	3600	0:02:53	2	11.4	100	2148	2550	0:03:30	2	10.8	100	1512	2803	0:06:12	2	20	100	2016	4032	0:08:32	1	0	100	6048	4032	0:08:32	1	0	100
315693	22 May-14 19:04:12	0:01:22	2	11.1	100	6129	5300	0:00:00	1	0.0	100	1853	3600	0:03:00	2	11.4	100	2160	2550	0:03:37	2	10.8	100	1560	2803	0:06:12	1	0	100	2016	4032	0:07:54	1	0	100	6048	4032	0:07:54	1	0	100
315694	22 May-14 19:04:17	0:01:28	2	11.1	100	6185	5300	0:00:00	1	0.0	100	1793	3600	0:03:07	2	11.4	100	2148	2550	0:03:42	2	12.0	100	1632	2803	0:06:12	1	0	100	2016	4032	0:07:56	1	0	100	4032	4032	0:07:56	2	25	100
315695	22 May-14 19:04:22	0:01:34	2	11.1	100	6240	5300	0:00:00	1	0.0	100	1769	3600	0:03:13	2	9.6	100	2124	2550	0:03:50	2	10.8	100	1680	2803	0:05:26	1	0	100	2016	4032	0:07:57	1	0	100	4032	4032	0:07:57	1	0	100
315696	22 May-14 19:04:27	0:01:40	2	11.1	100	6296	5300	0:00:00	1	0.0	100	1733	3600	0:03:16	2	9.0	100	2112	2550	0:03:55	2	10.8	100	1728	2803	0:05:27	1	0	100	2016	4032	0:07:58	1	0	100	4032	4032	0:07:58	1	0	100
315697	22 May-14 19:04:32	0:01:46	2	11.2	100	6300	5300	0:00:00	1	0.0	100	1685	3600	0:03:20	2	8.4	100	2088	2550	0:04:00	2	12.0	100	1800	2803	0:05:28	1	0	100	2016	4032	0:07:59	1	0	100	4032	4032	0:07:59	1	0	100
315698	22 May-14 19:04:37	0:01:47	2	11.1	100	6300	5300	0:00:00	1	0.0	100	1649	3600	0:03:25	2	7.2	100	2076	2550	0:04:07	2	10.8	100	1848	2803	0:05:29	1	0	100	2016	4032	0:08:00	1	0	100	4032	4032	0:08:00	1	0	100
315699	22 May-14 19:04:42	0:01:47	2	11.2	100	6300	5300	0:00:00	1	0.0	100	1601	3600	0:03:29	2	8.4	100	2076	2550	0:04:12	2	10.8	100	1896	2803	0:05:30	1	0	100	2016	4032	0:08:02	1	0	100	4032	4032	0:08:02	1	0	100
315700	22 May-14 19:04:47	0:01:47	2	11.1	100	6300	5300	0:00:00	1	0.0	100	1565	3600	0:03:34	2	8.4	100	2040	2550	0:04:17	2	12.0	100	1968	2803	0:05:32	1	0	100	2016	4032	0:08:03	1	0	100	4032	4032	0:08:03	1	0	100
315701	22 May-14 19:04:52	0:01:47	2	11.1	100	6300	5300	0:00:00	1	0.0	100	1517	3600	0:03:38	2	8.4	100	2040	2550	0:04:24	2	10.8	100	2016	2803	0:05:33	1	0	100	2016	4032	0:08:04	1	0	100	4032	4032	0:08:04	1	0	100
315702	22 May-14 19:04:57	0:01:47	2	11.1	100	6300	5300	0:00:00	1	0.0	100	1481	3600	0:03:43	2	8.4	100	2028	2550	0:04:29	2	10.8	100	2064	2803	0:05:34	1	0	100	2016	4032	0:08:05	1	0	100	4032	4032	0:08:05	1	0	100
315703	22 May-14 19:05:02	0:01:47	2	11.1	100	6300	5300	0:00:00	1	0.0	100	1433	3600	0:03:47	2	8.4	100	2004	2550	0:04:34	2	12.0	100	2136	2803	0:05:35	1	0	100	2016	4032	0:08:06	1	0	100	4032	4032	0:08:06	1	0	100
315704	22 May-14 19:05:07	0:01:47	2	11.1	100	6300	5300	0:00:00	1	0.0	100	1397	3600	0:03:52	2	8.4	100	1992	2550	0:04:42	2	10.8	100	2184	2803	0:05:37	1	0	100	2016	4032	0:08:08	1	0	100	4032	4032	0:08:08	1	0	100
315705	22 May-14 19:05:12	0:01:47	2	11.2	100	6300	5300	0:00:00	1	0.0	100	1349	3600	0:03:56	2	8.4	100	1992	2550	0:04:47	2	10.8	100	2232	2803	0:05:38	1	0	100	2016	4032	0:08:09	1	0	100	4032	4032	0:08:09	1	0	100
315706	22 May-14 19:05:17	0:01:47	2	11.2	100	6300	5300	0:00:00	1	0.0	100	1313	3600	0:04:01	2	8.4	100	1956	2550	0:04:52	2	12.0	100	2304	2803	0:05:39	1	0	100	2016	4032	0:08:10	1	0	100	4032	4032	0:08:10	1	0	100
315707	22 May-14 19:05:22	0:01:47	2	11.1	100	6300	5300	0:00:00	1	0.0	100	1265	3600	0:04:05	2	8.4	100	1956	2550	0:04:59	2	10.8	100	2352	2803	0:05:40	1	0	100	2016	4032	0:08:11	1	0	100	4032	4032	0:08:11	1	0	100
315708	22 May-14 19:05:27	0:01:47	2	11.2	100	6300	5300	0:00:00	2	0.0	100	1231	3600	0:04:10	2	8.4	100	1944	2550	0:05:04	2	10.8	100	2400	2803	0:05:41	1	0	100	2016	4032	0:08:12	1	0	100	4032	4032	0:08:12	1	0	100
315709	22 May-14 19:05:32	0:01:46	2	11.1	100	6300	5300	0:00:00	2	0.0	100	1189	3600	0:04:13	2	8.4	100	1920	2550	0:05:09	2	12.0	100	2472	2803	0:05:42	1	0	100	2016	4032	0:08:13	1	0	100	4032	4032	0:08:13	1	0	100
315710	22 May-14 19:05:37	0:01:46	2	11.1	100	6300	5300	0:00:00	2	0.0	100	1158	3600	0:04:16	2	8.4	100	1908	2550	0:05:14	2	10.8	100	2520	2803	0:05:41	1	0	100	2016	4032	0:08:13	1	0	100	4032	4032	0:08:13	1	0	100
315711	22 May-14 19:05:42	0:01:46	2	11.1	100	6300	5300	0:00:00	2	1.2	100	1121	3600	0:04:19	2	8.4	100	1908	2550	0:05:18	2	10.8	100	2568	2803	0:05:41	1	0	100	2016	4032	0:08:12	1	0	100	4032	4032	0:08:12	1	0	100
315712	22 May-14 19:05:47	0:01:45	2	11.1	100	6300	5300	0:00:00	2	3.0	100	1111	3600	0:04:21	2	9.0	100	1884	2550	0:05:20	2	12.0	100	2640	2803	0:05:39	1	0	100	0	4032	0:08:10	2	24	100	6048	4032	0:08:10	1	0	100
315713	22 May-14 19:05:52	0:01:42	2	11.2	100	6300	5300	0:00:00	2	3.3	100	1086	3600	0:04:15	2	8.4	100	1872	2550	0:05:16	2	10.8	100	2688	2803	0:06:12	1	0	100	0	4032	0:10:32	1	0	100	6048	4032	0:10:32	1	0	100
315714	22 May-14 19:05:57	0:01:41	2	11.1	100	6300	5300	0:00:00	2	3.4	100	1058	3600	0:04:16	2	8.4	100	1860	2550	0:05:18	2	10.8	100	2736	2803	0:06:12	1	0	100	0	4032	0:10:30	1	0	100	6048	4032	0:10:30	1	0	100
315715	22 May-14 19:06:02	0:01:41	2	11.2	100	6300	5300	0:00:00	2	3.1	100	1015	3600	0:04:17	2	8.4	100	1836	2550	0:05:20	2	12.0	100	2808	2803	0:06:12	1	0	100	0	4032	0:10:28	1	0	100	6048	4032	0:10:28	1	0	100
315716	22 May-14 19:06:07	0:01:40	2	11.3	100	6300	5300	0:00:00	2	1.5	100	985	3600	0:04:20	2	7.8	100	1824	2550	0:05:26	2	10.8	100	2856	2803	0:06:12	1	0	100	0	4032	0:10:28	1	0	100	6048	4032	0:10:28	1	0	100
315717	22 May-14 19:06:12	0:01:40	2	11.2	100	6300	5300	0:00:00	2	1.2	100	941	3600	0:04:22	2	8.4	100	1824	2550	0:05:29	2	10.8	100	2904	2803	0:06:12	1	0	100	0	4032	0:10:31	1	0	100	6048	4032	0:10:31	1	0	100
315718	22 May-14 19:06:17	0:01:40	2	11.3	100	6300	5300	0:00:00	2	0.0	100	931	3600	0:04:26	2	7.2	100	1764	2550	0:05:33	2	12.0	100	2976	2803	0:06:12	1	0	100	0	4032	0:10:35	1	0	100	6048	4032	0:10:35	1	0	100
315719	22 May-14 19:06:22	0:01:40	2	11.2	100	6300	5300	0:00:00	1	0.0	100	907	3600	0:04:27	2	6.0	100	1740	2550	0:05:39	2	10.8	100	3024	2803	0:06:12	1	0	100	0	4032	0:10:42	1	0	100	6048	4032	0:10:42	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
315720	22 May-14 19:06:27	0:01:40	2	11.0	100	6300	5300	0:00:00	1	0.0	100	883	3600	0:04:31	2	5.4	100	1716	2550	0:05:45	2	10.8	100	3072	2803	0:06:12	1	0	100	0	4032	0:10:48	1	0	100	6048	4032	0:10:48	1	0	100
315721	22 May-14 19:06:32	0:01:41	2	11.2	100	6300	5300	0:00:00	1	0.0	100	883	3600	0:04:34	1	0.0	100	1644	2550	0:05:51	2	12.0	100	3144	2803	0:06:12	1	0	100	0	4032	0:10:53	1	0	100	6048	4032	0:10:53	1	0	100
315722	22 May-14 19:06:37	0:01:41	2	11.1	100	6300	5300	0:00:00	1	0.0	100	883	3600	0:04:36	1	0.0	100	1596	2550	0:06:00	2	10.8	100	3192	2803	0:06:12	1	0	100	0	4032	0:11:02	1	0	100	6048	4032	0:11:02	1	0	100
315723	22 May-14 19:06:42	0:01:44	2	11.2	100	6300	5300	0:00:00	1	0.0	100	883	3600	0:04:43	1	0.0	100	1548	2550	0:06:12	2	10.8	100	3240	2803	0:06:12	1	0	100	0	4032	0:11:14	1	0	100	6048	4032	0:11:14	1	0	100
315724	22 May-14 19:06:47	0:01:45	2	11.2	100	6300	5300	0:00:00	1	0.0	100	883	3600	0:04:46	1	0.0	100	1476	2550	0:06:18	2	12.0	100	3312	2803	0:06:18	1	0	100	0	4032	0:11:21	1	0	100	6048	4032	0:11:21	1	0	100
315725	22 May-14 19:06:52	0:01:45	2	11.1	100	6300	5300	0:00:00	2	0.0	100	887	3600	0:04:47	1	0.0	100	1428	2550	0:06:27	2	10.8	100	3360	2803	0:06:27	1	0	100	0	4032	0:11:29	1	0	100	6048	4032	0:11:29	1	0	100
315726	22 May-14 19:06:57	0:01:45	2	11.2	100	6300	5300	0:00:00	2	0.0	100	893	3600	0:04:47	1	0.0	100	1380	2550	0:06:31	2	10.8	100	3408	2803	0:06:31	1	0	100	0	4032	0:11:34	1	0	100	6048	4032	0:11:34	1	0	100
315727	22 May-14 19:07:02	0:01:45	2	11.4	100	6300	5300	0:00:00	2	2.9	100	941	3600	0:04:46	1	0.0	100	1332	2550	0:06:35	2	10.8	100	3456	2803	0:06:35	1	0	100	0	4032	0:11:38	1	0	100	6048	4032	0:11:38	1	0	100
315728	22 May-14 19:07:07	0:01:42	2	11.1	100	6296	5300	0:00:00	2	5.7	100	996	3600	0:04:33	1	0.0	100	1308	2550	0:06:27	2	8.4	100	1464	2803	0:06:27	2	20	100	2016	4032	0:11:29	1	0	100	6048	4032	0:11:29	1	0	100
315729	22 May-14 19:07:12	0:01:38	2	11.2	100	6296	5300	0:00:00	2	8.3	100	1052	3600	0:04:18	1	0.0	100	1260	2550	0:06:14	2	8.4	100	1512	2803	0:08:04	1	0	100	2016	4032	0:10:35	1	0	100	6048	4032	0:10:35	1	0	100
315730	22 May-14 19:07:17	0:01:35	2	11.2	100	6299	5300	0:00:00	2	10.7	100	1107	3600	0:04:03	1	0.0	100	1188	2550	0:06:04	2	9.6	100	1584	2803	0:07:50	1	0	100	2016	4032	0:10:21	1	0	100	6048	4032	0:10:21	1	0	100
315731	22 May-14 19:07:22	0:01:32	2	11.0	100	6298	5300	0:00:00	2	11.1	100	1163	3600	0:03:50	1	0.0	100	1140	2550	0:05:57	2	9.6	100	1632	2803	0:07:38	1	0	100	2016	4032	0:10:09	1	0	100	6048	4032	0:10:09	1	0	100
315732	22 May-14 19:07:27	0:01:29	2	11.2	100	6297	5300	0:00:00	2	11.1	100	1218	3600	0:03:37	1	0.0	100	1092	2550	0:05:49	2	10.8	100	1680	2803	0:07:26	1	0	100	2016	4032	0:09:57	1	0	100	6048	4032	0:09:57	1	0	100
315733	22 May-14 19:07:32	0:01:26	2	11.1	100	6296	5300	0:00:00	2	11.1	100	1274	3600	0:03:25	1	0.0	100	1044	2550	0:05:42	2	10.8	100	1728	2803	0:07:15	1	0	100	2016	4032	0:09:46	1	0	100	6048	4032	0:09:46	1	0	100
315734	22 May-14 19:07:37	0:01:23	2	11.1	100	6297	5300	0:00:00	2	11.2	100	1330	3600	0:03:14	1	0.0	100	996	2550	0:05:35	2	9.6	100	1776	2803	0:07:04	1	0	100	2016	4032	0:09:35	1	0	100	6048	4032	0:09:35	1	0	100
315735	22 May-14 19:07:42	0:01:20	2	11.1	100	6296	5300	0:00:00	2	11.2	100	1386	3600	0:03:04	1	0.0	100	948	2550	0:05:30	2	9.6	100	1824	2803	0:06:54	1	0	100	2016	4032	0:09:25	1	0	100	6048	4032	0:09:25	1	0	100
315736	22 May-14 19:07:47	0:01:18	2	11.2	100	6297	5300	0:00:00	2	11.2	100	1441	3600	0:02:54	1	0.0	100	924	2550	0:05:25	2	8.4	100	1848	2803	0:06:45	1	0	100	2016	4032	0:09:16	1	0	100	6048	4032	0:09:16	1	0	100
315737	22 May-14 19:07:52	0:01:16	2	11.2	100	6297	5300	0:00:00	2	11.2	100	1497	3600	0:02:46	1	0.0	100	876	2550	0:05:18	2	8.4	100	1896	2803	0:06:37	1	0	100	2016	4032	0:09:08	1	0	100	6048	4032	0:09:08	1	0	100
315738	22 May-14 19:07:57	0:01:16	2	11.1	100	6297	5300	0:00:00	2	11.1	100	1552	3600	0:02:41	1	0.0	100	828	2550	0:05:18	2	8.4	100	1944	2803	0:06:33	1	0	100	2016	4032	0:09:04	1	0	100	6048	4032	0:09:04	1	0	100
315739	22 May-14 19:08:02	0:01:16	2	11.3	100	6299	5300	0:00:00	2	11.1	100	1608	3600	0:02:37	1	0.0	100	804	2550	0:05:18	2	7.2	100	1968	2803	0:06:29	1	0	100	2016	4032	0:09:00	1	0	100	6048	4032	0:09:00	1	0	100
315740	22 May-14 19:08:07	0:01:16	2	11.2	100	6299	5300	0:00:00	2	11.1	100	1663	3600	0:02:32	1	0.0	100	780	2550	0:05:16	2	7.2	100	1992	2803	0:06:25	1	0	100	2016	4032	0:08:56	1	0	100	6048	4032	0:08:56	1	0	100
315741	22 May-14 19:08:12	0:01:16	2	11.2	100	6299	5300	0:00:00	2	11.1	100	1719	3600	0:02:28	1	0.0	100	732	2550	0:05:14	2	7.2	100	2040	2803	0:06:21	1	0	100	2016	4032	0:08:52	1	0	100	6048	4032	0:08:52	1	0	100
315742	22 May-14 19:08:17	0:01:16	2	11.2	100	6298	5300	0:00:00	2	11.1	100	1774	3600	0:02:24	1	0.0	100	684	2550	0:05:14	2	7.2	100	2088	2803	0:06:17	1	0	100	2016	4032	0:08:48	1	0	100	6048	4032	0:08:48	1	0	100
315743	22 May-14 19:08:22	0:01:16	2	11.0	100	6297	5300	0:00:00	2	11.1	100	1830	3600	0:02:20	1	0.0	100	636	2550	0:05:14	2	8.4	100	2136	2803	0:06:13	1	0	100	2016	4032	0:08:45	1	0	100	6048	4032	0:08:45	1	0	100
315744	22 May-14 19:08:27	0:01:16	2	11.1	100	6298	5300	0:00:00	2	11.1	100	1885	3600	0:02:15	1	0.0	100	564	2550	0:05:15	2	10.8	100	2208	2803	0:06:12	1	0	100	2016	4032	0:08:41	1	0	100	6048	4032	0:08:41	1	0	100
315745	22 May-14 19:08:32	0:01:16	2	11.1	100	6298	5300	0:00:00	2	11.1	100	1941	3600	0:02:11	1	0.0	100	516	2550	0:05:17	2	10.8	100	2256	2803	0:06:12	1	0	100	2016	4032	0:08:38	1	0	100	6048	4032	0:08:38	1	0	100
315746	22 May-14 19:08:37	0:01:16	2	11.1	100	6298	5300	0:00:00	2	11.1	100	1996	3600	0:02:07	1	0.0	100	468	2550	0:05:17	2	10.8	100	2304	2803	0:06:12	1	0	100	2016	4032	0:08:34	1	0	100	6048	4032	0:08:34	1	0	100
315747	22 May-14 19:08:42	0:01:16	2	11.2	100	6298	5300	0:00:00	2	11.1	100	2052	3600	0:02:03	1	0.0	100	444	2550	0:05:18	2	9.6	100	2328	2803	0:06:12	1	0	100	0	4032	0:08:30	2	24	100	6048	4032	0:08:30	1	0	100
315748	22 May-14 19:08:47	0:01:16	2	11.1	100	6298	5300	0:00:00	2	11.1	100	2107	3600	0:01:58	1	0.0	100	396	2550	0:05:16	2	8.4	100	2376	2803	0:06:12	1	0	100	0	4032	0:10:57	1	0	100	6048	4032	0:10:57	1	0	100
315749	22 May-14 19:08:52	0:01:16	2	11.5	100	6300	5300	0:00:00	2	11.1	100	2163	3600	0:01:54	1	0.0	100	348	2550	0:05:16	2	8.4	100	2424	2803	0:06:12	1	0	100	0	4032	0:10:54	1	0	100	6048	4032	0:10:54	1	0	100
315750	22 May-14 19:08:57	0:01:16	2	11.3	100	6295	5300	0:00:00	2	11.1	100	2218	3600	0:01:50	1	0.0	100	324	2550	0:05:16	2	7.2	100	2448	2803	0:06:12	1	0	100	0	4032	0:10:50	1	0	100	4032	4032	0:10:50	2	25	100
315751	22 May-14 19:09:02	0:01:16	2	11.1	100	6292	5300	0:00:00	2	11.1	100	2274	3600	0:01:46	1	0.0	100	276	2550	0:05:14	2	8.4	100	2496	2803	0:05:43	1	0	100	0	4032	0:10:46	1	0	100	4032	4032	0:10:46	1	0	100
315752	22 May-14 19:09:07	0:01:16	2	11.2	100	6292	5300	0:00:00	2	11.2	100	2330	3600	0:01:41	1	0.0	100	228	2550	0:05:14	2	8.4	100	2544	2803	0:05:40	1	0	100	0	4032	0:10:42	1	0	100	4032	4032	0:10:42	1	0	100
315753	22 May-14 19:09:12	0:01:16	2	10.8	100	6293	5300	0:00:00	2	11.1	100	2385	3600	0:01:37	1	0.0	100	204	2550	0:05:15	2	7.2	100	2568	2803	0:05:36	1	0	100	0	4032	0:10:38	1	0	100	4032	4032	0:10:38	1	0	100
315754	22 May-14 19:09:17	0:01:16	2	11.0	100	6292	5300	0:00:00	2	11.2	100	2393	3600	0:01:33	2	2.4	100	228	2550	0:05:13	2	7.2	100	2592	2803	0:05:32	1	0	100	0	4032	0:10:34	1	0	100	4032	4032	0:10:34	1	0	100
315755	22 May-14 19:09:22	0:01:16	2	11.2	100	6293	5300	0:00:00	2	11.1	100	2412	3600	0:01:32	2	4.2	100	264	2550	0:05:09	1	0.0	100	2592	2803	0:05:27	1	0	100	0	4032	0:10:29	1	0	100	4032	4032	0:10:29	1	0	100
315756	22 May-14 19:09:27	0:01:16	2	11.2	100	6293	5300	0:00:00	2	11.1	100	2412	3600	0:01:31	2	4.2	100	264	2550	0:05:04	1	0.0	100	2592	2803	0:05:21	1	0	100	0	4032	0:10:24	1	0	100	4032	4032	0:10:24	1	0	100
315757	22 May-14 19:09:32	0:01:16	2	10.6	100	6292	5300	0:00:00	2	10.6	100	2420	3600	0:01:31	2	6.3	100	312	2550	0:05:04	1	0.0	100	2592	2803	0:05:21	1	0	100	0	4032	0:10:24	1	0	100	4032	4032	0:10:24	1	0	100
315758	22 May-14 19:09:37	0:01:16	2	10.6	100	6293	5300	0:00:00	2	10.6	100	2439	3600	0:01:30	2	8.0	100	348	2550	0:04:59	1	0.0	100	2592	2803	0:05:16	1	0	100	0	4032	0:10:19	1	0	100	4032	4032	0:10:19	1	0	100
315759	22 May-14 19:09:42	0:01:16	2	10.7	100	6295	5300	0:00:00	2	10.6	100	2447	3600	0:01:29	2	8.0	100	396	2550	0:04:54	1	0.0	100	2592	2803	0:05:11	1	0	100	0	4032	0:10:14	1	0	100	4032	4032	0:10:14	1	0	100
315760	22 May-14 19:09:47	0:01:16	2	10.6	100	6293	5300	0:00:00	2	10.6	100	2466	3600	0:01:28	2	8.0	100	432	2550	0:04:48	1	0.0	100	2592	2803	0:05:06	1	0	100	0	4032	0:10:08	1	0	100	4032	4032	0:10:08	1	0	100
315761	22 May-14 19:09:52	0:01:16	2	11.2	100	6293	5300	0:00:00	2	11.1	100	2474	3600	0:01:27	2	8.4	100	480	2550	0:04:43	1	0.0	100	2592	2803	0:05:01	1	0	100	0	4032	0:10:03	1	0	100	4032	4032	0:10:03	1	0	100
315762	22 May-14 19:09:57	0:01:16	2	11.2	100	6294	5300	0:00:00	2	11.1	100	2493	3600	0:01:26	2	8.4	100	516	2550	0:04:37	1	0.0	100	2592	2803	0:04:55	1	0	100	0	4032	0:09:57	1	0	100	4032	4032	0:09:57	1	0	100
315763	22 May-14 19:10:02	0:01:16	2	11.0	100	6293	5300	0:00:00	2	11.1	100	2501	3600	0:01:25	2	8.4	100	564	2550	0:04:32	1	0.0	100	2592	2803	0:04:50	1	0	100	0	4032	0:09:52	1	0	100	4032	4032	0:09:52	1	0	100
315764	22 May-14 19:10:07	0:01:16	2	11.2	100	6295	5300	0:00:00	2	11.1	100	2520	3600	0:01:24	2	8.4	100	600	2550	0:04:27	1	0.0	100	2592	2803	0:04:44	1	0	100	0	4032	0:09:47	1	0	100	4032	4032	0:09:47	1	0	100
315765	22 May-14 19:10:12	0:01:16	2	11.1	100	6293	5300	0:00:00	2	11.1	100	2528	3600	0:01:23	2	8.4	100	648	2550	0:04:22	1	0.0	100	2592	2803	0:04:39	1	0	100	0	4032	0:09:42	1	0	100	4032	4032	0:09:42	1	0	100
315766	22 May-14 19:10:17	0:01:16	2	11.1	100	6294	5300	0:00:00	2	11.1	100	2547	3600	0:01:22	2	8.4	100	684	2550	0:04:17	1	0.0	100	576	2803	0:04:34	2	20	100	2016	4032	0:09:37	1	0	100	4032	4032	0:09:37	1	0	100
315767	22 May-14 19:10:22	0:01:16	2	11.3	100	6296	5300	0:00:00	2	11.1	100	2543	3600	0:01:21	2	9.0	100	744	2550	0:04:12	1	0.0	100	576	2803	0:07:18	1	0	100	2016	4032	0:09:49	1	0	100	4032	4032	0:09:49	1	0	100
315768	22 May-14 19:10:27	0:01:16	2	11.1	100	6294	5300	0:00:00	2	11.1	100	2550	3600	0:01:21	2	9.6	100	792	2550	0:04:06	1	0.0	100	576	2803	0:07:12	1	0	100	2016	4032	0:09:43	1	0	100	4032	4032	0:09:43	1	0	100
315769	22 May-14 19:10:32	0:01:16	2	11.2	100	6294	5300	0:00:00	2	11.1	100	2546	3600	0:01:20	2	10.2	100	852	2550	0:04:01	1	0.0	100	576	2803	0:07:07	1	0	100	2016	4032	0:09:38	1	0	100	4032	4032	0:09:38	1	0	100
315770	22 May-14 19:10:37	0:01:16	2	11.1	100	6294	5300	0:00:00	2	11.1	100	2553	3600	0:01:20	2	10.8	100	900	2550	0:03:56	1	0.0	100	576	2803	0:07:01	1	0	100	2016	4032	0:09:33	1	0	100	4032	4032	0:09:33	1	0	100
315771	22 May-14 19:10:42	0:01:16	2	11.0	100	6294	5300	0:00:00	2	11.1	100	2561	3600	0:01:20	2	10.2	100	948	2550	0:03:51	1	0.0	100	576	2803	0:06:56	1	0	100	2016	4032	0:09:28	1	0	100	4032	4032	0:09:28	1	0	100
315772	22 May-14 19:10:47	0:01:16	2	11.2	100	6295	5300	0:00:00	2	11.1	100	2556	3600	0:01:19	2	10.8	100	1008	2550	0:03:46	1	0.0	100	576	2803	0:06:51	1	0	100	2016	4032	0:09:23	1	0	100	4032	4032	0:09:23	1	0	100
315773	22 May-14 19:10:52	0:01:16	2	11.1	100	6294	5300	0:00:00	2	11.1	100	2552	3600	0:01:20	2	10.8	100	1068	2550	0:03:41	1	0.0	100	576	2803	0:06:46	1	0	100	2016	4032	0:09:17	1	0	100	4032	4032	0:09:17	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
315774	22 May-14 19:10:57	0:01:16	2	11.2	100	6294	5300	0:00:00	2	11.2	100	2560	3600	0:01:20	2	10.8	100	1116	2550	0:03:35	1	0.0	100	576	2803	0:06:41	1	0	100	2016	4032	0:09:12	1	0	100	4032	4032	0:09:12	1	0	100
315775	22 May-14 19:11:02	0:01:16	2	11.2	100	6295	5300	0:00:00	2	11.1	100	2567	3600	0:01:19	2	10.8	100	1164	2550	0:03:30	1	0.0	100	576	2803	0:06:36	1	0	100	2016	4032	0:09:07	1	0	100	4032	4032	0:09:07	1	0	100
315776	22 May-14 19:11:07	0:01:16	2	11.2	100	6295	5300	0:00:00	2	11.2	100	2563	3600	0:01:19	2	10.8	100	1224	2550	0:03:25	1	0.0	100	576	2803	0:06:31	1	0	100	2016	4032	0:09:02	1	0	100	4032	4032	0:09:02	1	0	100
315777	22 May-14 19:11:12	0:01:16	2	11.2	100	6295	5300	0:00:00	2	11.1	100	2570	3600	0:01:19	2	10.2	100	1272	2550	0:03:20	1	0.0	100	576	2803	0:06:26	1	0	100	2016	4032	0:08:57	1	0	100	4032	4032	0:08:57	1	0	100
315778	22 May-14 19:11:17	0:01:16	2	11.1	100	6294	5300	0:00:00	2	11.1	100	2578	3600	0:01:19	2	10.2	100	1320	2550	0:03:15	1	0.0	100	576	2803	0:06:21	1	0	100	2016	4032	0:08:52	1	0	100	4032	4032	0:08:52	1	0	100
315779	22 May-14 19:11:22	0:01:16	2	11.2	100	6296	5300	0:00:00	2	11.1	100	2573	3600	0:01:18	2	10.8	100	1380	2550	0:03:10	1	0.0	100	576	2803	0:06:16	1	0	100	2016	4032	0:08:47	1	0	100	4032	4032	0:08:47	1	0	100
315780	22 May-14 19:11:27	0:01:16	2	11.1	100	6295	5300	0:00:00	2	11.1	100	2581	3600	0:01:18	2	10.2	100	1428	2550	0:03:05	1	0.0	100	576	2803	0:06:11	1	0	100	2016	4032	0:08:42	1	0	100	4032	4032	0:08:42	1	0	100
315781	22 May-14 19:11:32	0:01:16	2	11.2	100	6296	5300	0:00:00	2	11.1	100	2576	3600	0:01:18	2	10.8	100	1488	2550	0:03:00	1	0.0	100	576	2803	0:06:06	1	0	100	2016	4032	0:08:37	1	0	100	4032	4032	0:08:37	1	0	100
315782	22 May-14 19:11:37	0:01:16	2	11.2	100	6295	5300	0:00:00	2	11.1	100	2572	3600	0:01:18	2	11.4	100	1548	2550	0:02:55	1	0.0	100	576	2803	0:06:00	1	0	100	2016	4032	0:08:32	1	0	100	4032	4032	0:08:32	1	0	100
315783	22 May-14 19:11:42	0:01:16	2	11.1	100	6296	5300	0:00:00	2	11.1	100	2567	3600	0:01:18	2	11.4	100	1608	2550	0:02:50	1	0.0	100	576	2803	0:05:55	1	0	100	2016	4032	0:08:26	1	0	100	4032	4032	0:08:26	1	0	100
315784	22 May-14 19:11:47	0:01:16	2	11.1	100	6295	5300	0:00:00	2	11.1	100	2575	3600	0:01:19	2	11.4	100	1656	2550	0:02:45	1	0.0	100	576	2803	0:05:50	1	0	100	2016	4032	0:08:21	1	0	100	4032	4032	0:08:21	1	0	100
315785	22 May-14 19:11:52	0:01:16	2	11.1	100	6296	5300	0:00:00	2	11.1	100	2570	3600	0:01:18	2	11.4	100	1716	2550	0:02:40	1	0.0	100	576	2803	0:05:45	1	0	100	2016	4032	0:08:16	1	0	100	4032	4032	0:08:16	1	0	100
315786	22 May-14 19:11:57	0:01:16	2	11.2	100	6297	5300	0:00:00	2	11.1	100	2578	3600	0:01:19	2	10.8	100	1764	2550	0:02:35	1	0.0	100	576	2803	0:05:40	1	0	100	0	4032	0:08:11	2	24	100	6048	4032	0:08:11	1	0	100
315787	22 May-14 19:12:02	0:01:16	2	11.1	100	6295	5300	0:00:00	2	11.2	100	2586	3600	0:01:18	2	10.2	100	1812	2550	0:02:30	1	0.0	100	576	2803	0:06:12	1	0	100	0	4032	0:10:38	1	0	100	6048	4032	0:10:38	1	0	100
315788	22 May-14 19:12:07	0:01:16	2	11.2	100	6296	5300	0:00:00	2	11.1	100	2581	3600	0:01:17	2	10.8	100	1872	2550	0:02:25	1	0.0	100	576	2803	0:06:12	1	0	100	0	4032	0:10:33	1	0	100	6048	4032	0:10:33	1	0	100
315789	22 May-14 19:12:12	0:01:16	2	11.2	100	6297	5300	0:00:00	2	11.2	100	2577	3600	0:01:18	2	10.8	100	1932	2550	0:02:19	1	0.0	100	576	2803	0:06:12	1	0	100	0	4032	0:10:27	1	0	100	6048	4032	0:10:27	1	0	100
315790	22 May-14 19:12:17	0:01:16	2	11.1	100	6297	5300	0:00:00	2	11.1	100	2584	3600	0:01:18	2	10.8	100	1980	2550	0:02:14	1	0.0	100	576	2803	0:06:12	1	0	100	0	4032	0:10:22	1	0	100	6048	4032	0:10:22	1	0	100
315791	22 May-14 19:12:22	0:01:16	2	11.2	100	6296	5300	0:00:00	2	11.1	100	2580	3600	0:01:17	2	11.4	100	2040	2550	0:02:09	1	0.0	100	576	2803	0:06:12	1	0	100	0	4032	0:10:17	1	0	100	6048	4032	0:10:17	1	0	100
315792	22 May-14 19:12:27	0:01:16	2	10.8	100	6289	5300	0:00:00	2	11.1	100	2587	3600	0:01:18	2	10.8	100	2088	2550	0:02:04	1	0.0	100	576	2803	0:06:12	1	0	100	0	4032	0:10:12	1	0	100	6048	4032	0:10:12	1	0	100
315793	22 May-14 19:12:32	0:01:15	1	0.0	100	6233	5300	0:00:00	2	11.1	100	2583	3600	0:01:17	2	10.8	100	2148	2550	0:01:59	1	0.0	100	576	2803	0:06:12	1	0	100	0	4032	0:10:07	1	0	100	6048	4032	0:10:07	1	0	100
315794	22 May-14 19:12:37	0:01:11	1	0.0	100	6178	5300	0:00:00	2	11.1	100	2578	3600	0:01:17	2	11.4	100	2208	2550	0:01:54	1	0.0	100	576	2803	0:06:12	1	0	100	0	4032	0:10:02	1	0	100	6048	4032	0:10:02	1	0	100
315795	22 May-14 19:12:42	0:01:07	1	0.0	100	6122	5300	0:00:00	2	11.1	100	2586	3600	0:01:18	2	10.8	100	2256	2550	0:01:49	1	0.0	100	576	2803	0:06:12	1	0	100	0	4032	0:09:57	1	0	100	6048	4032	0:09:57	1	0	100
315796	22 May-14 19:12:47	0:01:03	1	0.0	100	6067	5300	0:00:00	2	11.1	100	2581	3600	0:01:17	2	11.4	100	2316	2550	0:01:44	1	0.0	100	576	2803	0:06:12	1	0	100	0	4032	0:09:52	1	0	100	6048	4032	0:09:52	1	0	100
315797	22 May-14 19:12:52	0:00:58	1	0.0	100	6011	5300	0:00:00	2	11.1	100	2589	3600	0:01:18	2	10.8	100	2340	2550	0:01:39	2	1.2	100	600	2803	0:06:12	1	0	100	0	4032	0:09:47	1	0	100	6048	4032	0:09:47	1	0	100
315798	22 May-14 19:12:57	0:00:54	1	0.0	100	5955	5300	0:00:00	2	11.2	100	2597	3600	0:01:17	2	10.2	100	2316	2550	0:01:36	2	4.8	100	672	2803	0:06:12	1	0	100	0	4032	0:09:42	1	0	100	6048	4032	0:09:42	1	0	100
315799	22 May-14 19:13:02	0:00:50	1	0.0	100	5900	5300	0:00:00	2	11.1	100	2604	3600	0:01:16	2	10.2	100	2316	2550	0:01:38	2	7.2	100	720	2803	0:06:12	1	0	100	0	4032	0:09:37	1	0	100	6048	4032	0:09:37	1	0	100
315800	22 May-14 19:13:07	0:00:46	1	0.0	100	5844	5300	0:00:00	2	11.2	100	2600	3600	0:01:16	2	10.2	100	2328	2550	0:01:37	2	9.6	100	768	2803	0:06:12	1	0	100	0	4032	0:09:33	1	0	100	6048	4032	0:09:33	1	0	100
315801	22 May-14 19:13:12	0:00:41	1	0.0	100	5789	5300	0:00:00	2	11.1	100	2595	3600	0:01:16	2	10.8	100	2316	2550	0:01:36	2	12.0	100	840	2803	0:06:12	1	0	100	0	4032	0:09:28	1	0	100	6048	4032	0:09:28	1	0	100
315802	22 May-14 19:13:17	0:00:37	1	0.0	100	5733	5300	0:00:00	2	11.1	100	2603	3600	0:01:17	2	10.8	100	2316	2550	0:01:38	2	10.8	100	888	2803	0:06:12	1	0	100	0	4032	0:09:23	1	0	100	6048	4032	0:09:23	1	0	100
315803	22 May-14 19:13:22	0:00:33	1	0.0	100	5677	5300	0:00:00	2	11.2	100	2599	3600	0:01:16	2	11.4	100	2328	2550	0:01:37	2	10.8	100	936	2803	0:06:12	1	0	100	0	4032	0:09:18	1	0	100	6048	4032	0:09:18	1	0	100
315804	22 May-14 19:13:27	0:00:28	1	0.0	100	5622	5300	0:00:00	2	11.1	100	2594	3600	0:01:16	2	11.4	100	2316	2550	0:01:37	2	12.0	100	1008	2803	0:06:12	1	0	100	0	4032	0:09:13	1	0	100	6048	4032	0:09:13	1	0	100
315805	22 May-14 19:13:32	0:00:24	1	0.0	100	5566	5300	0:00:00	2	11.2	100	2602	3600	0:01:17	2	10.8	100	2316	2550	0:01:38	2	10.8	100	1056	2803	0:06:12	1	0	100	0	4032	0:09:08	1	0	100	6048	4032	0:09:08	1	0	100
315806	22 May-14 19:13:37	0:00:20	1	0.0	100	5511	5300	0:00:00	2	11.1	100	2585	3600	0:01:16	2	12.0	100	2340	2550	0:01:37	2	10.8	100	1104	2803	0:06:12	1	0	100	0	4032	0:09:04	1	0	100	6048	4032	0:09:04	1	0	100
315807	22 May-14 19:13:42	0:00:16	1	0.0	100	5455	5300	0:00:00	2	11.1	100	2593	3600	0:01:17	2	11.4	100	2316	2550	0:01:36	2	12.0	100	1176	2803	0:06:12	1	0	100	0	4032	0:08:59	1	0	100	6048	4032	0:08:59	1	0	100
315808	22 May-14 19:13:47	0:00:11	1	0.0	100	5400	5300	0:00:00	2	11.1	100	2588	3600	0:01:17	2	11.4	100	2328	2550	0:01:38	2	10.8	100	1224	2803	0:06:12	1	0	100	0	4032	0:08:54	1	0	100	6048	4032	0:08:54	1	0	100
315809	22 May-14 19:13:52	0:00:07	1	0.0	100	5344	5300	0:00:00	2	11.1	100	2596	3600	0:01:17	2	11.4	100	2328	2550	0:01:37	2	10.8	100	1272	2803	0:06:12	1	0	100	0	4032	0:08:50	1	0	100	6048	4032	0:08:50	1	0	100
315810	22 May-14 19:13:57	0:00:03	1	0.0	100	5288	5300	0:00:00	2	11.2	100	2592	3600	0:01:16	2	10.8	100	2316	2550	0:01:37	2	12.0	100	1344	2803	0:06:12	1	0	100	0	4032	0:08:45	1	0	100	6048	4032	0:08:45	1	0	100
315811	22 May-14 19:14:02	0:00:00	1	0.0	100	5233	5300	0:00:01	2	11.1	100	2587	3600	0:01:18	2	11.4	100	2328	2550	0:01:40	2	10.8	100	1392	2803	0:06:12	1	0	100	0	4032	0:08:42	1	0	100	6048	4032	0:08:42	1	0	100
315812	22 May-14 19:14:07	0:00:00	1	0.0	100	5177	5300	0:00:08	2	11.2	100	2595	3600	0:01:26	2	10.8	100	2328	2550	0:01:46	2	10.8	100	1440	2803	0:06:12	1	0	100	0	4032	0:08:44	1	0	100	6048	4032	0:08:44	1	0	100
315813	22 May-14 19:14:12	0:00:00	1	0.0	100	5122	5300	0:00:15	2	11.1	100	2590	3600	0:01:32	2	11.4	100	2316	2550	0:01:52	2	12.0	100	1512	2803	0:06:12	1	0	100	0	4032	0:08:47	1	0	100	6048	4032	0:08:47	1	0	100
315814	22 May-14 19:14:17	0:00:00	1	0.0	100	5066	5300	0:00:22	2	11.1	100	2586	3600	0:01:39	2	11.4	100	2328	2550	0:02:01	2	10.8	100	1560	2803	0:06:12	1	0	100	0	4032	0:08:49	1	0	100	6048	4032	0:08:49	1	0	100
315815	22 May-14 19:14:22	0:00:00	1	0.0	100	5011	5300	0:00:29	2	11.1	100	2581	3600	0:01:47	2	11.4	100	2340	2550	0:02:07	2	10.8	100	1608	2803	0:06:12	1	0	100	0	4032	0:08:51	1	0	100	6048	4032	0:08:51	1	0	100
315816	22 May-14 19:14:27	0:00:00	1	0.0	100	4955	5300	0:00:36	2	11.1	100	2589	3600	0:01:54	2	11.4	100	2316	2550	0:02:13	2	12.0	100	1680	2803	0:06:12	1	0	100	0	4032	0:08:54	1	0	100	6048	4032	0:08:54	1	0	100
315817	22 May-14 19:14:32	0:00:00	1	0.0	100	4900	5300	0:00:43	2	11.1	100	2596	3600	0:02:00	2	10.8	100	2316	2550	0:02:21	2	10.8	100	1728	2803	0:06:12	1	0	100	0	4032	0:08:56	1	0	100	6048	4032	0:08:56	1	0	100
315818	22 May-14 19:14:37	0:00:00	1	0.0	100	4844	5300	0:00:50	2	11.1	100	2592	3600	0:02:07	2	10.8	100	2328	2550	0:02:28	2	10.8	100	1776	2803	0:06:12	1	0	100	0	4032	0:08:59	1	0	100	6048	4032	0:08:59	1	0	100
315819	22 May-14 19:14:42	0:00:00	1	0.0	100	4789	5300	0:00:57	2	11.1	100	2587	3600	0:02:14	2	10.8	100	2316	2550	0:02:34	2	12.0	100	1848	2803	0:06:12	1	0	100	0	4032	0:09:01	1	0	100	6048	4032	0:09:01	1	0	100
315820	22 May-14 19:14:47	0:00:00	1	0.0	100	4733	5300	0:01:03	2	11.1	100	2595	3600	0:02:21	2	10.8	100	2316	2550	0:02:42	2	10.8	100	1896	2803	0:06:12	1	0	100	0	4032	0:09:03	1	0	100	6048	4032	0:09:03	1	0	100
315821	22 May-14 19:14:52	0:00:00	1	0.0	100	4678	5300	0:01:10	2	11.1	100	2590	3600	0:02:27	2	11.4	100	2328	2550	0:02:49	2	10.8	100	1944	2803	0:06:12	1	0	100	0	4032	0:09:06	1	0	100	6048	4032	0:09:06	1	0	100
315822	22 May-14 19:14:57	0:00:00	1	0.0	100	4622	5300	0:01:17	2	11.1	100	2586	3600	0:02:35	2	11.4	100	2316	2550	0:02:55	2	12.0	100	2016	2803	0:06:12	1	0	100	0	4032	0:09:08	1	0	100	6048	4032	0:09:08	1	0	100
315823	22 May-14 19:15:02	0:00:00	1	0.0	100	4567	5300	0:01:24	2	11.1	100	2593	3600	0:02:42	2	10.8	100	2316	2550	0:03:03	2	10.8	100	2064	2803	0:06:12	1	0	100	0	4032	0:09:10	1	0	100	6048	4032	0:09:10	1	0	100
315824	22 May-14 19:15:07	0:00:00	1	0.0	100	4511	5300	0:01:31	2	11.1	100	2589	3600	0:02:48	2	11.4	100	2328	2550	0:03:10	2	10.8	100	2112	2803	0:06:12	1	0	100	0	4032	0:09:13	1	0	100	6048	4032	0:09:13	1	0	100
315825	22 May-14 19:15:12	0:00:00	1	0.0	100	4456	5300	0:01:38	2	11.1	100	2596	3600	0:02:56	2	10.8	100	2304	2550	0:03:16	2	12.0	100	2184	2803	0:06:12	1	0	100	0	4032	0:09:15	1	0	100	6048	4032	0:09:15	1	0	100
315826	22 May-14 19:15:17	0:00:00	1	0.0	100	4400	5300	0:01:45	2	11.1	100	2592	3600	0:03:02	2	10.8	100	2316	2550	0:03:24	2	10.8	100	2232	2803	0:06:12	1	0	100	0	4032	0:09:18	1	0	100	6048	4032	0:09:18	1	0	100
315827	22 May-14 19:15:22	0:00:00	1	0.0	100	4345	5300	0:01:52	2	11.1	100	2587	3600	0:03:09	2	11.4	100	2328	2550	0:03:31	2	10.8	100	2280	2803	0:06:12	1	0	100	0	4032	0:09:20	1	0	100	6048	4032	0:09:20	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
315828	22 May-14 19:15:27	0:00:00	1	0.0	100	4289	5300	0:01:59	2	11.1	100	2595	3600	0:03:17	2	10.8	100	2304	2550	0:03:37	2	12.0	100	2352	2803	0:06:12	1	0	100	0	4032	0:09:22	1	0	100	6048	4032	0:09:22	1	0	100
315829	22 May-14 19:15:32	0:00:00	1	0.0	100	4233	5300	0:02:06	2	11.2	100	2603	3600	0:03:23	2	10.8	100	2304	2550	0:03:45	2	10.8	100	2400	2803	0:06:12	1	0	100	0	4032	0:09:25	1	0	100	6048	4032	0:09:25	1	0	100
315830	22 May-14 19:15:37	0:00:00	1	0.0	100	4178	5300	0:02:13	2	11.1	100	2598	3600	0:03:29	2	10.8	100	2316	2550	0:03:52	2	10.8	100	2448	2803	0:06:12	1	0	100	0	4032	0:09:27	1	0	100	6048	4032	0:09:27	1	0	100
315831	22 May-14 19:15:42	0:00:00	1	0.0	100	4122	5300	0:02:20	2	11.2	100	2594	3600	0:03:37	2	10.8	100	2304	2550	0:03:58	2	12.0	100	2520	2803	0:06:12	1	0	100	0	4032	0:09:30	1	0	100	6048	4032	0:09:30	1	0	100
315832	22 May-14 19:15:47	0:00:00	1	0.0	100	4067	5300	0:02:27	2	11.1	100	2601	3600	0:03:44	2	10.8	100	2304	2550	0:04:06	2	10.8	100	2568	2803	0:06:12	1	0	100	0	4032	0:09:32	1	0	100	6048	4032	0:09:32	1	0	100
315833	22 May-14 19:15:52	0:00:00	1	0.0	100	4011	5300	0:02:34	2	11.1	100	2597	3600	0:03:50	2	11.4	100	2316	2550	0:04:13	2	10.8	100	2616	2803	0:06:12	1	0	100	0	4032	0:09:34	1	0	100	6048	4032	0:09:34	1	0	100
315834	22 May-14 19:15:57	0:00:00	1	0.0	100	3956	5300	0:02:41	2	11.1	100	2604	3600	0:03:58	2	10.8	100	2292	2550	0:04:19	2	12.0	100	2688	2803	0:06:12	1	0	100	0	4032	0:09:37	1	0	100	6048	4032	0:09:37	1	0	100
315835	22 May-14 19:16:02	0:00:00	1	0.0	100	3898	5300	0:02:48	2	11.2	100	2614	3600	0:04:04	2	10.2	100	2292	2550	0:04:27	2	10.8	100	2736	2803	0:06:12	1	0	100	0	4032	0:09:39	1	0	100	6048	4032	0:09:39	1	0	100
315836	22 May-14 19:16:07	0:00:00	1	0.0	100	3843	5300	0:02:55	2	11.2	100	2609	3600	0:04:10	2	10.8	100	2304	2550	0:04:34	2	10.8	100	2784	2803	0:06:12	1	0	100	0	4032	0:09:42	1	0	100	6048	4032	0:09:42	1	0	100
315837	22 May-14 19:16:12	0:00:00	1	0.0	100	3787	5300	0:03:02	2	11.2	100	2605	3600	0:04:18	2	10.8	100	2292	2550	0:04:40	2	12.0	100	2856	2803	0:06:12	1	0	100	0	4032	0:09:44	1	0	100	6048	4032	0:09:44	1	0	100
315838	22 May-14 19:16:17	0:00:00	1	0.0	100	3732	5300	0:03:09	2	11.2	100	2612	3600	0:04:25	2	10.8	100	2292	2550	0:04:48	2	10.8	100	2904	2803	0:06:12	1	0	100	0	4032	0:09:51	1	0	100	6048	4032	0:09:51	1	0	100
315839	22 May-14 19:16:22	0:00:00	1	0.0	100	3672	5300	0:03:16	2	10.8	100	2600	3600	0:04:31	2	11.4	100	2292	2550	0:04:55	2	11.4	100	2976	2803	0:06:12	1	0	100	0	4032	0:09:57	1	0	100	6048	4032	0:09:57	1	0	100
315840	22 May-14 19:16:27	0:00:00	1	0.0	100	3612	5300	0:03:23	2	11.0	100	2612	3600	0:04:40	2	10.9	100	2292	2550	0:05:03	2	11.4	100	3024	2803	0:06:12	1	0	100	0	4032	0:10:06	1	0	100	6048	4032	0:10:06	1	0	100
315841	22 May-14 19:16:32	0:00:00	1	0.0	100	3557	5300	0:03:31	2	11.0	100	2571	3600	0:04:46	2	12.6	100	2340	2550	0:05:10	2	10.3	100	3072	2803	0:06:12	1	0	100	0	4032	0:10:12	1	0	100	6048	4032	0:10:12	1	0	100
315842	22 May-14 19:16:37	0:00:00	1	0.0	100	3501	5300	0:03:37	2	11.0	100	2591	3600	0:04:56	2	12.0	100	2304	2550	0:05:15	2	11.4	100	3144	2803	0:06:12	1	0	100	0	4032	0:10:18	1	0	100	6048	4032	0:10:18	1	0	100
315843	22 May-14 19:16:42	0:00:00	1	0.0	100	3446	5300	0:03:44	2	11.3	100	2610	3600	0:05:02	2	10.8	100	2292	2550	0:05:24	2	10.8	100	3192	2803	0:06:12	1	0	100	0	4032	0:10:27	1	0	100	6048	4032	0:10:27	1	0	100
315844	22 May-14 19:16:47	0:00:00	1	0.0	100	3390	5300	0:03:51	2	11.1	100	2606	3600	0:05:07	2	11.4	100	2280	2550	0:05:31	2	12.0	100	3264	2803	0:06:12	1	0	100	0	4032	0:10:33	1	0	100	6048	4032	0:10:33	1	0	100
315845	22 May-14 19:16:52	0:00:00	1	0.0	100	3334	5300	0:03:58	2	11.2	100	2590	3600	0:05:15	2	10.2	100	2304	2550	0:05:39	2	12.0	100	3312	2803	0:06:12	1	0	100	0	4032	0:10:42	1	0	100	6048	4032	0:10:42	1	0	100
315846	22 May-14 19:16:57	0:00:00	1	0.0	100	3279	5300	0:04:05	2	11.1	100	2597	3600	0:05:23	2	10.8	100	2304	2550	0:05:45	2	10.8	100	3360	2803	0:06:12	1	0	100	0	4032	0:10:48	1	0	100	6048	4032	0:10:48	1	0	100
315847	22 May-14 19:17:02	0:00:00	1	0.0	100	3223	5300	0:04:12	2	11.2	100	2605	3600	0:05:29	2	11.4	100	2280	2550	0:05:52	2	12.0	100	3432	2803	0:06:12	1	0	100	0	4032	0:10:54	1	0	100	6048	4032	0:10:54	1	0	100
315848	22 May-14 19:17:07	0:00:00	1	0.0	100	3168	5300	0:04:19	2	11.1	100	2600	3600	0:05:36	2	11.4	100	2292	2550	0:06:00	2	10.8	100	3480	2803	0:06:12	1	0	100	0	4032	0:11:03	1	0	100	6048	4032	0:11:03	1	0	100
315849	22 May-14 19:17:12	0:00:00	1	0.0	100	3112	5300	0:04:26	2	11.1	100	2596	3600	0:05:43	2	10.8	100	2304	2550	0:06:06	2	10.8	100	1512	2803	0:06:12	2	20	100	2016	4032	0:11:09	1	0	100	6048	4032	0:11:09	1	0	100
315850	22 May-14 19:17:17	0:00:00	1	0.0	100	3056	5300	0:04:33	2	11.2	100	2604	3600	0:05:50	2	10.8	100	2280	2550	0:06:12	2	12.0	100	1584	2803	0:07:58	1	0	100	2016	4032	0:10:30	1	0	100	6048	4032	0:10:30	1	0	100
315851	22 May-14 19:17:22	0:00:00	1	0.0	100	3001	5300	0:04:40	2	11.1	100	2611	3600	0:05:56	2	10.8	100	2280	2550	0:06:21	2	10.8	100	1632	2803	0:08:01	1	0	100	2016	4032	0:10:32	1	0	100	6048	4032	0:10:32	1	0	100
315852	22 May-14 19:17:27	0:00:00	1	0.0	100	2945	5300	0:04:47	2	11.2	100	2619	3600	0:06:03	2	10.2	100	2280	2550	0:06:27	2	10.8	100	1680	2803	0:08:04	1	0	100	2016	4032	0:10:35	1	0	100	6048	4032	0:10:35	1	0	100
315853	22 May-14 19:17:32	0:00:00	1	0.0	100	2890	5300	0:04:54	2	11.1	100	2614	3600	0:06:09	2	10.2	100	2268	2550	0:06:34	2	12.0	100	1752	2803	0:08:06	1	0	100	2016	4032	0:10:37	1	0	100	6048	4032	0:10:37	1	0	100
315854	22 May-14 19:17:37	0:00:00	1	0.0	100	2834	5300	0:05:01	2	11.1	100	2610	3600	0:06:16	2	10.8	100	2280	2550	0:06:42	2	10.8	100	1800	2803	0:08:08	1	0	100	2016	4032	0:10:40	1	0	100	6048	4032	0:10:40	1	0	100
315855	22 May-14 19:17:42	0:00:00	1	0.0	100	2779	5300	0:05:08	2	11.1	100	2617	3600	0:06:24	2	10.8	100	2280	2550	0:06:48	2	10.8	100	1848	2803	0:08:11	1	0	100	2016	4032	0:10:42	1	0	100	6048	4032	0:10:42	1	0	100
315856	22 May-14 19:17:47	0:00:00	1	0.0	100	2723	5300	0:05:15	2	11.1	100	2613	3600	0:06:30	2	11.4	100	2268	2550	0:06:55	2	12.0	100	1920	2803	0:08:13	1	0	100	2016	4032	0:10:44	1	0	100	6048	4032	0:10:44	1	0	100
315857	22 May-14 19:17:52	0:00:00	1	0.0	100	2668	5300	0:05:22	2	11.1	100	2608	3600	0:06:37	2	11.4	100	2280	2550	0:07:03	2	10.8	100	1968	2803	0:08:16	1	0	100	2016	4032	0:10:47	1	0	100	6048	4032	0:10:47	1	0	100
315858	22 May-14 19:17:57	0:00:00	1	0.0	100	2612	5300	0:05:29	2	11.1	100	2604	3600	0:06:45	2	11.4	100	2292	2550	0:07:09	2	10.8	100	2016	2803	0:08:18	1	0	100	2016	4032	0:10:49	1	0	100	6048	4032	0:10:49	1	0	100
315859	22 May-14 19:18:02	0:00:00	1	0.0	100	2556	5300	0:05:36	2	11.2	100	2612	3600	0:06:52	2	11.4	100	2268	2550	0:07:15	2	12.0	100	2088	2803	0:08:20	1	0	100	2016	4032	0:10:51	1	0	100	6048	4032	0:10:51	1	0	100
315860	22 May-14 19:18:07	0:00:00	1	0.0	100	2501	5300	0:05:43	2	11.1	100	2619	3600	0:06:58	2	10.8	100	2268	2550	0:07:24	2	10.8	100	2136	2803	0:08:23	1	0	100	2016	4032	0:10:54	1	0	100	6048	4032	0:10:54	1	0	100
315861	22 May-14 19:18:12	0:00:00	1	0.0	100	2449	5300	0:05:49	2	11.0	100	2611	3600	0:07:05	2	10.8	100	2280	2550	0:07:30	2	10.8	100	2184	2803	0:08:25	1	0	100	2016	4032	0:10:56	1	0	100	6048	4032	0:10:56	1	0	100
315862	22 May-14 19:18:17	0:00:00	1	0.0	100	2399	5300	0:05:56	2	10.7	100	2601	3600	0:07:12	2	10.8	100	2268	2550	0:07:36	2	12.0	100	2256	2803	0:08:27	1	0	100	2016	4032	0:10:59	1	0	100	6048	4032	0:10:59	1	0	100
315863	22 May-14 19:18:22	0:00:00	1	0.0	100	2348	5300	0:06:02	2	10.4	100	2604	3600	0:07:19	2	10.8	100	2268	2550	0:07:45	2	10.8	100	2304	2803	0:08:30	1	0	100	2016	4032	0:11:01	1	0	100	6048	4032	0:11:01	1	0	100
315864	22 May-14 19:18:27	0:00:00	1	0.0	100	2297	5300	0:06:09	2	10.2	100	2595	3600	0:07:25	2	11.4	100	2280	2550	0:07:51	2	10.8	100	2352	2803	0:08:32	1	0	100	2016	4032	0:11:03	1	0	100	6048	4032	0:11:03	1	0	100
315865	22 May-14 19:18:32	0:00:00	1	0.0	100	2247	5300	0:06:15	2	10.1	100	2585	3600	0:07:33	2	11.4	100	2268	2550	0:07:57	2	12.0	100	2424	2803	0:08:34	1	0	100	2016	4032	0:11:06	1	0	100	6048	4032	0:11:06	1	0	100
315866	22 May-14 19:18:37	0:00:00	1	0.0	100	2196	5300	0:06:21	2	10.2	100	2576	3600	0:07:40	2	11.4	100	2280	2550	0:08:06	2	10.8	100	2472	2803	0:08:37	1	0	100	2016	4032	0:11:08	1	0	100	6048	4032	0:11:08	1	0	100
315867	22 May-14 19:18:42	0:00:00	1	0.0	100	2146	5300	0:06:28	2	10.1	100	2578	3600	0:07:47	2	11.4	100	2280	2550	0:08:12	2	10.8	100	2520	2803	0:08:39	1	0	100	2016	4032	0:11:10	1	0	100	6048	4032	0:11:10	1	0	100
315868	22 May-14 19:18:47	0:00:00	1	0.0	100	2095	5300	0:06:34	2	10.1	100	2569	3600	0:07:54	2	11.4	100	2340	2550	0:08:18	1	0.0	100	2520	2803	0:08:41	1	0	100	2016	4032	0:11:13	1	0	100	6048	4032	0:11:13	1	0	100
315869	22 May-14 19:18:52	0:00:00	1	0.0	100	2044	5300	0:06:40	2	9.7	100	2572	3600	0:08:01	2	10.3	100	2388	2550	0:08:20	1	0.0	100	2520	2803	0:08:43	1	0	100	0	4032	0:11:14	2	24	100	6048	4032	0:11:14	1	0	100
315870	22 May-14 19:18:57	0:00:00	1	0.0	100	1994	5300	0:06:47	2	9.6	100	2562	3600	0:08:08	2	10.3	100	2448	2550	0:08:22	1	0.0	100	2520	2803	0:08:46	1	0	100	0	4032	0:13:48	1	0	100	6048	4032	0:13:48	1	0	100
315871	22 May-14 19:19:02	0:00:00	1	0.0	100	1943	5300	0:06:53	2	9.7	100	2553	3600	0:08:15	2	10.9	100	2508	2550	0:08:24	1	0.0	100	2520	2803	0:08:47	1	0	100	0	4032	0:13:50	1	0	100	6048	4032	0:13:50	1	0	100
315872	22 May-14 19:19:07	0:00:00	1	0.0	100	1893	5300	0:06:59	2	9.6	100	2555	3600	0:08:22	2	10.3	100	2556	2550	0:08:26	1	0.0	100	2520	2803	0:08:49	1	0	100	0	4032	0:13:52	1	0	100	6048	4032	0:13:52	1	0	100
315873	22 May-14 19:19:12	0:00:00	1	0.0	100	1842	5300	0:07:05	2	10.1	100	2558	3600	0:08:28	2	10.8	100	2604	2550	0:08:28	1	0.0	100	2520	2803	0:08:51	1	0	100	0	4032	0:13:54	1	0	100	6048	4032	0:13:54	1	0	100
315874	22 May-14 19:19:17	0:00:00	1	0.0	100	1792	5300	0:07:12	2	10.1	100	2572	3600	0:08:34	2	9.6	100	2640	2550	0:08:34	1	0.0	100	2520	2803	0:08:58	1	0	100	0	4032	0:14:00	1	0	100	6048	4032	0:14:00	1	0	100
315875	22 May-14 19:19:22	0:00:00	1	0.0	100	1741	5300	0:07:18	2	10.1	100	2587	3600	0:08:39	2	8.4	100	2676	2550	0:08:39	1	0.0	100	2520	2803	0:09:03	1	0	100	0	4032	0:14:05	1	0	100	6048	4032	0:14:05	1	0	100
315876	22 May-14 19:19:27	0:00:00	1	0.0	100	1691	5300	0:07:24	2	10.1	100	2637	3600	0:08:45	1	0.0	100	2676	2550	0:08:45	1	0.0	100	2520	2803	0:09:08	1	0	100	0	4032	0:14:10	1	0	100	6048	4032	0:14:10	1	0	100
315877	22 May-14 19:19:32	0:00:00	1	0.0	100	1640	5300	0:07:31	2	10.1	100	2688	3600	0:08:47	1	0.0	100	2676	2550	0:08:47	1	0.0	100	2520	2803	0:09:10	1	0	100	0	4032	0:14:13	1	0	100	6048	4032	0:14:13	1	0	100
315878	22 May-14 19:19:37	0:00:00	1	0.0	100	1590	5300	0:07:37	2	10.1	100	2738	3600	0:08:49	1	0.0	100	2676	2550	0:08:49	1	0.0	100	2520	2803	0:09:13	1	0	100	0	4032	0:14:15	1	0	100	6048	4032	0:14:15	1	0	100
315879	22 May-14 19:19:42	0:00:00	1	0.0	100	1539	5300	0:07:43	2	10.1	100	2789	3600	0:08:51	1	0.0	100	2676	2550	0:08:51	1	0.0	100	2520	2803	0:09:15	1	0	100	0	4032	0:14:17	1	0	100	6048	4032	0:14:17	1	0	100
315880	22 May-14 19:19:47	0:00:00	1	0.0	100	1489	5300	0:07:50	2	10.1	100	2839	3600	0:08:53	1	0.0	100	2676	2550	0:08:53	1	0.0	100	2520	2803	0:09:17	1	0	100	0	4032	0:14:19	1	0	100	6048	4032	0:14:19	1	0	100
315881	22 May-14 19:19:52	0:00:00	1	0.0	100	1438	5300	0:07:56	2	10.1	100	2890	3600	0:08:56	1	0.0	100	2676	2550	0:08:56	1	0.0	100	2520	2803	0:09:19	1	0	100	0	4032	0:14:22	1	0	100	6048	4032	0:14:22	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
315882	22 May-14 19:19:57	0:00:00	1	0.0	100	1388	5300	0:08:02	2	10.1	100	2940	3600	0:08:58	1	0.0	100	2676	2550	0:08:58	1	0.0	100	2520	2803	0:09:22	1	0	100	0	4032	0:14:24	1	0	100	6048	4032	0:14:24	1	0	100
315883	22 May-14 19:20:02	0:00:00	1	0.0	100	1337	5300	0:08:09	2	10.1	100	2991	3600	0:09:00	1	0.0	100	2652	2550	0:09:00	2	1.2	100	2544	2803	0:09:24	1	0	100	0	4032	0:14:26	1	0	100	6048	4032	0:14:26	1	0	100
315884	22 May-14 19:20:07	0:00:00	1	0.0	100	1287	5300	0:08:15	2	10.1	100	3041	3600	0:09:03	1	0.0	100	2604	2550	0:09:03	2	3.6	100	576	2803	0:09:24	2	20	100	2016	4032	0:14:27	1	0	100	6048	4032	0:14:27	1	0	100
315885	22 May-14 19:20:12	0:00:00	1	0.0	100	1236	5300	0:08:21	2	10.1	100	3080	3600	0:09:05	2	0.0	100	2568	2550	0:09:05	2	6.0	100	624	2803	0:12:10	1	0	100	2016	4032	0:14:42	1	0	100	6048	4032	0:14:42	1	0	100
315886	22 May-14 19:20:17	0:00:00	1	0.0	100	1185	5300	0:08:28	2	10.2	100	3131	3600	0:09:08	1	0.0	100	2496	2550	0:09:08	2	9.6	100	696	2803	0:12:10	1	0	100	2016	4032	0:14:41	1	0	100	6048	4032	0:14:41	1	0	100
315887	22 May-14 19:20:22	0:00:00	1	0.0	100	1135	5300	0:08:34	2	10.1	100	3181	3600	0:09:11	1	0.0	100	2424	2550	0:09:16	2	12.0	100	768	2803	0:12:11	1	0	100	2016	4032	0:14:42	1	0	100	6048	4032	0:14:42	1	0	100
315888	22 May-14 19:20:27	0:00:00	1	0.0	100	1084	5300	0:08:40	2	10.2	100	3184	3600	0:09:13	2	3.0	100	2400	2550	0:09:25	2	13.2	100	840	2803	0:12:13	1	0	100	2016	4032	0:14:45	1	0	100	6048	4032	0:14:45	1	0	100
315889	22 May-14 19:20:32	0:00:00	1	0.0	100	1034	5300	0:08:47	2	10.1	100	3186	3600	0:09:19	2	4.8	100	2400	2550	0:09:33	2	13.2	100	888	2803	0:12:16	1	0	100	2016	4032	0:14:47	1	0	100	6048	4032	0:14:47	1	0	100
315890	22 May-14 19:20:37	0:00:00	1	0.0	100	983	5300	0:08:53	2	10.1	100	3165	3600	0:09:25	2	8.4	100	2448	2550	0:09:39	2	10.8	100	912	2803	0:12:18	1	0	100	2016	4032	0:14:49	1	0	100	6048	4032	0:14:49	1	0	100
315891	22 May-14 19:20:42	0:00:00	1	0.0	100	932	5300	0:08:59	2	10.2	100	3180	3600	0:09:33	2	10.2	100	2412	2550	0:09:43	2	10.8	100	984	2803	0:12:19	1	0	100	2016	4032	0:14:50	1	0	100	6048	4032	0:14:50	1	0	100
315892	22 May-14 19:20:47	0:00:00	1	0.0	100	882	5300	0:09:06	2	10.1	100	3170	3600	0:09:39	2	10.8	100	2400	2550	0:09:51	2	10.8	100	1056	2803	0:12:21	1	0	100	2016	4032	0:14:52	1	0	100	6048	4032	0:14:52	1	0	100
315893	22 May-14 19:20:52	0:00:00	1	0.0	100	831	5300	0:09:12	2	10.2	100	3161	3600	0:09:46	2	11.4	100	2412	2550	0:09:59	2	10.8	100	1104	2803	0:12:23	1	0	100	2016	4032	0:14:54	1	0	100	6048	4032	0:14:54	1	0	100
315894	22 May-14 19:20:57	0:00:00	1	0.0	100	781	5300	0:09:18	2	10.1	100	3175	3600	0:09:53	2	9.6	100	2424	2550	0:10:05	2	10.8	100	1128	2803	0:12:25	1	0	100	2016	4032	0:14:56	1	0	100	6048	4032	0:14:56	1	0	100
315895	22 May-14 19:21:02	0:00:00	1	0.0	100	730	5300	0:09:24	2	10.1	100	3166	3600	0:09:58	2	10.8	100	2412	2550	0:10:09	2	10.8	100	1200	2803	0:12:27	1	0	100	2016	4032	0:14:58	1	0	100	6048	4032	0:14:58	1	0	100
315896	22 May-14 19:21:07	0:00:00	1	0.0	100	680	5300	0:09:31	2	10.1	100	3168	3600	0:10:05	2	10.2	100	2412	2550	0:10:18	2	9.6	100	1248	2803	0:12:29	1	0	100	2016	4032	0:15:01	1	0	100	6048	4032	0:15:01	1	0	100
315897	22 May-14 19:21:12	0:00:00	1	0.0	100	629	5300	0:09:37	2	10.1	100	3159	3600	0:10:11	2	10.2	100	2400	2550	0:10:24	2	10.8	100	1320	2803	0:12:32	1	0	100	2016	4032	0:15:03	1	0	100	6048	4032	0:15:03	1	0	100
315898	22 May-14 19:21:17	0:00:00	1	0.0	100	578	5300	0:09:43	2	10.2	100	3150	3600	0:10:18	2	11.4	100	2388	2550	0:10:32	2	13.2	100	1392	2803	0:12:34	1	0	100	2016	4032	0:15:05	1	0	100	6048	4032	0:15:05	1	0	100
315899	22 May-14 19:21:22	0:00:00	1	0.0	100	528	5300	0:09:50	2	10.1	100	3152	3600	0:10:25	2	10.8	100	2388	2550	0:10:40	2	12.0	100	1440	2803	0:12:36	1	0	100	2016	4032	0:15:07	1	0	100	6048	4032	0:15:07	1	0	100
315900	22 May-14 19:21:27	0:00:00	1	0.0	100	477	5300	0:09:56	2	10.2	100	3143	3600	0:10:31	2	11.4	100	2376	2550	0:10:46	2	13.2	100	1512	2803	0:12:38	1	0	100	2016	4032	0:15:09	1	0	100	6048	4032	0:15:09	1	0	100
315901	22 May-14 19:21:32	0:00:00	1	0.0	100	426	5300	0:10:02	2	10.2	100	3134	3600	0:10:38	2	11.4	100	2364	2550	0:10:54	2	13.2	100	1584	2803	0:12:40	1	0	100	2016	4032	0:15:12	1	0	100	6048	4032	0:15:12	1	0	100
315902	22 May-14 19:21:37	0:00:00	1	0.0	100	376	5300	0:10:09	2	10.1	100	3136	3600	0:10:45	2	10.8	100	2340	2550	0:11:02	2	13.2	100	1656	2803	0:12:43	1	0	100	2016	4032	0:15:14	1	0	100	6048	4032	0:15:14	1	0	100
315903	22 May-14 19:21:42	0:00:00	1	0.0	100	325	5300	0:10:15	2	10.2	100	3127	3600	0:10:52	2	11.4	100	2328	2550	0:11:11	2	14.4	100	1728	2803	0:12:45	1	0	100	2016	4032	0:15:16	1	0	100	6048	4032	0:15:16	1	0	100
315904	22 May-14 19:21:47	0:00:00	1	0.0	100	274	5300	0:10:21	2	10.2	100	3118	3600	0:10:59	2	11.4	100	2316	2550	0:11:19	2	14.4	100	1800	2803	0:12:47	1	0	100	0	4032	0:15:18	2	24	100	6048	4032	0:15:18	1	0	100
315905	22 May-14 19:21:52	0:00:00	1	0.0	100	224	5300	0:10:28	2	10.1	100	3108	3600	0:11:06	2	11.4	100	2328	2550	0:11:27	2	13.2	100	1848	2803	0:12:49	1	0	100	0	4032	0:17:52	1	0	100	6048	4032	0:17:52	1	0	100
315906	22 May-14 19:21:57	0:00:00	1	0.0	100	173	5300	0:10:34	2	10.2	100	3111	3600	0:11:13	2	11.4	100	2304	2550	0:11:33	2	13.2	100	1920	2803	0:12:51	1	0	100	0	4032	0:17:54	1	0	100	6048	4032	0:17:54	1	0	100
315907	22 May-14 19:22:02	0:00:00	1	0.0	100	122	5300	0:10:40	2	10.2	100	3102	3600	0:11:19	2	11.4	100	2316	2550	0:11:41	2	12.0	100	1968	2803	0:12:54	1	0	100	0	4032	0:17:56	1	0	100	6048	4032	0:17:56	1	0	100
315908	22 May-14 19:22:07	0:00:00	1	0.0	100	72	5300	0:10:47	2	10.1	100	3092	3600	0:11:26	2	11.4	100	2328	2550	0:11:47	2	10.8	100	2016	2803	0:12:56	1	0	100	0	4032	0:17:58	1	0	100	6048	4032	0:17:58	1	0	100
315909	22 May-14 19:22:12	0:00:00	1	0.0	100	21	5300	0:10:53	2	10.2	100	3095	3600	0:11:33	2	10.8	100	2304	2550	0:11:53	2	12.0	100	2088	2803	0:12:58	1	0	100	0	4032	0:18:00	1	0	100	6048	4032	0:18:00	1	0	100
315910	22 May-14 19:22:17	0:00:00	1	0.0	100	0	5300	0:10:59	2	10.1	100	3085	3600	0:11:39	2	11.4	100	2316	2550	0:12:02	2	10.8	100	2136	2803	0:13:00	1	0	100	0	4032	0:18:03	1	0	100	6048	4032	0:18:03	1	0	100
315911	22 May-14 19:22:22	0:00:00	1	0.0	100	0	5300	0:11:02	2	10.1	100	3076	3600	0:11:43	2	11.4	100	2328	2550	0:12:04	2	10.8	100	2184	2803	0:12:59	1	0	100	0	4032	0:18:01	1	0	100	6048	4032	0:18:01	1	0	100
315912	22 May-14 19:22:27	0:00:00	1	0.0	100	0	5300	0:11:02	2	10.1	100	3066	3600	0:11:43	2	11.4	100	2316	2550	0:12:03	2	12.0	100	2256	2803	0:12:54	1	0	100	0	4032	0:17:57	1	0	100	6048	4032	0:17:57	1	0	100
315913	22 May-14 19:22:32	0:00:00	1	0.0	100	0	5300	0:11:02	2	10.1	100	3069	3600	0:11:44	2	11.4	100	2316	2550	0:12:05	2	10.8	100	2304	2803	0:12:50	1	0	100	0	4032	0:17:53	1	0	100	6048	4032	0:17:53	1	0	100
315914	22 May-14 19:22:37	0:00:00	1	0.0	100	0	5300	0:11:02	2	9.7	100	3051	3600	0:11:44	2	11.4	100	2328	2550	0:12:05	2	10.8	100	2352	2803	0:12:46	1	0	100	0	4032	0:17:49	1	0	100	6048	4032	0:17:49	1	0	100
315915	22 May-14 19:22:42	0:00:00	1	0.0	100	0	5300	0:11:02	2	9.2	100	3044	3600	0:11:45	2	10.8	100	2304	2550	0:12:06	2	12.0	100	2424	2803	0:12:43	1	0	100	0	4032	0:17:45	1	0	100	6048	4032	0:17:45	1	0	100
315916	22 May-14 19:22:47	0:00:00	1	0.0	100	0	5300	0:11:02	2	8.7	100	3024	3600	0:11:46	2	10.8	100	2316	2550	0:12:09	2	10.8	100	2472	2803	0:12:40	1	0	100	0	4032	0:17:42	1	0	100	6048	4032	0:17:42	1	0	100
315917	22 May-14 19:22:52	0:00:00	1	0.0	100	0	5300	0:11:02	2	8.2	100	3004	3600	0:11:48	2	11.4	100	2328	2550	0:12:09	2	10.8	100	2520	2803	0:12:37	1	0	100	0	4032	0:17:39	1	0	100	6048	4032	0:17:39	1	0	100
315918	22 May-14 19:22:57	0:00:00	1	0.0	100	0	5300	0:11:02	2	7.3	100	2980	3600	0:11:50	2	10.8	100	2304	2550	0:12:10	2	12.0	100	2592	2803	0:12:33	1	0	100	0	4032	0:17:36	1	0	100	6048	4032	0:17:36	1	0	100
315919	22 May-14 19:23:02	0:00:00	1	0.0	100	0	5300	0:11:02	2	5.6	100	2928	3600	0:11:53	2	11.4	100	2316	2550	0:12:15	2	10.8	100	2640	2803	0:12:32	1	0	100	0	4032	0:17:35	1	0	100	6048	4032	0:17:35	1	0	100
315920	22 May-14 19:23:07	0:00:00	1	0.0	100	0	5300	0:11:02	2	3.9	100	2874	3600	0:11:58	2	11.4	100	2304	2550	0:12:19	2	12.0	100	2712	2803	0:12:33	1	0	100	0	4032	0:17:35	1	0	100	6048	4032	0:17:35	1	0	100
315921	22 May-14 19:23:12	0:00:00	1	0.0	100	0	5300	0:11:02	2	2.2	100	2831	3600	0:12:04	2	10.8	100	2304	2550	0:12:27	2	12.0	100	2760	2803	0:12:34	1	0	100	0	4032	0:17:36	1	0	100	6048	4032	0:17:36	1	0	100
315922	22 May-14 19:23:17	0:00:00	1	0.0	100	0	5300	0:11:02	2	1.3	100	2777	3600	0:12:10	2	11.4	100	2316	2550	0:12:32	2	10.8	100	2808	2803	0:12:36	1	0	100	0	4032	0:17:38	1	0	100	6048	4032	0:17:38	1	0	100
315923	22 May-14 19:23:22	0:00:00	1	0.0	100	0	5300	0:11:02	2	1.1	100	2722	3600	0:12:16	2	11.4	100	2328	2550	0:12:38	2	10.8	100	2856	2803	0:12:38	1	0	100	0	4032	0:17:40	1	0	100	6048	4032	0:17:40	1	0	100
315924	22 May-14 19:23:27	0:00:00	1	0.0	100	0	5300	0:11:02	2	1.1	100	2680	3600	0:12:23	2	10.8	100	2304	2550	0:12:44	2	10.8	100	2928	2803	0:12:44	1	0	100	0	4032	0:17:46	1	0	100	6048	4032	0:17:46	1	0	100
315925	22 May-14 19:23:32	0:00:00	1	0.0	100	0	5300	0:11:02	2	1.0	100	2623	3600	0:12:29	2	11.4	100	2316	2550	0:12:52	2	10.8	100	2976	2803	0:12:52	1	0	100	0	4032	0:17:54	1	0	100	6048	4032	0:17:54	1	0	100
315926	22 May-14 19:23:37	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	2563	3600	0:12:37	2	11.4	100	2352	2550	0:12:58	2	9.6	100	3000	2803	0:12:58	1	0	100	0	4032	0:18:01	1	0	100	6048	4032	0:18:01	1	0	100
315927	22 May-14 19:23:42	0:00:00	1	0.0	100	0	5300	0:11:02	2	0.0	100	2519	3600	0:12:45	2	10.8	100	2352	2550	0:13:04	2	9.6	100	3048	2803	0:13:04	1	0	100	0	4032	0:18:06	1	0	100	6048	4032	0:18:06	1	0	100
315928	22 May-14 19:23:47	0:00:00	1	0.0	100	0	5300	0:11:02	2	0.0	100	2463	3600	0:12:53	2	11.4	100	2340	2550	0:13:11	2	9.6	100	3120	2803	0:13:11	1	0	100	0	4032	0:18:13	1	0	100	6048	4032	0:18:13	1	0	100
315929	22 May-14 19:23:52	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	2403	3600	0:13:00	2	11.4	100	2352	2550	0:13:19	2	9.6	100	3168	2803	0:13:19	1	0	100	0	4032	0:18:21	1	0	100	6048	4032	0:18:21	1	0	100
315930	22 May-14 19:23:57	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	2355	3600	0:13:07	2	10.8	100	2352	2550	0:13:25	2	10.8	100	3216	2803	0:13:25	1	0	100	0	4032	0:18:27	1	0	100	6048	4032	0:18:27	1	0	100
315931	22 May-14 19:24:02	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	2295	3600	0:13:12	2	11.4	100	2340	2550	0:13:30	2	12.0	100	3288	2803	0:13:30	1	0	100	0	4032	0:18:33	1	0	100	6048	4032	0:18:33	1	0	100
315932	22 May-14 19:24:07	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	2235	3600	0:13:19	2	11.4	100	2352	2550	0:13:38	2	10.8	100	3336	2803	0:13:38	1	0	100	0	4032	0:18:41	1	0	100	6048	4032	0:18:41	1	0	100
315933	22 May-14 19:24:12	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	2187	3600	0:13:26	2	10.8	100	2352	2550	0:13:44	2	10.8	100	3384	2803	0:13:44	1	0	100	0	4032	0:18:46	1	0	100	6048	4032	0:18:46	1	0	100
315934	22 May-14 19:24:17	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	2127	3600	0:13:32	2	11.4	100	2340	2550	0:13:50	2	12.0	100	3456	2803	0:13:50	1	0	100	0	4032	0:18:52	1	0	100	6048	4032	0:18:52	1	0	100
315935	22 May-14 19:24:22	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	2067	3600	0:13:39	2	11.4	100	2352	2550	0:13:58	2	10.8	100	1488	2803	0:13:58	2	20	100	2016	4032	0:19:00	1	0	100	6048	4032	0:19:00	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
315936	22 May-14 19:24:27	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	2019	3600	0:13:45	2	10.8	100	2352	2550	0:14:03	2	10.8	100	1536	2803	0:15:52	1	0	100	2016	4032	0:18:23	1	0	100	6048	4032	0:18:23	1	0	100
315937	22 May-14 19:24:32	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	1947	3600	0:13:50	2	12.0	100	2352	2550	0:14:08	2	12.0	100	1608	2803	0:15:53	1	0	100	2016	4032	0:18:24	1	0	100	6048	4032	0:18:24	1	0	100
315938	22 May-14 19:24:37	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	1899	3600	0:13:59	2	11.4	100	2352	2550	0:14:17	2	10.8	100	1656	2803	0:15:55	1	0	100	2016	4032	0:18:26	1	0	100	6048	4032	0:18:26	1	0	100
315939	22 May-14 19:24:42	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	1839	3600	0:14:04	2	11.4	100	2364	2550	0:14:22	2	10.8	100	1704	2803	0:15:57	1	0	100	2016	4032	0:18:28	1	0	100	6048	4032	0:18:28	1	0	100
315940	22 May-14 19:24:47	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	1791	3600	0:14:11	2	11.4	100	2340	2550	0:14:28	2	12.0	100	1776	2803	0:15:58	1	0	100	2016	4032	0:18:29	1	0	100	6048	4032	0:18:29	1	0	100
315941	22 May-14 19:24:52	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	1731	3600	0:14:16	2	10.8	100	2352	2550	0:14:35	2	10.8	100	1824	2803	0:15:59	1	0	100	2016	4032	0:18:31	1	0	100	6048	4032	0:18:31	1	0	100
315942	22 May-14 19:24:57	0:00:00	1	0.0	100	0	5300	0:11:02	1	0.0	100	1671	3600	0:14:22	2	11.4	100	2364	2550	0:14:40	2	10.8	100	1872	2803	0:16:01	1	0	100	2016	4032	0:18:32	1	0	100	6048	4032	0:18:32	1	0	100
315943	22 May-14 19:25:02	0:00:00	2	0.0	100	11	5300	0:11:02	1	0.0	100	1623	3600	0:14:29	2	10.8	100	2340	2550	0:14:46	2	12.0	100	1944	2803	0:16:02	1	0	100	2016	4032	0:18:33	1	0	100	6048	4032	0:18:33	1	0	100
315944	22 May-14 19:25:07	0:00:00	1	0.0	100	11	5300	0:10:55	1	0.0	100	1563	3600	0:14:26	2	11.4	100	2352	2550	0:14:46	2	10.8	100	1992	2803	0:15:56	1	0	100	2016	4032	0:18:27	1	0	100	6048	4032	0:18:27	1	0	100
315945	22 May-14 19:25:12	0:00:00	2	0.0	100	13	5300	0:10:55	1	0.0	100	1515	3600	0:14:33	2	10.8	100	2352	2550	0:14:51	2	10.8	100	2040	2803	0:15:58	1	0	100	2016	4032	0:18:29	1	0	100	6048	4032	0:18:29	1	0	100
315946	22 May-14 19:25:17	0:00:00	2	1.5	100	29	5300	0:10:53	1	0.0	100	1455	3600	0:14:37	2	10.8	100	2340	2550	0:14:55	2	12.0	100	2112	2803	0:15:58	1	0	100	2016	4032	0:18:29	1	0	100	6048	4032	0:18:29	1	0	100
315947	22 May-14 19:25:22	0:00:00	2	1.0	100	31	5300	0:10:43	1	0.0	100	1395	3600	0:14:33	2	11.4	100	2352	2550	0:14:52	2	10.8	100	2160	2803	0:15:49	1	0	100	2016	4032	0:18:20	1	0	100	6048	4032	0:18:20	1	0	100
315948	22 May-14 19:25:27	0:00:00	2	1.6	100	43	5300	0:10:42	1	0.0	100	1335	3600	0:14:38	2	11.4	100	2364	2550	0:14:56	2	10.8	100	2208	2803	0:15:49	1	0	100	2016	4032	0:18:20	1	0	100	6048	4032	0:18:20	1	0	100
315949	22 May-14 19:25:32	0:00:00	2	1.7	100	46	5300	0:10:34	1	0.0	100	1275	3600	0:14:37	2	12.0	100	2352	2550	0:14:54	2	12.0	100	2280	2803	0:15:42	1	0	100	2016	4032	0:18:14	1	0	100	6048	4032	0:18:14	1	0	100
315950	22 May-14 19:25:37	0:00:00	1	0.0	100	46	5300	0:10:32	1	0.0	100	1239	3600	0:14:41	2	10.8	100	2340	2550	0:14:59	2	10.8	100	2328	2803	0:15:42	1	0	100	2016	4032	0:18:13	1	0	100	6048	4032	0:18:13	1	0	100
315951	22 May-14 19:25:42	0:00:00	1	0.0	100	46	5300	0:10:32	1	0.0	100	1203	3600	0:14:45	2	9.6	100	2328	2550	0:15:04	2	10.8	100	2376	2803	0:15:43	1	0	100	2016	4032	0:18:14	1	0	100	6048	4032	0:18:14	1	0	100
315952	22 May-14 19:25:47	0:00:00	1	0.0	100	46	5300	0:10:32	1	0.0	100	1155	3600	0:14:49	2	9.0	100	2304	2550	0:15:09	2	12.0	100	2448	2803	0:15:44	1	0	100	2016	4032	0:18:15	1	0	100	6048	4032	0:18:15	1	0	100
315953	22 May-14 19:25:52	0:00:00	1	0.0	100	46	5300	0:10:32	1	0.0	100	1119	3600	0:14:54	2	7.8	100	2292	2550	0:15:16	2	10.8	100	2496	2803	0:15:46	1	0	100	2016	4032	0:18:17	1	0	100	6048	4032	0:18:17	1	0	100
315954	22 May-14 19:25:57	0:00:00	1	0.0	100	46	5300	0:10:38	1	0.0	100	1083	3600	0:15:03	2	7.4	100	2280	2550	0:15:27	2	10.3	100	2544	2803	0:15:52	1	0	100	2016	4032	0:18:23	1	0	100	6048	4032	0:18:23	1	0	100
315955	22 May-14 19:26:02	0:00:00	1	0.0	100	46	5300	0:10:38	1	0.0	100	1035	3600	0:15:08	2	8.0	100	2256	2550	0:15:32	2	11.4	100	2616	2803	0:15:54	1	0	100	2016	4032	0:18:25	1	0	100	6048	4032	0:18:25	1	0	100
315956	22 May-14 19:26:07	0:00:00	1	0.0	100	46	5300	0:10:39	1	0.0	100	987	3600	0:15:14	2	8.0	100	2256	2550	0:15:41	2	10.3	100	2664	2803	0:15:56	1	0	100	2016	4032	0:18:27	1	0	100	6048	4032	0:18:27	1	0	100
315957	22 May-14 19:26:12	0:00:00	1	0.0	100	46	5300	0:10:47	1	0.0	100	951	3600	0:15:27	2	8.0	100	2244	2550	0:15:54	2	10.3	100	2712	2803	0:16:06	1	0	100	2016	4032	0:18:37	1	0	100	6048	4032	0:18:37	1	0	100
315958	22 May-14 19:26:17	0:00:00	1	0.0	100	46	5300	0:10:48	1	0.0	100	915	3600	0:15:32	2	8.4	100	2208	2550	0:16:00	2	12.0	100	2784	2803	0:16:08	1	0	100	2016	4032	0:18:39	1	0	100	6048	4032	0:18:39	1	0	100
315959	22 May-14 19:26:22	0:00:00	1	0.0	100	46	5300	0:10:55	1	0.0	100	867	3600	0:15:42	2	8.4	100	2208	2550	0:16:14	2	10.8	100	2832	2803	0:16:15	1	0	100	2016	4032	0:18:46	1	0	100	6048	4032	0:18:46	1	0	100
315960	22 May-14 19:26:27	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	831	3600	0:15:49	2	7.8	100	2196	2550	0:16:20	2	10.8	100	2880	2803	0:16:20	1	0	100	2016	4032	0:18:52	1	0	100	6048	4032	0:18:52	1	0	100
315961	22 May-14 19:26:32	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	795	3600	0:15:53	2	7.8	100	2160	2550	0:16:25	2	12.0	100	2952	2803	0:16:25	1	0	100	2016	4032	0:18:57	1	0	100	6048	4032	0:18:57	1	0	100
315962	22 May-14 19:26:37	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	759	3600	0:15:57	2	7.8	100	2148	2550	0:16:33	2	10.8	100	3000	2803	0:16:33	1	0	100	2016	4032	0:19:04	1	0	100	6048	4032	0:19:04	1	0	100
315963	22 May-14 19:26:42	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	735	3600	0:16:01	2	6.6	100	2124	2550	0:16:38	2	10.8	100	3048	2803	0:16:38	1	0	100	2016	4032	0:19:09	1	0	100	6048	4032	0:19:09	1	0	100
315964	22 May-14 19:26:47	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:03	2	6.0	100	2076	2550	0:16:42	2	12.0	100	3120	2803	0:16:42	1	0	100	2016	4032	0:19:14	1	0	100	6048	4032	0:19:14	1	0	100
315965	22 May-14 19:26:52	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	2028	2550	0:16:49	2	10.8	100	3168	2803	0:16:49	1	0	100	2016	4032	0:19:21	1	0	100	6048	4032	0:19:21	1	0	100
315966	22 May-14 19:26:57	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1956	2550	0:16:54	2	12.0	100	3240	2803	0:16:54	1	0	100	2016	4032	0:19:25	1	0	100	6048	4032	0:19:25	1	0	100
315967	22 May-14 19:27:02	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1908	2550	0:17:01	2	12.0	100	3288	2803	0:17:01	1	0	100	2016	4032	0:19:32	1	0	100	6048	4032	0:19:32	1	0	100
315968	22 May-14 19:27:07	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1860	2550	0:17:05	2	10.8	100	3336	2803	0:17:05	1	0	100	2016	4032	0:19:36	1	0	100	6048	4032	0:19:36	1	0	100
315969	22 May-14 19:27:12	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1812	2550	0:17:10	2	10.8	100	3384	2803	0:17:10	1	0	100	2016	4032	0:19:41	1	0	100	6048	4032	0:19:41	1	0	100
315970	22 May-14 19:27:17	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1740	2550	0:17:14	2	10.8	100	3456	2803	0:17:14	1	0	100	2016	4032	0:19:46	1	0	100	6048	4032	0:19:46	1	0	100
315971	22 May-14 19:27:22	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1692	2550	0:17:21	2	10.8	100	1488	2803	0:17:21	2	20	100	4032	4032	0:19:52	1	0	100	6048	4032	0:19:52	1	0	100
315972	22 May-14 19:27:27	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1620	2550	0:17:26	2	12.0	100	1560	2803	0:19:14	1	0	100	4032	4032	0:19:14	1	0	100	6048	4032	0:19:14	1	0	100
315973	22 May-14 19:27:32	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1596	2550	0:17:33	2	10.8	100	1584	2803	0:19:15	1	0	100	4032	4032	0:19:15	1	0	100	6048	4032	0:19:15	1	0	100
315974	22 May-14 19:27:37	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1596	2550	0:17:35	1	0.0	100	1584	2803	0:19:15	1	0	100	4032	4032	0:19:15	1	0	100	6048	4032	0:19:15	1	0	100
315975	22 May-14 19:27:42	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1596	2550	0:17:35	1	0.0	100	1584	2803	0:19:16	1	0	100	4032	4032	0:19:16	1	0	100	6048	4032	0:19:16	1	0	100
315976	22 May-14 19:27:47	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1596	2550	0:17:35	1	0.0	100	1584	2803	0:19:16	1	0	100	4032	4032	0:19:16	1	0	100	6048	4032	0:19:16	1	0	100
315977	22 May-14 19:27:52	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1548	2550	0:17:35	2	2.4	100	1632	2803	0:19:16	1	0	100	4032	4032	0:19:16	1	0	100	6048	4032	0:19:16	1	0	100
315978	22 May-14 19:27:57	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1476	2550	0:17:40	2	6.0	100	1704	2803	0:19:17	1	0	100	4032	4032	0:19:17	1	0	100	6048	4032	0:19:17	1	0	100
315979	22 May-14 19:28:02	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1476	2550	0:17:46	1	0.0	100	1704	2803	0:19:17	1	0	100	4032	4032	0:19:17	1	0	100	6048	4032	0:19:17	1	0	100
315980	22 May-14 19:28:07	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1476	2550	0:17:46	1	0.0	100	1704	2803	0:19:17	1	0	100	4032	4032	0:19:17	1	0	100	6048	4032	0:19:17	1	0	100
315981	22 May-14 19:28:12	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1428	2550	0:17:46	2	6.0	100	1752	2803	0:19:18	1	0	100	4032	4032	0:19:18	1	0	100	6048	4032	0:19:18	1	0	100
315982	22 May-14 19:28:17	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1356	2550	0:17:51	2	6.0	100	1824	2803	0:19:18	1	0	100	4032	4032	0:19:18	1	0	100	6048	4032	0:19:18	1	0	100
315983	22 May-14 19:28:22	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1308	2550	0:17:58	2	8.4	100	1872	2803	0:19:19	1	0	100	4032	4032	0:19:19	1	0	100	6048	4032	0:19:19	1	0	100
315984	22 May-14 19:28:27	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1308	2550	0:18:02	1	0.0	100	1872	2803	0:19:19	1	0	100	4032	4032	0:19:19	1	0	100	6048	4032	0:19:19	1	0	100
315985	22 May-14 19:28:32	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1284	2550	0:18:02	2	7.2	100	1896	2803	0:19:19	1	0	100	4032	4032	0:19:19	1	0	100	6048	4032	0:19:19	1	0	100
315986	22 May-14 19:28:37	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1236	2550	0:18:04	2	6.0	100	1944	2803	0:19:20	1	0	100	4032	4032	0:19:20	1	0	100	6048	4032	0:19:20	1	0	100
315987	22 May-14 19:28:42	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1164	2550	0:18:09	2	7.2	100	2016	2803	0:19:20	1	0	100	4032	4032	0:19:20	1	0	100	6048	4032	0:19:20	1	0	100
315988	22 May-14 19:28:47	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1116	2550	0:18:16	2	9.6	100	2064	2803	0:19:21	1	0	100	4032	4032	0:19:21	1	0	100	6048	4032	0:19:21	1	0	100
315989	22 May-14 19:28:52	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	1068	2550	0:18:20	2	10.8	100	2112	2803	0:19:21	1	0	100	4032	4032	0:19:21	1	0	100	6048	4032	0:19:21	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
315990	22 May-14 19:28:57	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	996	2550	0:18:25	2	12.0	100	2184	2803	0:19:22	1	0	100	4032	4032	0:19:22	1	0	100	6048	4032	0:19:22	1	0	100
315991	22 May-14 19:29:02	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	948	2550	0:18:31	2	10.8	100	2232	2803	0:19:22	1	0	100	4032	4032	0:19:22	1	0	100	6048	4032	0:19:22	1	0	100
315992	22 May-14 19:29:07	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	900	2550	0:18:36	2	10.8	100	2280	2803	0:19:23	1	0	100	4032	4032	0:19:23	1	0	100	6048	4032	0:19:23	1	0	100
315993	22 May-14 19:29:12	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	828	2550	0:18:40	2	12.0	100	2352	2803	0:19:24	1	0	100	4032	4032	0:19:24	1	0	100	6048	4032	0:19:24	1	0	100
315994	22 May-14 19:29:17	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	780	2550	0:18:47	2	10.8	100	2400	2803	0:19:24	1	0	100	4032	4032	0:19:24	1	0	100	6048	4032	0:19:24	1	0	100
315995	22 May-14 19:29:22	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	732	2550	0:18:52	2	10.8	100	2448	2803	0:19:25	1	0	100	4032	4032	0:19:25	1	0	100	6048	4032	0:19:25	1	0	100
315996	22 May-14 19:29:27	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	660	2550	0:18:56	2	12.0	100	2520	2803	0:19:25	1	0	100	4032	4032	0:19:25	1	0	100	6048	4032	0:19:25	1	0	100
315997	22 May-14 19:29:32	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	612	2550	0:19:03	2	10.8	100	2568	2803	0:19:26	1	0	100	4032	4032	0:19:26	1	0	100	6048	4032	0:19:26	1	0	100
315998	22 May-14 19:29:37	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	564	2550	0:19:07	2	10.8	100	2616	2803	0:19:27	1	0	100	4032	4032	0:19:27	1	0	100	6048	4032	0:19:27	1	0	100
315999	22 May-14 19:29:42	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	492	2550	0:19:12	2	12.0	100	2688	2803	0:19:27	1	0	100	4032	4032	0:19:27	1	0	100	6048	4032	0:19:27	1	0	100
316000	22 May-14 19:29:47	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	444	2550	0:19:19	2	10.8	100	2736	2803	0:19:28	1	0	100	4032	4032	0:19:28	1	0	100	6048	4032	0:19:28	1	0	100
316001	22 May-14 19:29:52	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	396	2550	0:19:23	2	10.8	100	2784	2803	0:19:29	1	0	100	4032	4032	0:19:29	1	0	100	6048	4032	0:19:29	1	0	100
316002	22 May-14 19:29:57	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	324	2550	0:19:28	2	12.0	100	2856	2803	0:19:29	1	0	100	4032	4032	0:19:29	1	0	100	6048	4032	0:19:29	1	0	100
316003	22 May-14 19:30:02	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	276	2550	0:19:34	2	10.8	100	2904	2803	0:19:34	1	0	100	4032	4032	0:19:34	1	0	100	6048	4032	0:19:34	1	0	100
316004	22 May-14 19:30:07	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	228	2550	0:19:39	2	10.8	100	2952	2803	0:19:39	1	0	100	4032	4032	0:19:39	1	0	100	6048	4032	0:19:39	1	0	100
316005	22 May-14 19:30:12	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	156	2550	0:19:43	2	12.0	100	3024	2803	0:19:43	1	0	100	4032	4032	0:19:43	1	0	100	6048	4032	0:19:43	1	0	100
316006	22 May-14 19:30:17	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	156	2550	0:19:50	1	0.0	100	3024	2803	0:19:50	1	0	100	4032	4032	0:19:50	1	0	100	6048	4032	0:19:50	1	0	100
316007	22 May-14 19:30:22	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	156	2550	0:19:50	1	0.0	100	3024	2803	0:19:50	1	0	100	4032	4032	0:19:50	1	0	100	6048	4032	0:19:50	1	0	100
316008	22 May-14 19:30:27	0:00:00	1	0.0	100	46	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	156	2550	0:19:50	1	0.0	100	3024	2803	0:19:50	1	0	100	4032	4032	0:19:50	1	0	100	6048	4032	0:19:50	1	0	100
316009	22 May-14 19:30:32	0:00:00	2	0.0	100	49	5300	0:10:56	1	0.0	100	711	3600	0:16:06	1	0.0	100	156	2550	0:19:50	1	0.0	100	3024	2803	0:19:50	1	0	100	4032	4032	0:19:50	1	0	100	6048	4032	0:19:50	1	0	100
316010	22 May-14 19:30:37	0:00:00	2	0.0	100	63	5300	0:10:54	1	0.0	100	711	3600	0:16:04	1	0.0	100	156	2550	0:19:48	1	0.0	100	3024	2803	0:19:48	1	0	100	4032	4032	0:19:48	1	0	100	6048	4032	0:19:48	1	0	100
316011	22 May-14 19:30:42	0:00:00	1	0.0	100	63	5300	0:10:45	1	0.0	100	711	3600	0:15:55	1	0.0	100	156	2550	0:19:39	1	0.0	100	3024	2803	0:19:39	1	0	100	4032	4032	0:19:39	1	0	100	6048	4032	0:19:39	1	0	100
316012	22 May-14 19:30:47	0:00:00	1	0.0	100	63	5300	0:10:45	1	0.0	100	711	3600	0:15:55	1	0.0	100	156	2550	0:19:39	1	0.0	100	3024	2803	0:19:39	1	0	100	4032	4032	0:19:39	1	0	100	6048	4032	0:19:39	1	0	100
316013	22 May-14 19:30:52	0:00:00	1	0.0	100	63	5300	0:10:45	1	0.0	100	711	3600	0:15:55	1	0.0	100	156	2550	0:19:39	1	0.0	100	1008	2803	0:19:39	2	20	100	6048	4032	0:19:39	1	0	100	6048	4032	0:19:39	1	0	100
316014	22 May-14 19:30:57	0:00:00	1	0.0	100	63	5300	0:10:45	1	0.0	100	711	3600	0:15:55	1	0.0	100	156	2550	0:19:39	1	0.0	100	1008	2803	0:22:08	1	0	100	6048	4032	0:22:08	1	0	100	6048	4032	0:22:08	1	0	100
316015	22 May-14 19:31:02	0:00:00	1	0.0	100	63	5300	0:10:45	1	0.0	100	711	3600	0:15:55	1	0.0	100	156	2550	0:19:39	1	0.0	100	1008	2803	0:22:08	1	0	100	6048	4032	0:22:08	1	0	100	6048	4032	0:22:08	1	0	100
316016	22 May-14 19:31:07	0:00:00	1	0.0	100	63	5300	0:10:45	1	0.0	100	711	3600	0:15:55	1	0.0	100	156	2550	0:19:39	1	0.0	100	1008	2803	0:22:09	1	0	100	6048	4032	0:22:09	1	0	100	6048	4032	0:22:09	1	0	100
316017	22 May-14 19:31:12	0:00:00	1	0.0	100	63	5300	0:10:45	1	0.0	100	711	3600	0:15:55	1	0.0	100	156	2550	0:19:39	1	0.0	100	1008	2803	0:22:09	1	0	100	6048	4032	0:22:09	1	0	100	6048	4032	0:22:09	1	0	100
316018	22 May-14 19:31:17	0:00:00	1	0.0	100	63	5300	0:10:45	1	0.0	100	711	3600	0:15:55	1	0.0	100	156	2550	0:19:39	1	0.0	100	1008	2803	0:22:09	1	0	100	6048	4032	0:22:09	1	0	100	6048	4032	0:22:09	1	0	100
316019	22 May-14 19:31:22	0:00:00	1	0.0	100	63	5300	0:10:45	1	0.0	100	711	3600	0:15:55	1	0.0	100	156	2550	0:19:39	1	0.0	100	1008	2803	0:22:09	1	0	100	6048	4032	0:22:09	1	0	100	6048	4032	0:22:09	1	0	100
316020	22 May-14 19:31:27	0:00:00	1	0.0	100	63	5300	0:10:47	1	0.0	100	711	3600	0:15:56	1	0.0	100	156	2550	0:19:41	1	0.0	100	1008	2803	0:22:10	1	0	100	6048	4032	0:22:10	1	0	100	6048	4032	0:22:10	1	0	100
316021	22 May-14 19:31:32	0:00:00	1	0.0	100	63	5300	0:10:54	1	0.0	100	711	3600	0:16:04	1	0.0	100	156	2550	0:19:48	1	0.0	100	1008	2803	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100
316022	22 May-14 19:31:37	0:00:00	1	0.0	100	63	5300	0:10:54	1	0.0	100	711	3600	0:16:04	1	0.0	100	156	2550	0:19:48	1	0.0	100	1008	2803	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100
316023	22 May-14 19:31:42	0:00:00	1	0.0	100	63	5300	0:10:54	1	0.0	100	711	3600	0:16:04	1	0.0	100	156	2550	0:19:48	1	0.0	100	1008	2803	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100
316024	22 May-14 19:31:47	0:00:00	1	0.0	100	63	5300	0:10:54	1	0.0	100	711	3600	0:16:04	1	0.0	100	156	2550	0:19:48	1	0.0	100	1008	2803	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100
316025	22 May-14 19:31:52	0:00:00	1	0.0	100	63	5300	0:10:54	1	0.0	100	711	3600	0:16:04	1	0.0	100	156	2550	0:19:48	1	0.0	100	1008	2803	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100
316026	22 May-14 19:31:57	0:00:00	1	0.0	100	63	5300	0:10:54	1	0.0	100	711	3600	0:16:04	1	0.0	100	156	2550	0:19:48	1	0.0	100	1008	2803	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100
316027	22 May-14 19:32:02	0:00:00	1	0.0	100	63	5300	0:10:54	1	0.0	100	711	3600	0:16:04	1	0.0	100	156	2550	0:19:48	1	0.0	100	1008	2803	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100
316028	22 May-14 19:32:07	0:00:00	1	0.0	100	63	5300	0:10:54	1	0.0	100	711	3600	0:16:04	1	0.0	100	156	2550	0:19:48	1	0.0	100	1008	2803	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100
316029	22 May-14 19:32:12	0:00:00	1	0.0	100	63	5300	0:10:54	1	0.0	100	711	3600	0:16:04	1	0.0	100	156	2550	0:19:48	1	0.0	100	1008	2803	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100
316030	22 May-14 19:32:17	0:00:00	1	0.0	100	63	5300	0:10:54	1	0.0	100	711	3600	0:16:04	1	0.0	100	156	2550	0:19:48	1	0.0	100	1008	2803	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100
316031	22 May-14 19:32:22	0:00:00	1	0.0	100	63	5300	0:10:54	1	0.0	100	711	3600	0:16:04	1	0.0	100	156	2550	0:19:48	1	0.0	100	1008	2803	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100
316032	22 May-14 19:32:27	0:00:00	2	2.1	100	105	5300	0:10:54	1	0.0	100	711	3600	0:16:04	1	0.0	100	156	2550	0:19:48	1	0.0	100	1008	2803	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100	6048	4032	0:22:18	1	0	100
316033	22 May-14 19:32:32	0:00:00	2	2.6	100	115	5300	0:10:27	1	0.0	100	711	3600	0:15:36	1	0.0	100	156	2550	0:19:21	1	0.0	100	1008	2803	0:21:50	1	0	100	6048	4032	0:21:50	1	0	100	6048	4032	0:21:50	1	0	100
316034	22 May-14 19:32:37	0:00:00	1	0.0	100	115	5300	0:10:21	1	0.0	100	711	3600	0:15:30	1	0.0	100	156	2550	0:19:15	1	0.0	100	1008	2803	0:21:44	1	0	100	6048	4032	0:21:44	1	0	100	6048	4032	0:21:44	1	0	100
316035	22 May-14 19:32:42	0:00:00	1	0.0	100	115	5300	0:10:21	1	0.0	100	711	3600	0:15:30	1	0.0	100	156	2550	0:19:15	1	0.0	100	1008	2803	0:21:44	1	0	100	6048	4032	0:21:44	1	0	100	6048	4032	0:21:44	1	0	100
316036	22 May-14 19:32:47	0:00:00	1	0.0	100	115	5300	0:10:21	1	0.0	100	711	3600	0:15:30	1	0.0	100	156	2550	0:19:15	1	0.0	100	1008	2803	0:21:44	1	0	100	6048	4032	0:21:44	1	0	100	6048	4032	0:21:44	1	0	100
316037	22 May-14 19:32:52	0:00:00	1	0.0	100	115	5300	0:10:21	1	0.0	100	711	3600	0:15:30	1	0.0	100	156	2550	0:19:15	1	0.0	100	1008	2803	0:21:44	1	0	100	6048	4032	0:21:44	1	0	100	6048	4032	0:21:44	1	0	100
316038	22 May-14 19:32:57	0:00:00	1	0.0	100	115	5300	0:10:21	1	0.0	100	711	3600	0:15:31	1	0.0	100	156	2550	0:19:15	1	0.0	100	1008	2803	0:21:45	1	0	100	6048	4032	0:21:45	1	0	100	6048	4032	0:21:45	1	0	100
316039	22 May-14 19:33:02	0:00:00	1	0.0	100	115	5300	0:10:21	1	0.0	100	711	3600	0:15:31	1	0.0	100	156	2550	0:19:15	1	0.0	100	1008	2803	0:21:45	1	0	100	6048	4032	0:21:45	1	0	100	6048	4032	0:21:45	1	0	100
316040	22 May-14 19:33:07	0:00:00	1	0.0	100	115	5300	0:10:21	1	0.0	100	711	3600	0:15:31	1	0.0	100	156	2550	0:19:15	1	0.0	100	1008	2803	0:21:45	1	0	100	6048	4032	0:21:45	1	0	100	6048	4032	0:21:45	1	0	100
316041	22 May-14 19:33:12	0:00:00	1	0.0	100	115	5300	0:10:21	1	0.0	100	711	3600	0:15:31	1	0.0	100	156	2550	0:19:15	1	0.0	100	1008	2803	0:21:45	1	0	100	6048	4032	0:21:45	1	0	100	6048	4032	0:21:45	1	0	100
316042	22 May-14 19:33:17	0:00:00	1	0.0	100	115	5300	0:10:21	1	0.0	100	711	3600	0:15:31	1	0.0	100	156	2550	0:19:15	1	0.0	100	1008	2803	0:21:45	1	0	100	6048	4032	0:21:45	1	0	100	6048	4032	0:21:45	1	0	100
316043	22 May-14 19:33:22	0:00:00	2	0.0	100	128	5300	0:10:42	1	0.0	100	711	3600	0:15:52	1	0.0	100	156	2550	0:19:36	1	0.0	100	1008	2803	0:22:06	1	0	100	6048	4032	0:22:06	1	0	100	6048	4032	0:22:06	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
316044	22 May-14 19:33:27	0:00:00	2	3.8	100	190	5300	0:10:39	1	0.0	100	711	3600	0:15:49	1	0.0	100	156	2550	0:19:33	1	0.0	100	1008	2803	0:22:03	1	0	100	6048	4032	0:22:03	1	0	100	6048	4032	0:22:03	1	0	100
316045	22 May-14 19:33:32	0:00:00	2	6.3	100	240	5300	0:10:01	1	0.0	100	711	3600	0:15:11	1	0.0	100	156	2550	0:18:55	1	0.0	100	1008	2803	0:21:25	1	0	100	6048	4032	0:21:25	1	0	100	6048	4032	0:21:25	1	0	100
316046	22 May-14 19:33:37	0:00:00	2	9.0	100	295	5300	0:09:33	1	0.0	100	711	3600	0:14:43	1	0.0	100	156	2550	0:18:27	1	0.0	100	1008	2803	0:20:57	1	0	100	6048	4032	0:20:57	1	0	100	6048	4032	0:20:57	1	0	100
316047	22 May-14 19:33:42	0:00:00	2	11.3	100	353	5300	0:09:05	1	0.0	100	711	3600	0:14:14	1	0.0	100	156	2550	0:17:59	1	0.0	100	1008	2803	0:20:28	1	0	100	6048	4032	0:20:28	1	0	100	6048	4032	0:20:28	1	0	100
316048	22 May-14 19:33:47	0:00:00	2	10.8	100	406	5300	0:08:36	1	0.0	100	711	3600	0:13:45	1	0.0	100	156	2550	0:17:30	1	0.0	100	1008	2803	0:19:59	1	0	100	6048	4032	0:19:59	1	0	100	6048	4032	0:19:59	1	0	100
316049	22 May-14 19:33:52	0:00:00	2	11.1	100	462	5300	0:08:12	1	0.0	100	711	3600	0:13:21	1	0.0	100	156	2550	0:17:06	1	0.0	100	1008	2803	0:19:35	1	0	100	6048	4032	0:19:35	1	0	100	6048	4032	0:19:35	1	0	100
316050	22 May-14 19:33:57	0:00:00	2	11.2	100	518	5300	0:07:49	1	0.0	100	711	3600	0:12:58	1	0.0	100	156	2550	0:16:43	1	0.0	100	1008	2803	0:19:12	1	0	100	6048	4032	0:19:12	1	0	100	6048	4032	0:19:12	1	0	100
316051	22 May-14 19:34:02	0:00:00	2	11.1	100	574	5300	0:07:27	1	0.0	100	711	3600	0:12:37	1	0.0	100	156	2550	0:16:21	1	0.0	100	1008	2803	0:18:51	1	0	100	6048	4032	0:18:51	1	0	100	6048	4032	0:18:51	1	0	100
316052	22 May-14 19:34:07	0:00:00	2	11.2	100	629	5300	0:07:07	1	0.0	100	711	3600	0:12:16	1	0.0	100	156	2550	0:16:01	1	0.0	100	1008	2803	0:18:30	1	0	100	6048	4032	0:18:30	1	0	100	6048	4032	0:18:30	1	0	100
316053	22 May-14 19:34:12	0:00:00	2	11.2	100	685	5300	0:06:48	1	0.0	100	711	3600	0:11:58	1	0.0	100	156	2550	0:15:42	1	0.0	100	1008	2803	0:18:12	1	0	100	6048	4032	0:18:12	1	0	100	6048	4032	0:18:12	1	0	100
316054	22 May-14 19:34:17	0:00:00	2	11.2	100	741	5300	0:06:33	1	0.0	100	711	3600	0:11:43	1	0.0	100	156	2550	0:15:27	1	0.0	100	1008	2803	0:17:57	1	0	100	6048	4032	0:17:57	1	0	100	6048	4032	0:17:57	1	0	100
316055	22 May-14 19:34:22	0:00:00	2	11.1	100	796	5300	0:06:30	1	0.0	100	711	3600	0:11:40	1	0.0	100	156	2550	0:15:24	1	0.0	100	1008	2803	0:17:54	1	0	100	6048	4032	0:17:54	1	0	100	6048	4032	0:17:54	1	0	100
316056	22 May-14 19:34:27	0:00:00	2	11.3	100	854	5300	0:06:24	1	0.0	100	711	3600	0:11:34	1	0.0	100	156	2550	0:15:18	1	0.0	100	1008	2803	0:17:48	1	0	100	6048	4032	0:17:48	1	0	100	6048	4032	0:17:48	1	0	100
316057	22 May-14 19:34:32	0:00:00	2	11.2	100	908	5300	0:06:19	1	0.0	100	711	3600	0:11:28	1	0.0	100	156	2550	0:15:13	1	0.0	100	1008	2803	0:17:42	1	0	100	6048	4032	0:17:42	1	0	100	6048	4032	0:17:42	1	0	100
316058	22 May-14 19:34:37	0:00:00	2	11.2	100	964	5300	0:06:15	1	0.0	100	711	3600	0:11:24	1	0.0	100	156	2550	0:15:09	1	0.0	100	1008	2803	0:17:38	1	0	100	6048	4032	0:17:38	1	0	100	6048	4032	0:17:38	1	0	100
316059	22 May-14 19:34:42	0:00:00	2	11.2	100	1019	5300	0:06:09	1	0.0	100	711	3600	0:11:19	1	0.0	100	156	2550	0:15:03	1	0.0	100	1008	2803	0:17:33	1	0	100	6048	4032	0:17:33	1	0	100	6048	4032	0:17:33	1	0	100
316060	22 May-14 19:34:47	0:00:00	2	11.1	100	1075	5300	0:06:05	1	0.0	100	711	3600	0:11:15	1	0.0	100	156	2550	0:14:59	1	0.0	100	1008	2803	0:17:29	1	0	100	6048	4032	0:17:29	1	0	100	6048	4032	0:17:29	1	0	100
316061	22 May-14 19:34:52	0:00:00	2	11.5	100	1137	5300	0:06:00	1	0.0	100	711	3600	0:11:10	1	0.0	100	156	2550	0:14:54	1	0.0	100	1008	2803	0:17:24	1	0	100	6048	4032	0:17:24	1	0	100	6048	4032	0:17:24	1	0	100
316062	22 May-14 19:34:57	0:00:00	2	11.3	100	1189	5300	0:05:54	1	0.0	100	711	3600	0:11:03	1	0.0	100	156	2550	0:14:48	1	0.0	100	1008	2803	0:17:17	1	0	100	6048	4032	0:17:17	1	0	100	6048	4032	0:17:17	1	0	100
316063	22 May-14 19:35:02	0:00:00	2	11.2	100	1242	5300	0:05:50	1	0.0	100	711	3600	0:10:59	1	0.0	100	156	2550	0:14:44	1	0.0	100	1008	2803	0:17:13	1	0	100	6048	4032	0:17:13	1	0	100	6048	4032	0:17:13	1	0	100
316064	22 May-14 19:35:07	0:00:00	2	11.1	100	1297	5300	0:05:46	1	0.0	100	711	3600	0:10:55	1	0.0	100	156	2550	0:14:40	1	0.0	100	1008	2803	0:17:09	1	0	100	6048	4032	0:17:09	1	0	100	6048	4032	0:17:09	1	0	100
316065	22 May-14 19:35:12	0:00:00	2	10.8	100	1353	5300	0:05:41	1	0.0	100	711	3600	0:10:51	1	0.0	100	156	2550	0:14:35	1	0.0	100	1008	2803	0:17:05	1	0	100	6048	4032	0:17:05	1	0	100	6048	4032	0:17:05	1	0	100
316066	22 May-14 19:35:17	0:00:00	2	11.0	100	1409	5300	0:05:36	1	0.0	100	711	3600	0:10:46	1	0.0	100	156	2550	0:14:30	1	0.0	100	1008	2803	0:17:00	1	0	100	6048	4032	0:17:00	1	0	100	6048	4032	0:17:00	1	0	100
316067	22 May-14 19:35:22	0:00:00	2	11.2	100	1465	5300	0:05:32	1	0.0	100	711	3600	0:10:42	1	0.0	100	156	2550	0:14:26	1	0.0	100	1008	2803	0:16:56	1	0	100	6048	4032	0:16:56	1	0	100	6048	4032	0:16:56	1	0	100
316068	22 May-14 19:35:27	0:00:00	2	11.3	100	1523	5300	0:05:27	1	0.0	100	711	3600	0:10:36	1	0.0	100	156	2550	0:14:21	1	0.0	100	1008	2803	0:16:50	1	0	100	6048	4032	0:16:50	1	0	100	6048	4032	0:16:50	1	0	100
316069	22 May-14 19:35:32	0:00:00	2	11.2	100	1576	5300	0:05:22	1	0.0	100	711	3600	0:10:31	1	0.0	100	156	2550	0:14:16	1	0.0	100	1008	2803	0:16:45	1	0	100	6048	4032	0:16:45	1	0	100	6048	4032	0:16:45	1	0	100
316070	22 May-14 19:35:37	0:00:00	2	11.2	100	1632	5300	0:05:17	1	0.0	100	711	3600	0:10:27	1	0.0	100	156	2550	0:14:11	1	0.0	100	1008	2803	0:16:41	1	0	100	6048	4032	0:16:41	1	0	100	6048	4032	0:16:41	1	0	100
316071	22 May-14 19:35:42	0:00:00	2	11.3	100	1690	5300	0:05:13	1	0.0	100	711	3600	0:10:22	1	0.0	100	156	2550	0:14:07	1	0.0	100	1008	2803	0:16:36	1	0	100	6048	4032	0:16:36	1	0	100	6048	4032	0:16:36	1	0	100
316072	22 May-14 19:35:47	0:00:00	2	11.1	100	1744	5300	0:05:08	1	0.0	100	711	3600	0:10:18	1	0.0	100	156	2550	0:14:02	1	0.0	100	1008	2803	0:16:32	1	0	100	6048	4032	0:16:32	1	0	100	6048	4032	0:16:32	1	0	100
316073	22 May-14 19:35:52	0:00:00	2	11.2	100	1799	5300	0:05:03	1	0.0	100	711	3600	0:10:13	1	0.0	100	156	2550	0:13:57	1	0.0	100	1008	2803	0:16:27	1	0	100	6048	4032	0:16:27	1	0	100	6048	4032	0:16:27	1	0	100
316074	22 May-14 19:35:57	0:00:00	2	11.2	100	1855	5300	0:04:58	1	0.0	100	711	3600	0:10:08	1	0.0	100	156	2550	0:13:52	1	0.0	100	1008	2803	0:16:22	1	0	100	6048	4032	0:16:22	1	0	100	6048	4032	0:16:22	1	0	100
316075	22 May-14 19:36:02	0:00:00	2	11.0	100	1910	5300	0:04:53	1	0.0	100	711	3600	0:10:03	1	0.0	100	156	2550	0:13:47	1	0.0	100	1008	2803	0:16:17	1	0	100	6048	4032	0:16:17	1	0	100	6048	4032	0:16:17	1	0	100
316076	22 May-14 19:36:07	0:00:00	2	11.1	100	1966	5300	0:04:49	1	0.0	100	711	3600	0:09:58	1	0.0	100	156	2550	0:13:43	1	0.0	100	1008	2803	0:16:12	1	0	100	6048	4032	0:16:12	1	0	100	6048	4032	0:16:12	1	0	100
316077	22 May-14 19:36:12	0:00:00	2	11.1	100	2021	5300	0:04:44	1	0.0	100	711	3600	0:09:54	1	0.0	100	156	2550	0:13:38	1	0.0	100	1008	2803	0:16:08	1	0	100	6048	4032	0:16:08	1	0	100	6048	4032	0:16:08	1	0	100
316078	22 May-14 19:36:17	0:00:00	2	11.1	100	2077	5300	0:04:40	1	0.0	100	711	3600	0:09:49	1	0.0	100	156	2550	0:13:34	1	0.0	100	1008	2803	0:16:03	1	0	100	6048	4032	0:16:03	1	0	100	6048	4032	0:16:03	1	0	100
316079	22 May-14 19:36:22	0:00:00	2	11.2	100	2133	5300	0:04:35	1	0.0	100	711	3600	0:09:45	1	0.0	100	156	2550	0:13:29	1	0.0	100	1008	2803	0:15:59	1	0	100	6048	4032	0:15:59	1	0	100	6048	4032	0:15:59	1	0	100
316080	22 May-14 19:36:27	0:00:00	2	11.1	100	2188	5300	0:04:30	1	0.0	100	711	3600	0:09:39	1	0.0	100	156	2550	0:13:24	1	0.0	100	1008	2803	0:15:53	1	0	100	6048	4032	0:15:53	1	0	100	6048	4032	0:15:53	1	0	100
316081	22 May-14 19:36:32	0:00:00	2	11.2	100	2244	5300	0:04:25	1	0.0	100	711	3600	0:09:35	1	0.0	100	156	2550	0:13:19	1	0.0	100	1008	2803	0:15:49	1	0	100	6048	4032	0:15:49	1	0	100	6048	4032	0:15:49	1	0	100
316082	22 May-14 19:36:37	0:00:00	2	11.2	100	2300	5300	0:04:21	1	0.0	100	711	3600	0:09:30	1	0.0	100	156	2550	0:13:15	1	0.0	100	1008	2803	0:15:44	1	0	100	6048	4032	0:15:44	1	0	100	6048	4032	0:15:44	1	0	100
316083	22 May-14 19:36:42	0:00:00	2	11.1	100	2355	5300	0:04:16	1	0.0	100	711	3600	0:09:25	1	0.0	100	156	2550	0:13:10	1	0.0	100	1008	2803	0:15:39	1	0	100	6048	4032	0:15:39	1	0	100	6048	4032	0:15:39	1	0	100
316084	22 May-14 19:36:47	0:00:00	2	11.3	100	2413	5300	0:04:11	1	0.0	100	711	3600	0:09:21	1	0.0	100	156	2550	0:13:05	1	0.0	100	1008	2803	0:15:35	1	0	100	6048	4032	0:15:35	1	0	100	6048	4032	0:15:35	1	0	100
316085	22 May-14 19:36:52	0:00:00	2	11.1	100	2466	5300	0:04:06	1	0.0	100	711	3600	0:09:15	1	0.0	100	156	2550	0:13:00	1	0.0	100	1008	2803	0:15:29	1	0	100	6048	4032	0:15:29	1	0	100	6048	4032	0:15:29	1	0	100
316086	22 May-14 19:36:57	0:00:00	2	11.1	100	2522	5300	0:04:02	1	0.0	100	711	3600	0:09:11	1	0.0	100	156	2550	0:12:56	1	0.0	100	1008	2803	0:15:25	1	0	100	6048	4032	0:15:25	1	0	100	6048	4032	0:15:25	1	0	100
316087	22 May-14 19:37:02	0:00:00	2	11.5	100	2585	5300	0:03:57	1	0.0	100	711	3600	0:09:06	1	0.0	100	156	2550	0:12:51	1	0.0	100	1008	2803	0:15:20	1	0	100	6048	4032	0:15:20	1	0	100	6048	4032	0:15:20	1	0	100
316088	22 May-14 19:37:07	0:00:00	2	11.1	100	2634	5300	0:03:50	1	0.0	100	711	3600	0:09:00	1	0.0	100	156	2550	0:12:44	1	0.0	100	1008	2803	0:15:14	1	0	100	6048	4032	0:15:14	1	0	100	6048	4032	0:15:14	1	0	100
316089	22 May-14 19:37:12	0:00:00	2	11.2	100	2689	5300	0:03:47	1	0.0	100	711	3600	0:08:57	1	0.0	100	156	2550	0:12:41	1	0.0	100	1008	2803	0:15:11	1	0	100	6048	4032	0:15:11	1	0	100	6048	4032	0:15:11	1	0	100
316090	22 May-14 19:37:17	0:00:00	2	11.2	100	2745	5300	0:03:43	1	0.0	100	711	3600	0:08:52	1	0.0	100	156	2550	0:12:37	1	0.0	100	1008	2803	0:15:06	1	0	100	6048	4032	0:15:06	1	0	100	6048	4032	0:15:06	1	0	100
316091	22 May-14 19:37:22	0:00:00	2	11.1	100	2807	5300	0:03:38	1	0.0	100	711	3600	0:08:47	1	0.0	100	156	2550	0:12:32	1	0.0	100	1008	2803	0:15:01	1	0	100	6048	4032	0:15:01	1	0	100	6048	4032	0:15:01	1	0	100
316092	22 May-14 19:37:27	0:00:00	2	11.1	100	2856	5300	0:03:32	1	0.0	100	711	3600	0:08:41	1	0.0	100	156	2550	0:12:26	1	0.0	100	1008	2803	0:14:55	1	0	100	6048	4032	0:14:55	1	0	100	6048	4032	0:14:55	1	0	100
316093	22 May-14 19:37:32	0:00:00	2	11.1	100	2911	5300	0:03:28	1	0.0	100	711	3600	0:08:38	1	0.0	100	156	2550	0:12:22	1	0.0	100	1008	2803	0:14:52	1	0	100	6048	4032	0:14:52	1	0	100	6048	4032	0:14:52	1	0	100
316094	22 May-14 19:37:37	0:00:00	2	11.1	100	2967	5300	0:03:24	1	0.0	100	711	3600	0:08:33	1	0.0	100	156	2550	0:12:18	1	0.0	100	1008	2803	0:14:47	1	0	100	6048	4032	0:14:47	1	0	100	6048	4032	0:14:47	1	0	100
316095	22 May-14 19:37:42	0:00:00	2	10.8	100	3023	5300	0:03:19	1	0.0	100	711	3600	0:08:29	1	0.0	100	156	2550	0:12:13	1	0.0	100	1008	2803	0:14:43	1	0	100	6048	4032	0:14:43	1	0	100	6048	4032	0:14:43	1	0	100
316096	22 May-14 19:37:47	0:00:00	2	11.2	100	3079	5300	0:03:14	1	0.0	100	711	3600	0:08:23	1	0.0	100	156	2550	0:12:08	1	0.0	100	1008	2803	0:14:37	1	0	100	6048	4032	0:14:37	1	0	100	6048	4032	0:14:37	1	0	100
316097	22 May-14 19:37:52	0:00:00	2	11.2	100	3135	5300	0:03:09	1	0.0	100	711	3600	0:08:19	1	0.0	100	156	2550	0:12:03	1	0.0	100	1008	2803	0:14:33	1	0	100	6048	4032	0:14:33	1	0	100	6048	4032	0:14:33	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
316098	22 May-14 19:37:57	0:00:00	2	11.2	100	3190	5300	0:03:05	1	0.0	100	711	3600	0:08:15	1	0.0	100	156	2550	0:11:59	1	0.0	100	1008	2803	0:14:29	1	0	100	6048	4032	0:14:29	1	0	100	6048	4032	0:14:29	1	0	100
316099	22 May-14 19:38:02	0:00:00	2	11.2	100	3246	5300	0:03:00	1	0.0	100	711	3600	0:08:09	1	0.0	100	156	2550	0:11:54	1	0.0	100	1008	2803	0:14:23	1	0	100	6048	4032	0:14:23	1	0	100	6048	4032	0:14:23	1	0	100
316100	22 May-14 19:38:07	0:00:00	2	11.3	100	3304	5300	0:02:55	1	0.0	100	711	3600	0:08:04	1	0.0	100	156	2550	0:11:49	1	0.0	100	1008	2803	0:14:18	1	0	100	6048	4032	0:14:18	1	0	100	6048	4032	0:14:18	1	0	100
316101	22 May-14 19:38:12	0:00:00	2	11.2	100	3358	5300	0:02:50	1	0.0	100	711	3600	0:07:59	1	0.0	100	156	2550	0:11:44	1	0.0	100	1008	2803	0:14:13	1	0	100	6048	4032	0:14:13	1	0	100	6048	4032	0:14:13	1	0	100
316102	22 May-14 19:38:17	0:00:00	2	11.2	100	3358	5300	0:02:46	1	0.0	100	711	3600	0:07:55	1	0.0	100	156	2550	0:11:40	1	0.0	100	1008	2803	0:14:09	1	0	100	6048	4032	0:14:09	1	0	100	6048	4032	0:14:09	1	0	100
316103	22 May-14 19:38:22	0:00:00	2	11.0	100	3420	5300	0:02:46	1	0.0	100	711	3600	0:07:55	1	0.0	100	156	2550	0:11:40	1	0.0	100	1008	2803	0:14:09	1	0	100	6048	4032	0:14:09	1	0	100	6048	4032	0:14:09	1	0	100
316104	22 May-14 19:38:27	0:00:00	2	11.2	100	3481	5300	0:02:40	1	0.0	100	711	3600	0:07:50	1	0.0	100	156	2550	0:11:34	1	0.0	100	1008	2803	0:14:04	1	0	100	6048	4032	0:14:04	1	0	100	6048	4032	0:14:04	1	0	100
316105	22 May-14 19:38:32	0:00:00	2	11.1	100	3548	5300	0:02:35	1	0.0	100	711	3600	0:07:44	1	0.0	100	156	2550	0:11:29	1	0.0	100	1008	2803	0:13:58	1	0	100	6048	4032	0:13:58	1	0	100	6048	4032	0:13:58	1	0	100
316106	22 May-14 19:38:37	0:00:00	2	11.3	100	3606	5300	0:02:29	1	0.0	100	711	3600	0:07:38	1	0.0	100	156	2550	0:11:23	1	0.0	100	1008	2803	0:13:52	1	0	100	6048	4032	0:13:52	1	0	100	6048	4032	0:13:52	1	0	100
316107	22 May-14 19:38:42	0:00:00	2	11.4	100	3659	5300	0:02:24	1	0.0	100	711	3600	0:07:33	1	0.0	100	156	2550	0:11:18	1	0.0	100	1008	2803	0:13:47	1	0	100	6048	4032	0:13:47	1	0	100	6048	4032	0:13:47	1	0	100
316108	22 May-14 19:38:47	0:00:00	2	11.1	100	3715	5300	0:02:20	1	0.0	100	711	3600	0:07:29	1	0.0	100	156	2550	0:11:14	1	0.0	100	1008	2803	0:13:43	1	0	100	6048	4032	0:13:43	1	0	100	6048	4032	0:13:43	1	0	100
316109	22 May-14 19:38:52	0:00:00	2	11.1	100	3770	5300	0:02:15	1	0.0	100	711	3600	0:07:24	1	0.0	100	156	2550	0:11:09	1	0.0	100	1008	2803	0:13:38	1	0	100	6048	4032	0:13:38	1	0	100	6048	4032	0:13:38	1	0	100
316110	22 May-14 19:38:57	0:00:00	2	11.0	100	3826	5300	0:02:10	1	0.0	100	711	3600	0:07:20	1	0.0	100	156	2550	0:11:04	1	0.0	100	1008	2803	0:13:34	1	0	100	6048	4032	0:13:34	1	0	100	6048	4032	0:13:34	1	0	100
316111	22 May-14 19:39:02	0:00:00	2	10.6	100	3881	5300	0:02:05	1	0.0	100	711	3600	0:07:15	1	0.0	100	156	2550	0:10:59	1	0.0	100	1008	2803	0:13:29	1	0	100	6048	4032	0:13:29	1	0	100	6048	4032	0:13:29	1	0	100
316112	22 May-14 19:39:07	0:00:00	2	10.6	100	3937	5300	0:02:02	1	0.0	100	711	3600	0:07:11	1	0.0	100	156	2550	0:10:55	1	0.0	100	1008	2803	0:13:25	1	0	100	6048	4032	0:13:25	1	0	100	6048	4032	0:13:25	1	0	100
316113	22 May-14 19:39:12	0:00:00	2	10.6	100	3993	5300	0:01:57	1	0.0	100	711	3600	0:07:06	1	0.0	100	156	2550	0:10:51	1	0.0	100	1008	2803	0:13:20	1	0	100	6048	4032	0:13:20	1	0	100	6048	4032	0:13:20	1	0	100
316114	22 May-14 19:39:17	0:00:00	2	10.6	100	4049	5300	0:01:51	1	0.0	100	711	3600	0:07:01	1	0.0	100	156	2550	0:10:45	1	0.0	100	1008	2803	0:13:15	1	0	100	6048	4032	0:13:15	1	0	100	6048	4032	0:13:15	1	0	100
316115	22 May-14 19:39:22	0:00:00	2	11.2	100	4104	5300	0:01:47	1	0.0	100	711	3600	0:06:57	1	0.0	100	156	2550	0:10:41	1	0.0	100	1008	2803	0:13:11	1	0	100	6048	4032	0:13:11	1	0	100	6048	4032	0:13:11	1	0	100
316116	22 May-14 19:39:27	0:00:00	2	11.2	100	4160	5300	0:01:42	1	0.0	100	711	3600	0:06:52	1	0.0	100	156	2550	0:10:36	1	0.0	100	1008	2803	0:13:06	1	0	100	6048	4032	0:13:06	1	0	100	6048	4032	0:13:06	1	0	100
316117	22 May-14 19:39:32	0:00:00	2	11.2	100	4211	5300	0:01:38	2	0.0	100	716	3600	0:06:47	1	0.0	100	156	2550	0:10:32	1	0.0	100	1008	2803	0:13:01	1	0	100	6048	4032	0:13:01	1	0	100	6048	4032	0:13:01	1	0	100
316118	22 May-14 19:39:37	0:00:00	2	11.3	100	4219	5300	0:01:33	2	2.8	100	766	3600	0:06:41	1	0.0	100	156	2550	0:10:25	1	0.0	100	1008	2803	0:12:55	1	0	100	6048	4032	0:12:55	1	0	100	6048	4032	0:12:55	1	0	100
316119	22 May-14 19:39:42	0:00:00	2	11.2	100	4221	5300	0:01:32	2	5.3	100	817	3600	0:06:25	1	0.0	100	156	2550	0:10:09	1	0.0	100	1008	2803	0:12:39	1	0	100	6048	4032	0:12:39	1	0	100	6048	4032	0:12:39	1	0	100
316120	22 May-14 19:39:47	0:00:00	2	11.2	100	4226	5300	0:01:32	2	7.9	100	868	3600	0:06:10	1	0.0	100	156	2550	0:09:54	1	0.0	100	1008	2803	0:12:24	1	0	100	6048	4032	0:12:24	1	0	100	6048	4032	0:12:24	1	0	100
316121	22 May-14 19:39:52	0:00:00	2	11.2	100	4231	5300	0:01:32	2	10.2	100	919	3600	0:05:55	1	0.0	100	156	2550	0:09:40	1	0.0	100	1008	2803	0:12:10	1	0	100	6048	4032	0:12:10	1	0	100	6048	4032	0:12:10	1	0	100
316122	22 May-14 19:39:57	0:00:00	2	11.2	100	4239	5300	0:01:31	2	10.2	100	969	3600	0:05:41	1	0.0	100	156	2550	0:09:25	1	0.0	100	1008	2803	0:11:55	1	0	100	6048	4032	0:11:55	1	0	100	6048	4032	0:11:55	1	0	100
316123	22 May-14 19:40:02	0:00:00	2	11.2	100	4241	5300	0:01:30	2	10.2	100	1020	3600	0:05:28	1	0.0	100	156	2550	0:09:12	1	0.0	100	1008	2803	0:11:42	1	0	100	6048	4032	0:11:42	1	0	100	6048	4032	0:11:42	1	0	100
316124	22 May-14 19:40:07	0:00:00	2	11.2	100	4247	5300	0:01:30	2	10.1	100	1070	3600	0:05:16	1	0.0	100	156	2550	0:09:01	1	0.0	100	1008	2803	0:11:30	1	0	100	6048	4032	0:11:30	1	0	100	6048	4032	0:11:30	1	0	100
316125	22 May-14 19:40:12	0:00:00	2	11.2	100	4252	5300	0:01:29	2	10.1	100	1121	3600	0:05:05	1	0.0	100	156	2550	0:08:50	1	0.0	100	1008	2803	0:11:19	1	0	100	6048	4032	0:11:19	1	0	100	6048	4032	0:11:19	1	0	100
316126	22 May-14 19:40:17	0:00:00	2	11.0	100	4257	5300	0:01:29	2	10.1	100	1171	3600	0:04:54	1	0.0	100	156	2550	0:08:39	1	0.0	100	1008	2803	0:11:08	1	0	100	6048	4032	0:11:08	1	0	100	6048	4032	0:11:08	1	0	100
316127	22 May-14 19:40:22	0:00:00	2	11.3	100	4265	5300	0:01:29	2	10.1	100	1222	3600	0:04:44	1	0.0	100	156	2550	0:08:29	1	0.0	100	1008	2803	0:10:58	1	0	100	6048	4032	0:10:58	1	0	100	6048	4032	0:10:58	1	0	100
316128	22 May-14 19:40:27	0:00:00	2	11.2	100	4268	5300	0:01:28	2	10.1	100	1272	3600	0:04:35	1	0.0	100	156	2550	0:08:19	1	0.0	100	1008	2803	0:10:49	1	0	100	6048	4032	0:10:49	1	0	100	6048	4032	0:10:49	1	0	100
316129	22 May-14 19:40:32	0:00:00	2	11.1	100	4272	5300	0:01:28	2	10.1	100	1323	3600	0:04:31	1	0.0	100	156	2550	0:08:15	1	0.0	100	1008	2803	0:10:45	1	0	100	6048	4032	0:10:45	1	0	100	6048	4032	0:10:45	1	0	100
316130	22 May-14 19:40:37	0:00:00	2	11.3	100	4280	5300	0:01:27	2	10.1	100	1373	3600	0:04:26	1	0.0	100	156	2550	0:08:11	1	0.0	100	1008	2803	0:10:40	1	0	100	6048	4032	0:10:40	1	0	100	6048	4032	0:10:40	1	0	100
316131	22 May-14 19:40:42	0:00:00	2	11.0	100	4283	5300	0:01:26	2	10.1	100	1424	3600	0:04:22	1	0.0	100	156	2550	0:08:06	1	0.0	100	1008	2803	0:10:36	1	0	100	6048	4032	0:10:36	1	0	100	6048	4032	0:10:36	1	0	100
316132	22 May-14 19:40:47	0:00:00	2	11.1	100	4287	5300	0:01:26	2	10.2	100	1475	3600	0:04:18	1	0.0	100	156	2550	0:08:02	1	0.0	100	1008	2803	0:10:32	1	0	100	6048	4032	0:10:32	1	0	100	6048	4032	0:10:32	1	0	100
316133	22 May-14 19:40:52	0:00:00	2	11.3	100	4295	5300	0:01:26	2	10.1	100	1525	3600	0:04:13	1	0.0	100	156	2550	0:07:58	1	0.0	100	1008	2803	0:10:27	1	0	100	6048	4032	0:10:27	1	0	100	6048	4032	0:10:27	1	0	100
316134	22 May-14 19:40:57	0:00:00	2	11.1	100	4299	5300	0:01:25	2	10.2	100	1576	3600	0:04:09	1	0.0	100	156	2550	0:07:53	1	0.0	100	1008	2803	0:10:23	1	0	100	6048	4032	0:10:23	1	0	100	6048	4032	0:10:23	1	0	100
316135	22 May-14 19:41:02	0:00:00	2	11.5	100	4310	5300	0:01:25	2	10.1	100	1626	3600	0:04:04	1	0.0	100	156	2550	0:07:49	1	0.0	100	1008	2803	0:10:18	1	0	100	6048	4032	0:10:18	1	0	100	6048	4032	0:10:18	1	0	100
316136	22 May-14 19:41:07	0:00:00	2	11.1	100	4307	5300	0:01:24	2	10.1	100	1677	3600	0:03:59	1	0.0	100	156	2550	0:07:44	1	0.0	100	1008	2803	0:10:13	1	0	100	6048	4032	0:10:13	1	0	100	6048	4032	0:10:13	1	0	100
316137	22 May-14 19:41:12	0:00:00	2	11.0	100	4312	5300	0:01:24	2	10.1	100	1727	3600	0:03:56	1	0.0	100	156	2550	0:07:40	1	0.0	100	1008	2803	0:10:10	1	0	100	6048	4032	0:10:10	1	0	100	6048	4032	0:10:10	1	0	100
316138	22 May-14 19:41:17	0:00:00	2	11.0	100	4317	5300	0:01:24	2	10.1	100	1778	3600	0:03:52	1	0.0	100	156	2550	0:07:36	1	0.0	100	1008	2803	0:10:06	1	0	100	6048	4032	0:10:06	1	0	100	6048	4032	0:10:06	1	0	100
316139	22 May-14 19:41:22	0:00:00	2	10.9	100	4324	5300	0:01:24	2	10.2	100	1829	3600	0:03:47	1	0.0	100	156	2550	0:07:31	1	0.0	100	1008	2803	0:10:01	1	0	100	6048	4032	0:10:01	1	0	100	6048	4032	0:10:01	1	0	100
316140	22 May-14 19:41:27	0:00:00	2	11.1	100	4327	5300	0:01:23	2	10.1	100	1879	3600	0:03:42	1	0.0	100	156	2550	0:07:27	1	0.0	100	1008	2803	0:09:56	1	0	100	6048	4032	0:09:56	1	0	100	6048	4032	0:09:56	1	0	100
316141	22 May-14 19:41:32	0:00:00	2	11.2	100	4332	5300	0:01:23	2	10.2	100	1930	3600	0:03:38	1	0.0	100	156	2550	0:07:23	1	0.0	100	1008	2803	0:09:52	1	0	100	6048	4032	0:09:52	1	0	100	6048	4032	0:09:52	1	0	100
316142	22 May-14 19:41:37	0:00:00	2	11.2	100	4338	5300	0:01:22	2	10.1	100	1980	3600	0:03:34	1	0.0	100	156	2550	0:07:18	1	0.0	100	1008	2803	0:09:48	1	0	100	6048	4032	0:09:48	1	0	100	6048	4032	0:09:48	1	0	100
316143	22 May-14 19:41:42	0:00:00	2	11.2	100	4345	5300	0:01:22	2	10.1	100	2031	3600	0:03:29	1	0.0	100	156	2550	0:07:14	1	0.0	100	1008	2803	0:09:43	1	0	100	6048	4032	0:09:43	1	0	100	6048	4032	0:09:43	1	0	100
316144	22 May-14 19:41:47	0:00:00	2	11.2	100	4349	5300	0:01:21	2	10.1	100	2081	3600	0:03:25	1	0.0	100	156	2550	0:07:09	1	0.0	100	1008	2803	0:09:39	1	0	100	6048	4032	0:09:39	1	0	100	6048	4032	0:09:39	1	0	100
316145	22 May-14 19:41:52	0:00:00	2	11.3	100	4355	5300	0:01:21	2	10.1	100	2132	3600	0:03:20	1	0.0	100	156	2550	0:07:05	1	0.0	100	1008	2803	0:09:34	1	0	100	6048	4032	0:09:34	1	0	100	6048	4032	0:09:34	1	0	100
316146	22 May-14 19:41:57	0:00:00	2	11.2	100	4359	5300	0:01:20	2	10.1	100	2182	3600	0:03:16	1	0.0	100	156	2550	0:07:00	1	0.0	100	1008	2803	0:09:30	1	0	100	6048	4032	0:09:30	1	0	100	6048	4032	0:09:30	1	0	100
316147	22 May-14 19:42:02	0:00:00	2	11.0	100	4363	5300	0:01:20	2	10.1	100	2233	3600	0:03:11	1	0.0	100	156	2550	0:06:56	1	0.0	100	1008	2803	0:09:26	1	0	100	6048	4032	0:09:26	1	0	100	6048	4032	0:09:26	1	0	100
316148	22 May-14 19:42:07	0:00:00	2	11.1	100	4369	5300	0:01:19	2	10.1	100	2283	3600	0:03:07	1	0.0	100	156	2550	0:06:52	1	0.0	100	1008	2803	0:09:21	1	0	100	6048	4032	0:09:21	1	0	100	6048	4032	0:09:21	1	0	100
316149	22 May-14 19:42:12	0:00:00	2	11.0	100	4373	5300	0:01:19	2	10.1	100	2334	3600	0:03:03	1	0.0	100	156	2550	0:06:47	1	0.0	100	1008	2803	0:09:17	1	0	100	6048	4032	0:09:17	1	0	100	6048	4032	0:09:17	1	0	100
316150	22 May-14 19:42:17	0:00:00	2	11.1	100	4378	5300	0:01:19	2	10.2	100	2385	3600	0:02:58	1	0.0	100	156	2550	0:06:43	1	0.0	100	1008	2803	0:09:12	1	0	100	6048	4032	0:09:12	1	0	100	6048	4032	0:09:12	1	0	100
316151	22 May-14 19:42:22	0:00:00	2	11.2	100	4384	5300	0:01:18	2	10.1	100	2435	3600	0:02:54	1	0.0	100	156	2550	0:06:38	1	0.0	100	1008	2803	0:09:08	1	0	100	6048	4032	0:09:08	1	0	100	6048	4032	0:09:08	1	0	100

id	read_time	m1_ft	m1_status	m1_speed	m1_entalpy	a1_lev	a1_cq	m2_ft	m2_status	m2_speed	m2_enthalpy	a2_lev	a2_cq	m3_ft	m3_status	m3_speed	m3_enthalpy	a3_lev	a3_cq	m4_ft	m4_status	m4_speed	m4_enthalpy	a4_lev	a4_cq	m5_ft	m5_status	m5_speed	m5_enthalpy	a5_lev	a5_cq	m6_ft	m6_status	m6_speed	m6_enthalpy	a6_lev	a6_cq	m7_ft	m7_status	m7_speed	m7_enthalpy
316152	22 May-14 19:42:27	0:00:00	2	11.1	100	4388	5300	0:01:18	2	10.2	100	2486	3600	0:02:49	1	0.0	100	156	2550	0:06:34	1	0.0	100	1008	2803	0:09:03	1	0	100	6048	4032	0:09:03	1	0	100	6048	4032	0:09:03	1	0	100
316153	22 May-14 19:42:32	0:00:00	2	11.2	100	4394	5300	0:01:17	2	10.1	100	2524	3600	0:02:45	2	0.0	100	168	2550	0:06:30	1	0.0	100	1008	2803	0:08:59	1	0	100	6048	4032	0:08:59	1	0	100	6048	4032	0:08:59	1	0	100
316154	22 May-14 19:42:37	0:00:00	2	11.2	100	4399	5300	0:01:17	2	10.1	100	2515	3600	0:02:42	2	3.6	100	228	2550	0:06:25	1	0.0	100	1008	2803	0:08:54	1	0	100	6048	4032	0:08:54	1	0	100	6048	4032	0:08:54	1	0	100
316155	22 May-14 19:42:42	0:00:00	2	11.1	100	4404	5300	0:01:16	2	10.1	100	2517	3600	0:02:42	2	6.0	100	276	2550	0:06:19	1	0.0	100	1008	2803	0:08:48	1	0	100	6048	4032	0:08:48	1	0	100	6048	4032	0:08:48	1	0	100
316156	22 May-14 19:42:47	0:00:00	2	11.2	100	4409	5300	0:01:16	2	10.1	100	2520	3600	0:02:41	2	8.4	100	324	2550	0:06:13	1	0.0	100	1008	2803	0:08:43	1	0	100	6048	4032	0:08:43	1	0	100	6048	4032	0:08:43	1	0	100
316157	22 May-14 19:42:52	0:00:00	2	11.1	100	4414	5300	0:01:16	2	10.1	100	2522	3600	0:02:41	2	10.2	100	372	2550	0:06:07	1	0.0	100	1008	2803	0:08:37	1	0	100	6048	4032	0:08:37	1	0	100	6048	4032	0:08:37	1	0	100
316158	22 May-14 19:42:57	0:00:00	2	11.1	100	4419	5300	0:01:15	2	10.1	100	2513	3600	0:02:40	2	10.2	100	432	2550	0:06:02	1	0.0	100	1008	2803	0:08:32	1	0	100	6048	4032	0:08:32	1	0	100	6048	4032	0:08:32	1	0	100
316159	22 May-14 19:43:02	0:00:00	2	11.2	100	4424	5300	0:01:15	2	10.2	100	2504	3600	0:02:40	2	10.8	100	492	2550	0:05:56	1	0.0	100	1008	2803	0:08:26	1	0	100	6048	4032	0:08:26	1	0	100	6048	4032	0:08:26	1	0	100
316160	22 May-14 19:43:07	0:00:00	2	11.1	100	4429	5300	0:01:14	2	10.1	100	2518	3600	0:02:41	2	10.2	100	528	2550	0:05:50	1	0.0	100	1008	2803	0:08:20	1	0	100	6048	4032	0:08:20	1	0	100	6048	4032	0:08:20	1	0	100
316161	22 May-14 19:43:12	0:00:00	2	11.2	100	4434	5300	0:01:14	2	10.2	100	2521	3600	0:02:39	2	10.2	100	576	2550	0:05:45	1	0.0	100	1008	2803	0:08:15	1	0	100	6048	4032	0:08:15	1	0	100	6048	4032	0:08:15	1	0	100
316162	22 May-14 19:43:17	0:00:00	2	11.2	100	4440	5300	0:01:13	2	10.1	100	2523	3600	0:02:38	2	9.6	100	624	2550	0:05:39	1	0.0	100	1008	2803	0:08:09	1	0	100	6048	4032	0:08:09	1	0	100	6048	4032	0:08:09	1	0	100
316163	22 May-14 19:43:22	0:00:00	2	11.2	100	4445	5300	0:01:13	2	10.1	100	2514	3600	0:02:38	2	9.6	100	684	2550	0:05:34	1	0.0	100	1008	2803	0:08:04	1	0	100	6048	4032	0:08:04	1	0	100	6048	4032	0:08:04	1	0	100
316164	22 May-14 19:43:27	0:00:00	2	11.2	100	4450	5300	0:01:12	2	10.1	100	2528	3600	0:02:38	2	9.6	100	720	2550	0:05:28	1	0.0	100	1008	2803	0:07:58	1	0	100	6048	4032	0:07:58	1	0	100	6048	4032	0:07:58	1	0	100
316165	22 May-14 19:43:32	0:00:00	2	11.3	100	4457	5300	0:01:12	2	10.1	100	2555	3600	0:02:37	2	8.4	100	744	2550	0:05:24	1	0.0	100	1008	2803	0:07:53	1	0	100	6048	4032	0:07:53	1	0	100	6048	4032	0:07:53	1	0	100
316166	22 May-14 19:43:37	0:00:00	2	11.1	100	4460	5300	0:01:11	2	10.1	100	2569	3600	0:02:34	2	7.8	100	780	2550	0:05:19	1	0.0	100	1008	2803	0:07:48	1	0	100	6048	4032	0:07:48	1	0	100	6048	4032	0:07:48	1	0	100
316167	22 May-14 19:43:42	0:00:00	2	11.1	100	4465	5300	0:01:11	2	10.1	100	2596	3600	0:02:32	2	6.0	100	804	2550	0:05:15	1	0.0	100	1008	2803	0:07:44	1	0	100	6048	4032	0:07:44	1	0	100	6048	4032	0:07:44	1	0	100
316168	22 May-14 19:43:47	0:00:00	2	11.2	100	4471	5300	0:01:11	2	10.1	100	2622	3600	0:02:30	2	5.4	100	828	2550	0:05:10	1	0.0	100	1008	2803	0:07:39	1	0	100	6048	4032	0:07:39	1	0	100	6048	4032	0:07:39	1	0	100
316169	22 May-14 19:43:52	0:00:00	2	11.0	100	4475	5300	0:01:10	2	10.1	100	2637	3600	0:02:27	2	6.0	100	864	2550	0:05:05	1	0.0	100	1008	2803	0:07:35	1	0	100	6048	4032	0:07:35	1	0	100	6048	4032	0:07:35	1	0	100
316170	22 May-14 19:43:57	0:00:00	2	11.2	100	4481	5300	0:01:10	2	10.1	100	2663	3600	0:02:26	2	5.4	100	888	2550	0:05:01	1	0.0	100	1008	2803	0:07:30	1	0	100	6048	4032	0:07:30	1	0	100	6048	4032	0:07:30	1	0	100
316171	22 May-14 19:44:02	0:00:00	2	11.1	100	4499	5300	0:01:09	2	9.4	100	2664	3600	0:02:23	2	6.0	100	924	2550	0:04:56	1	0.0	100	1008	2803	0:07:26	1	0	100	6048	4032	0:07:26	1	0	100	6048	4032	0:07:26	1	0	100
316172	22 May-14 19:44:07	0:00:00	2	11.1	100	4547	5300	0:01:08	2	7.3	100	2612	3600	0:02:22	2	7.8	100	984	2550	0:04:52	1	0.0	100	1008	2803	0:07:21	1	0	100	6048	4032	0:07:21	1	0	100	6048	4032	0:07:21	1	0	100
316173	22 May-14 19:44:12	0:00:00	2	11.3	100	4598	5300	0:01:04	2	5.1	100	2595	3600	0:02:24	2	7.2	100	1008	2550	0:04:48	1	0.0	100	1008	2803	0:07:18	1	0	100	6048	4032	0:07:18	1	0	100	6048	4032	0:07:18	1	0	100
316174	22 May-14 19:44:17	0:00:00	2	11.2	100	4648	5300	0:00:59	2	2.9	100	2600	3600	0:02:23	1	0.0	100	1008	2550	0:04:45	1	0.0	100	1008	2803	0:07:15	1	0	100	6048	4032	0:07:15	1	0	100	6048	4032	0:07:15	1	0	100
316175	22 May-14 19:44:22	0:00:00	2	11.3	100	4698	5300	0:00:55	2	1.3	100	2606	3600	0:02:20	1	0.0	100	1008	2550	0:04:43	1	0.0	100	1008	2803	0:07:12	1	0	100	6048	4032	0:07:12	1	0	100	6048	4032	0:07:12	1	0	100
316176	22 May-14 19:44:27	0:00:00	2	11.1	100	4745	5300	0:00:51	2	1.2	100	2612	3600	0:02:18	1	0.0	100	1008	2550	0:04:40	1	0.0	100	1008	2803	0:07:10	1	0	100	6048	4032	0:07:10	1	0	100	6048	4032	0:07:10	1	0	100
316177	22 May-14 19:44:32	0:00:00	2	11.1	100	4797	5300	0:00:47	2	1.2	100	2618	3600	0:02:16	1	0.0	100	1008	2550	0:04:38	1	0.0	100	1008	2803	0:07:08	1	0	100	6048	4032	0:07:08	1	0	100	6048	4032	0:07:08	1	0	100

This appendix represents 2 hours and 52 minutes of data from the Valpré plant experiment with was done from 5 May tot 29 June 2014 (eight weeks and 11 520 observations; one every five seconds). This is therefore 0.2% of the total data set which contains 1 367 hours of data. The complete data set is available from the researcher at cdurandt@coca-cola.com.

APPENDIX E:

PRODUCTION LINE TEST RESULTS – VALPRÉ EXPERIMENT

Valpre

Start -up test

Early start | Late start

Asolute value of the difference between best start-up moment and actual start-up observed

5 May - 11 May 2014

Machine	5-May-14			6-May-14			7-May-14			8-May-14			9-May-14			10-May-14			11-May-14		
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night
Labeller	00:00:00	00:00:00	00:00:00	00:23:04	00:11:43	00:00:00	00:00:00	00:00:00	00:00:00	00:03:06	00:07:39	00:00:00	02:35:09	00:40:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00
Variopak	00:00:00	00:00:00	00:00:00	00:04:46	00:06:20	00:00:00	00:00:00	00:00:00	00:00:00	00:01:11	00:08:02	00:00:00	00:09:28	00:14:05	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00
Wrapapak	00:00:00	00:00:00	00:00:00	00:19:41	00:13:55	00:00:00	00:00:00	00:00:00	00:00:00	00:16:27	00:09:12	00:00:00	00:19:35	00:18:37	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00
Sum	00:00:00	00:00:00	00:00:00	00:47:31	00:31:58	00:00:00	00:00:00	00:00:00	00:00:00	00:20:44	00:24:53	00:00:00	03:04:12	01:12:42	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00

12 May - 18 May 2014

Machine	12-May-14			13-May-14			14-May-14			15-May-14			16-May-14			17-May-14			18-May-14		
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night
Labeller	00:10:08	00:48:08	00:00:00	00:00:20	00:02:35	00:00:00	00:49:43	00:00:30	00:00:00	00:00:25	00:03:49	00:00:00	00:03:51	00:07:02	00:00:00	00:03:18	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00
Variopak	00:12:00	00:01:35	00:00:00	00:03:19	00:03:20	00:00:00	00:05:42	00:03:30	00:00:00	00:23:45	00:07:05	00:00:00	02:58:07	00:08:16	00:00:00	00:08:06	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00
Wrapapak	00:14:20	00:00:15	00:00:00	00:05:06	00:06:44	00:00:00	00:15:09	00:11:18	00:00:00	00:01:28	00:05:31	00:00:00	00:04:23	00:07:57	00:00:00	00:08:30	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00
Sum	00:36:28	00:49:58	00:00:00	00:08:45	00:12:39	00:00:00	01:10:34	00:15:18	00:00:00	00:25:38	00:16:25	00:00:00	03:06:21	00:23:15	00:00:00	00:19:54	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00

19 May - 25 May 2014

Machine	19-May-14			20-May-14			21-May-14			22-May-14			23-May-14			24-May-14			25-May-14		
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night
Labeller	00:00:49	00:02:05	00:00:00	00:12:55	00:00:00	00:00:00	00:02:10	00:02:15	00:00:00	00:06:50	00:01:00	00:00:00	00:00:00	00:01:10	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00
Variopak	00:08:08	00:13:52	00:00:00	00:00:50	00:00:00	00:00:00	00:00:26	00:13:20	00:00:00	00:11:39	00:06:40	00:00:00	00:00:00	00:02:21	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00
Wrapapak	00:04:17	00:10:52	00:00:00	00:12:17	00:00:00	00:00:00	00:04:05	00:14:47	00:00:00	00:15:38	00:07:46	00:00:00	00:00:00	00:02:24	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00
Sum	00:13:14	00:26:49	00:00:00	00:26:02	00:00:00	00:00:00	00:06:41	00:30:22	00:00:00	00:34:07	00:15:26	00:00:00	00:00:00	00:05:55	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00

26 May - 1 June 2014

Machine	26-May-14			27-May-14			28-May-14			29-May-14			30-May-14			31-May-14			1-Jun-14		
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night
Labeller	00:00:20	00:00:55	00:00:00	00:00:35	00:02:05	00:00:00	00:07:20	00:05:10	00:00:00	00:12:26	00:00:40	00:00:00	00:00:40	00:00:50	00:00:00	00:01:40	00:02:51	00:00:00	00:00:00	00:00:00	00:00:00
Variopak	00:10:39	00:01:06	00:00:00	00:05:59	00:04:14	00:00:00	00:07:30	00:04:25	00:00:00	00:05:08	00:02:33	00:00:00	00:09:34	00:02:26	00:00:00	00:01:42	00:03:56	00:00:00	00:00:00	00:00:00	00:00:00
Wrapapak	00:06:20	00:01:40	00:00:00	00:06:46	00:04:13	00:00:00	00:04:01	00:00:48	00:00:00	00:05:16	00:01:50	00:00:00	00:05:02	00:02:08	00:00:00	00:08:36	00:03:37	00:00:00	00:00:00	00:00:00	00:00:00
Sum	00:17:19	00:03:41	00:00:00	00:13:20	00:10:32	00:00:00	00:18:51	00:10:23	00:00:00	00:22:50	00:05:03	00:00:00	00:15:16	00:05:24	00:00:00	00:11:58	00:10:24	00:00:00	00:00:00	00:00:00	00:00:00

2 June -8 June 2014

Machine	2-Jun-14			3-Jun-14			4-Jun-14			5-Jun-14			6-Jun-14			7-Jun-14			8-Jun-14		
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night
Labeller	00:00:00	00:00:55	00:00:00	00:03:30	00:06:56	00:00:00	00:00:00	00:03:36	00:00:00	00:02:50	00:02:21	00:00:00	00:06:01	00:02:14	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00
Variopak	00:00:00	02:41:02	00:00:00	00:02:42	00:06:22	00:00:00	00:00:00	00:07:13	00:00:00	00:08:31	00:05:39	00:00:00	00:01:41	00:02:04	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00
Wrapapak	00:00:00	00:30:44	00:00:00	00:03:48	00:10:00	00:00:00	00:00:00	00:11:19	00:00:00	00:19:05	00:06:49	00:00:00	00:02:52	00:06:09	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00
Sum	00:00:00	03:12:41	00:00:00	00:10:00	00:23:18	00:00:00	00:00:00	00:22:08	00:00:00	00:30:26	00:14:49	00:00:00	00:10:34	00:10:27	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00

9 June - 15 June 2014

Machine	9-Jun-14			10-Jun-14			11-Jun-14			12-Jun-14			13-Jun-14			14-Jun-14			15-Jun-14		
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night
Labeller	00:09:40	00:10:50	00:00:00	00:03:10	00:01:55	00:00:00	00:01:25	00:14:27	00:00:00	00:03:00	00:05:40	00:00:00	00:05:14	00:03:43	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00
Variopak	00:09:10	00:00:05	00:00:00	00:27:22	00:14:13	00:00:00	00:41:13	00:13:20	00:00:00	02:22:49	00:09:03	00:00:00	00:08:18	00:03:48	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00
Wrapapak	02:31:52	00:00:24	00:00:00	00:18:50	00:04:11	00:00:00	00:39:31	00:15:04	00:00:00	03:03:40	00:14:11	00:00:00	00:06:16	00:06:05	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00
Sum	02:50:42	00:11:19	00:00:00	00:49:22	00:20:19	00:00:00	01:22:09	00:42:51	00:00:00	05:29:29	00:28:54	00:00:00	00:19:48	00:13:36	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00

16 June - 22 June 2014

Machine	16-Jun-14			17-Jun-14			18-Jun-14			19-Jun-14			20-Jun-14			21-Jun-14			22-Jun-14		
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night
Labeller	00:00:00	00:00:00	00:00:00	00:00:00	00:04:59	00:00:00	00:01:32	00:03:12	00:00:00	00:01:00	00:02:23	00:00:00	00:04:00	00:07:27	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00
Variopak	00:00:00	00:00:00	00:00:00	00:00:00	00:18:44	00:00:00	00:00:53	00:45:22	00:00:00	00:01:00	00:03:44	00:00:00	00:04:01	00:12:02	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00
Wrapapak	00:00:00	00:00:00	00:00:00	00:00:00	00:18:50	00:00:00	00:04:14	00:29:24	00:00:00	00:01:00	00:05:54	00:00:00	00:02:16	00:14:28	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00
Sum	00:00:00	00:00:00	00:00:00	00:00:00	00:42:33	00:00:00	00:06:39	01:17:58	00:00:00	00:03:00	00:12:01	00:00:00	00:10:17	00:33:57	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00	00:00:00

23 June - 29 June 2014

Machine	23-Jun-14			24-Jun-14			25-Jun-14			26-Jun-14			27-Jun-14			28-Jun-14			29-Jun-14		
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night
Labeller	00:00:00	00:00:48	00:01:00	00:32:28	00:01:11	00:01:28	00:03:10	00:07:14	00:04:00	00:00:00	00:00:54	00:09:47	00:00:00	00:07:00	00:00:43	00:09:00	00:01:44	00:01:00	00:00:00	00:00:00	00:00:00
Variopak	00:00:00	00:01:41	00:01:02	00:06:14	00:02:41	00:01:14	00:08:20	00:11:29	00:05:13	00:00:00	00:02:00	00:10:37	00:00:00	00:04:00	00:02:00	00:05:07	00:07:44	00:02:39	00:00:00	00:00:00	00:00:00
Wrapapak	00:00:00	00:02:00	00:01:39	03:18:38	00:02:25	00:03:12	00:08:35	00:13:06	00:08:40	00:00:00	00:00:30	00:13:24	00:00:00	00:02:45	00:01:38	00:07:13	00:08:17	00:03:50	00:00:00	00:00:00	00:00:00
Sum	00:00:00	00:04:29	00:03:41	03:57:20	00:06:17	00:05:54	00:20:05	00:31:49	00:17:53	00:00:00	00:03:24	00:33:48	00:00:00	00:13:45	00:04:21	00:21:20	00:17:45	00:07:29	00:00:00	00:00:00	00:00:00

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Free time use efficiency report

5 May - 11 May 2014

Machine	5-May-14			6-May-14			7-May-14			8-May-14			9-May-14			10-May-14			11-May-14			Average
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	
Filler				52%	70%					80%	85%		57%	62%	0%							
Labeller				72%	68%					98%	72%		76%	73%								
Variopak				82%	86%					87%	92%		54%	84%								
Wrapapak																						
Palitiser															0%	0%	0%	0%				0
Stretch wrap															0%	0%	0%	0%				0
Forklift															0%	0%	0%	0%				0
Average				69%	75%					88%	83%		62%	73%								

12 May - 18 May 2014

Machine	12-May-14			13-May-14			14-May-14			15-May-14			16-May-14			17-May-14			18-May-14			Average
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	
Filler		62%		54%	73%		83%	61%		74%	88%		62%	72%	0%	72%	64%					
Labeller		70%		89%	63%		98%	84%		72%	82%		80%	86%		42%	82%					
Variopak		88%		94%	70%		54%	81%		68%	72%		65%	82%		23%	84%					
Wrapapak																						
Palitiser																						0
Stretch wrap																						0
Forklift																						0
Average		73%		79%	69%		78%	75%		71%	81%		69%	80%		46%	77%					

19 May - 25 May 2014

Machine	19-May-14			20-May-14			21-May-14			22-May-14			23-May-14			24-May-14			25-May-14			Average
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	
Filler	62%	97%		98%			94%	92%		98%	99%		0%	99%	0%							
Labeller	70%	94%		94%			98%	98%		99%	98%			99%								
Variopak	89%	90%		98%			97%	94%		99%	100%			100%								
Wrapapak																						
Palitiser																						0
Stretch wrap																						0
Forklift																						0
Average	74%	94%		97%			96%	95%		99%	99%			99%								

26 May - 1 June 2014

Machine	26-May-14			27-May-14			28-May-14			29-May-14			30-May-14			31-May-14			1-Jun-14			Average
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	
Filler	72%	96%		85%	82%		94%	95%		97%	82%		84%	73%	0%	81%	72%					
Labeller	98%	97%		95%	80%		86%	96%		62%	79%		92%	94%		88%	96%					
Variopak	99%	91%		91%	96%		89%	91%		94%	94%		82%	91%		92%	94%					
Wrapapak																						
Palitiser																		0%				0
Stretch wrap																		0%				0
Forklift																		0%				0
Average	90%	95%		90%	86%		90%	94%		84%	85%		86%	86%		87%	87%					

2 June -8 June 2014

Machine	2-Jun-14			3-Jun-14			4-Jun-14			5-Jun-14			6-Jun-14			7-Jun-14			8-Jun-14			Average
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	
Filler		84%		70%	96%			69%		82%	92%		0%	0%	0%							
Labeller		97%		94%	98%			80%		98%	94%											
Variopak		91%		99%	97%			99%		92%	96%											
Wrapapak																						
Palitiser																		0%				0
Stretch wrap																		0%				0
Forklift																		0%				0
Average		91%		88%	97%			83%		91%	94%											

9 June - 15 June 2014

Machine	9-Jun-14			10-Jun-14			11-Jun-14			12-Jun-14			13-Jun-14			14-Jun-14			15-Jun-14			Average
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	
Filler	72%	97%		92%	84%		63%	97%		85%	94%		73%	87%	0%	94%	98%					
Labeller	99%	77%		98%	79%		99%	99%		96%	85%		94%	99%		90%	94%					
Variopak	100%	93%		93%	95%		100%	96%		92%	92%		100%	74%		96%	96%					
Wrapapak																						
Palitiser																						0
Stretch wrap																						0
Forklift																						0
Average	90%	89%		94%	86%		87%	97%		91%	90%		89%	87%		93%	96%					

16 June - 22 June 2014

Machine	16-Jun-14			17-Jun-14			18-Jun-14			19-Jun-14			20-Jun-14			21-Jun-14			22-Jun-14			Average
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	
Filler					82%		94%	95%		98%	95%		91%	91%	0%							
Labeller					94%		98%	87%		97%	96%		91%	97%								
Variopak					91%		97%	84%		95%	91%		96%	91%								
Wrapapak																						
Palitiser																	0%	0%				0%
Stretch wrap																	0%	0%				0%
Forklift																	0%	0%				0%
Average					89%		96%	89%		97%	94%		93%	93%								

23 June - 29 June 2014

Machine	23-Jun-14			24-Jun-14			25-Jun-14			26-Jun-14			27-Jun-14			28-Jun-14			29-Jun-14			Average
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	
Filler		91%	98%	98%	93%	87%	97%	95%	84%		93%	86%	0%	87%	92%	97%	94%	74%				
Labeller		91%	42%	65%	100%	100%	98%	86%	78%		65%	98%		98%	98%	98%	99%	84%				
Variopak		91%	49%	69%	97%	97%	96%	83%	94%		95%	73%		93%	100%	96%	93%	73%				
Wrapapak																						
Palitiser																						0%
Stretch wrap																						0%
Forklift																						0%
Average		91%	63%	77%	97%	95%	97%	88%	85%		84%	86%		93%	97%	97%	95%	77%				

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Daily Operational Report

Training date	Pre intervention	Post Intervention	Pack changes	Break downs

Cases	5-May-14			6-May-14			7-May-14			8-May-14			9-May-14			10-May-14			11-May-14		
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night
330 ml				0	0	0				0	0	0	0	0	0						
500 ml				4116	8820	0				8316	11592	0	6552	4368	0						
1000 ml				0	0	0				0	0	0	0	0	0						
1500 ml				0	0	0				0	0	0	0	0	0						
Total	0	0	0	4116	8820	0	0	0	0	8316	11592	0	6552	4368	0	0	0	0	0	0	0
Efficiency				29.61%	66.78%					61.11%	86.31%		49.77%	32.13%							

Cases	12-May-14			13-May-14			14-May-14			15-May-14			16-May-14			17-May-14			18-May-14		
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night
330 ml	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
500 ml	0	0	0	0	0	0	1428	6972	0	4620	0	0	0	0	0	0	0	0			
1000 ml	0	4275	0	1725	9375	0	0	0	0	0	0	0	0	0	0	0	0	0			
1500 ml	0	0	0	0	0	0	0	0	0	0	4125	0	6050	12210	0	7810	10340	0			
Total	0	4275	0	1725	9375	0	1428	6972	0	4620	4125	0	6050	12210	0	7810	10340	0	0	0	0
Efficiency		23.30%		8.44%	49.82%		9.45%	52.92%		34.02%	24.92%		37.38%	75.09%		47.48%	63.98%				

Cases	19-May-14			20-May-14			21-May-14			22-May-14			23-May-14			24-May-14			25-May-14		
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night
330 ml	2400	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
500 ml	0	3612	0	5880	0	0	5040	7224	0	6720	6300	0	0	6048	0						
1000 ml	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
1500 ml	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Total	2400	3612	0	5880	0	0	5040	7224	0	6720	6300	0	0	6048	0	0	0	0	0	0	0
Efficiency	17.10%	25.83%		44.73%			36.54%	54.81%		51.03%	45.99%			44.10%							

Cases	26-May-14			27-May-14			28-May-14			29-May-14			30-May-14			31-May-14			1-Jun-14		
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night
330 ml	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
500 ml	2268	10416	0	8568	10416	0	4284	8148	0	6552	4788	0	0	0	0	0	0	0			
1000 ml	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
1500 ml	0	0	0	0	0	0	0	0	0	385	0	0	8800	8305	0	8250	11000	0			
Total	2268	10416	0	8568	10416	0	4284	8148	0	6937	4788	0	8800	8305	0	8250	11000	0	0	0	0
Efficiency	17.64%	76.86%		64.89%	78.75%		33.39%	60.48%		50.76%	36.54%		53.54%	51.52%		50.17%	68.02%				

Cases	2-Jun-14			3-Jun-14			4-Jun-14			5-Jun-14			6-Jun-14			7-Jun-14			8-Jun-14		
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night
330 ml	0	0	0	0	0	0	0	0	0	0	0	0									
500 ml	0	0	0	4368	10332	0	0	924	0	9828	11424	0									
1000 ml	0	9600	0	0	0	0	0	0	0	0	0	0									
1500 ml	0	0	0	0	0	0	0	0	0	0	0	0									
Total	0	9600	0	4368	10332	0	0	924	0	9828	11424	0	0	0	0	0	0	0	0	0	0
Efficiency		50.22%		33.39%	76.23%			6.93%		74.34%	86.94%										

Cases	9-Jun-14			10-Jun-14			11-Jun-14			12-Jun-14			13-Jun-14			14-Jun-14			15-Jun-14		
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night
330 ml	0	0	0	0	0	0	3600	9000	0	7320	8400	0	0	0	0	0	0	0			
500 ml	3696	10836	0	7980	12096	0	168	0	0	0	0	0	0	0	0	0	0	0			
1000 ml	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
1500 ml	0	0	0	0	0	0	0	0	0	0	0	0	3740	11385	0	7700	10450	0			
Total	3696	10836	0	7980	12096	0	3768	9000	0	7320	8400	0	3740	11385	0	7700	10395	0	0	0	0
Efficiency	27.09%	82.53%		60.48%	91.35%		29.16%	68.40%		54.00%	61.20%		22.56%	70.04%		47.48%	63.64%				

Cases	16-Jun-14			17-Jun-14			18-Jun-14			19-Jun-14			20-Jun-14			21-Jun-14			22-Jun-14		
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night
330 ml				0	3480	0	0	0	0	0	0	0	0	0	0						
500 ml				0	0	0	1764	7308	0	9156	5628	0	9240	9744	0						
1000 ml				0	0	0	0	0	0	0	0	0	0	0	0						
1500 ml				0	0	0	0	0	0	0	0	0	0	0	0						
Total	0	0	0	0	3480	0	1764	7308	0	9156	5628	0	9240	9744	0	0	0	0	0	0	0
Efficiency					25.20%		11.97%	55.44%		69.30%	40.95%		69.93%	72.45%							

Cases	23-Jun-14			24-Jun-14			25-Jun-14			26-Jun-14			27-Jun-14			28-Jun-14			29-Jun-14		
	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night	Morning	Afternoon	Night
330 ml	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
500 ml	0	0	0	0	0	0	3948	7308	5376	0	8988	9744	0	9996	11508	11256	7308	5796			
1000 ml	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
1500 ml	0	7425	9020	11275	11550	9680	0	0	0	0	0	0	0	0	0	0	0	0			
Total	0	7425	9020	11275	11550	9680	3948	7308	5376	0	8988	9744	0	9996	11508	11256	7308	5796	0	0	0
Efficiency		44.79%	54.55%	69.37%	71.39%	59.60%	28.98%	56.07%	40.95%		68.67%	72.45%		74.34%	87.57%	83.79%	55.44%	42.84%			

APPENDIX F:

QUALITATIVE STUDY QUESTIONNAIRE

Productive use of Free time (PUFT)

May 2014

-Questionnaire-

ASSESSING PRODUCTION LINE OPERATOR'S RESPONSE TO THE FREE TIME TOOL

Do you know what the PUFT (Productive Use of Free Time) tool is?

I. Yes ☐

II. No ☐

If you answer is NO please do not complete this survey. Thank you for your time.

If Yes

Thank you for agreeing to take this survey. The survey is being done by Casper Durandt for his studies at the University of Stellenbosch. The purpose of the survey is to collect opinions from the production operators and supervisors that have been exposed to and have operated on the Free time tool implemented on the production line at the plant.

All of the answers you provide in this survey will be kept confidential. No identifying information will be provided to the readers of the thesis or the management of the plant without prior consent. The survey data will be reported in a summary fashion only and will not identify any individual person.

This survey will take about 10 minutes to complete.

1. Please indicate your category details

I.	Male	Female		
II.	0 – 2 years service	2 – 5 years service	5 - 10 years service	10 years service
III.	< 20 years old	20 – 30 years old	30 – 40 years old	> 40 years old
IV.	< Matric	Matric or Equivalent	Technicon or Collage	Degree

THE FREE TIME EXPERIMENT WAS SPECIFICALLY DESIGNED TO IMPROVE THE OPERATING ENVIRONMENT OF THE PRODUCTION OPERATOR. FREE TIME IS AVAILABLE TO OPERATORS DURING PRODUCTION AND THE ABILITY TO SHARE THIS FREE TIME WITH OTHER OPERATORS IS BEING STUDIED. IT IS INTENDED FOR THIS PROGRAM TO EVENTUALLY PRODUCE A COMMERCIAL SOLUTION FOR USE BY PRODUCTION OPERATORS IN MANY OTHER APPLICATIONS

2. Based on what your experience with the free time tool, do you think the tool is useful?

I. Definitely yes ☐
II. Probably yes ☐
III. Probably no ☐
IV. Definitely no ☐

3. When thinking about the free time tool, do you agree or disagree with the following statements? (Mark with a X)

	Strongly agree	Agree	Disagree	Strongly disagree
A. The use of the free time tool will lead to improved production efficiency				
B. I think the tool will help me manage my time during production better				
C. This is a new tool and have not seen it anywhere else before				
D. This tool will pay back the time and money invested in its creation				
E. This tool should be shared with more production lines				

4. Having participated in the in the free time introduction, do you agree or disagree with the following statements? (Mark with a X)

	Strongly agree	Agree	Disagree	Strongly disagree
A. I am trained and know what is expected of me				
B. I want the free time program to continue				
C. I would like to see the effect the productive use of free time has on efficiency of the production line				

5. How often have you used the free time tool?

I. More than once per day ☐

II. Every day ☐

III. Only a few times ☐

IV. Never ☐

6. How important would the following be to you?

	Very important	Somewhat important	Not very important	Not important at all
A. Free time tasks must be available				
B. Management must measure the free time used and				
C. I want to see my production machine free time on my smartphone or tablet				
D. Management must reward me for using free time				

7. Now that you've had a chance to think more about the free time program, do you think you will be using it more?

I. Definitely yes ☐
II. Probably yes ☐
III. Probably no ☐
IV. Definitely no ☐

8. Based on what you know today, would you recommend other production lines to implement the free time program?

I. Definitely yes ☐
II. Probably yes ☐
III. Probably no ☐
IV. Definitely no ☐

APPENDIX G:

PROGRAMMING SOFTWARE CODE EXTRACT

Utils

```
<?php if ( ! defined('BASEPATH')) exit('No direct script access allowed');

class Utils extends CI_Controller
{
  function Utils()
  {
    parent::__construct();

    $this->load->model('puft_model');
  }

  function index()
  {
    $data['title'] = 'Util Options';
    $data['main_content'] = 'utils/plc_simulator';

    $this->load->vars($data);
    $this->load->view('utils/index',$data);
  }

  function plc_reader()
  {
    $data['title'] = 'PLC Reader';

    $this->load->vars($data);
    $this->load->view('utils/plc_reader', $data);
  }

  function plc_1_iframe()
  {
    $this->load->view('utils/plc_1');
  }

  function plc_2_iframe()
  {
    $this->load->view('utils/plc_2');
  }

  function plc_3_iframe()
  {
    $this->load->view('utils/plc_3');
  }

  function plc_4_iframe()
  {
    $this->load->view('utils/plc_4');
  }

  function plc_5_iframe()
  {
    $this->load->view('utils/plc_5');
  }
```

```
function plc_6_iframe()
{
  $this->load->view('utils/plc_6');
}

function plc_7_iframe()
{
  $this->load->view('utils/plc_7');
}

function plc_reader_set_time()
{
  $plc_number = $this->uri->segment(3);

  $get_time_now = date("Y-m-d H:i:s");
  $tsp_time_now = strtotime($get_time_now);

  $the_second = substr($get_time_now, -1);

  if ($the_second > 0 && $the_second <= 5)
  {
    $a = 5 - $the_second;
    $b = $tsp_time_now + $a;
  }
  else if ($the_second > 5 && $the_second <= 9)
  {
    $a = 10 - $the_second;
    $b = $tsp_time_now + $a;
  }
  else
  {
    $b = $tsp_time_now;
  }

  $c = date("Y-m-d H:i:s", $b);
  echo "XXX: $the_second > $c ";

  die();

  switch ($plc_number)
  {
    case "1":
      redirect('utils/plc_1_start');
      break;
  }
}

function plc_reader_start()
{
  $msg = '1:';
  $contoller_data = $this->puft_model->getContollerData();

  $c1_ip = $contoller_data[0]['c_ip'];
  $c1_uid = $contoller_data[0]['c_unit_id'];
  $c1_uadd = $contoller_data[0]['c_unit_add'];
```

```
  $c2_ip = $contoller_data[1]['c_ip'];
  $c2_uid = $contoller_data[1]['c_unit_id'];
  $c2_uadd = $contoller_data[1]['c_unit_add'];

  $c3_ip = $contoller_data[2]['c_ip'];
  $c3_uid = $contoller_data[2]['c_unit_id'];
  $c3_uadd = $contoller_data[2]['c_unit_add'];

  $c4_ip = $contoller_data[3]['c_ip'];
  $c4_uid = $contoller_data[3]['c_unit_id'];
  $c4_uadd = $contoller_data[3]['c_unit_add'];

  $c5_ip = $contoller_data[4]['c_ip'];
  $c5_uid = $contoller_data[4]['c_unit_id'];
  $c5_uadd = $contoller_data[4]['c_unit_add'];

  $c6_ip = $contoller_data[5]['c_ip'];
  $c6_uid = $contoller_data[5]['c_unit_id'];
  $c6_uadd = $contoller_data[5]['c_unit_add'];

  $c7_ip = $contoller_data[6]['c_ip'];
  $c7_uid = $contoller_data[6]['c_unit_id'];
  $c7_uadd = $contoller_data[6]['c_unit_add'];


  require_once APPPATH . '/Phpmodbus/ModbusMaster.php';

  $c1_connection = new ModbusMaster($c1_ip, "TCP");
  $c2_connection = new ModbusMaster($c2_ip, "TCP");
  $c3_connection = new ModbusMaster($c3_ip, "TCP");
  $c4_connection = new ModbusMaster($c4_ip, "TCP");
  $c5_connection = new ModbusMaster($c5_ip, "TCP");
  $c6_connection = new ModbusMaster($c6_ip, "TCP");
  $c7_connection = new ModbusMaster($c7_ip, "TCP");

  echo '1:c1_m1, 999, 999 ||| c1_m2, 999, 999';
}

function plc_1_view()
{
  $this->load->view('utils/plc_1');
}

function plc_2_view()
{
  $this->load->view('utils/plc_2');
}

function plc_3_view()
{
  $this->load->view('utils/plc_3');
}

function plc_4_view()
{
  $this->load->view('utils/plc_4');
}
```

```
function plc_5_view()
{
  $this->load->view('utils/plc_5');
}

function plc_6_view()
{
  $this->load->view('utils/plc_6');
}

function plc_7_view()
{
  $this->load->view('utils/plc_7');
}

function plc_1_start()
{
  $msg = '1:';
  $contoller_data = $this->puft_model->getContollerData();

  $c1_ip = $contoller_data[0]['c_ip'];
  $c1_uid = $contoller_data[0]['c_unit_id'];
  $c1_uadd = $contoller_data[0]['c_unit_add'];

  require_once APPPATH . '/Phpmodbus/ModbusMaster.php';

  $c1_connection = new ModbusMaster($c1_ip, "TCP");

  try
  {
    /* Testing scenario */
    /*
    $this->db->query("TRUNCATE `c7_m2_data`;");
    $query = $this->db->query("SELECT * FROM c7_m2_raw ORDER BY id ASC");

    if ($query->num_rows() > 0)
    {
      foreach ($query->result_array() as $row)
      {
        $c1_m1_r1 = $row['reg_1'];
        $c1_m1_r2 = $row['reg_2'];
        $read_time = $row['read_time'];

        $this->regAnalyserTest('c7_m2_data', $c1_m1_r1, $c1_m1_r2, 7, $read_time);
      }
    }
    $query->free_result();
    */
    /* End testing scenario */

    /* LIVE */
    $c1_data = $c1_connection->readMultipleRegisters($c1_uid,$c1_uadd, 100);
    //$c1_data                                                                    =
array(0,0,0,0,0,0,0,0,111,111,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,140,141);

    $c1_m1_r1 = $c1_data['8'];
```

```
      $c1_m1_r2 = $c1_data['9'];
      // C1M2
      $c1_m2_r1 = $c1_data['40'];
      $c1_m2_r2 = $c1_data['41'];

      $msg .= "1:c1_m1, $c1_m1_r1, $c1_m1_r2 ||| c1_m2, $c1_m2_r1, $c1_m2_r2";
      /* LIVE */
    }
    catch (Exception $a )
    {
      // C1M1
      $c1_m1_r1 = '999';
      $c1_m1_r2 = '999';
      // C1M2
      $c1_m2_r1 = '999';
      $c1_m2_r2 = '999';

      $msg .= "c1_m1, 999, 999 ||| c1_m2, 999, 999";
    }

    /* LIVE */
    // Call function analyze the registers
    $this->puft_model->regAnalyser('c1_m1_data', $c1_m1_r1, $c1_m1_r2, 1);
    $this->puft_model->regAnalyser('c1_m2_data', $c1_m2_r1, $c1_m2_r2, 1);

    echo $msg;
    /* LIVE */
  }

  function plc_2_start()
  {
    $msg = '1:';

    $contoller_data = $this->puft_model->getContollerData();

    $c2_ip = $contoller_data[1]['c_ip'];
    $c2_uid = $contoller_data[1]['c_unit_id'];
    $c2_uadd = $contoller_data[1]['c_unit_add'];

    require_once APPPATH . '/Phpmodbus/ModbusMaster.php';

    $c2_connection = new ModbusMaster($c2_ip, "TCP");

    try
    {
      $c2_data = $c2_connection->readMultipleRegisters($c2_uid, $c2_uadd, 100);
      //$c2_data                                                          =
array(0,0,0,0,0,0,0,0,222,222,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,240,241);

      $c2_m1_r1 = $c2_data['8'];
      $c2_m1_r2 = $c2_data['9'];
      // C2M2
      $c2_m2_r1 = $c2_data['40'];
      $c2_m2_r2 = $c2_data['41'];

      $msg .= "1:c2_m1, $c2_m1_r1, $c2_m1_r2 ||| c2_m2, $c2_m2_r1, $c2_m2_r2";
    }
```

```
    catch (Exception $a )
    {
      // C1M1
      $c2_m1_r1 = '999';
      $c2_m1_r2 = '999';
      // C1M2
      $c2_m2_r1 = '999';
      $c2_m2_r2 = '999';

      $msg .= "c2_m1, 999, 999 ||| c2_m2, 999, 999";
    }

    // Call function analyze the registers
    $this->puft_model->regAnalyser('c2_m1_data', $c2_m1_r1, $c2_m1_r2, 1);
    $this->puft_model->regAnalyser('c2_m2_data', $c2_m2_r1, $c2_m2_r2, 1);

    echo $msg;
  }

  function plc_3_start()
  {
    $msg = '1:';

    $contoller_data = $this->puft_model->getContollerData();

    $c3_ip = $contoller_data[2]['c_ip'];
    $c3_uid = $contoller_data[2]['c_unit_id'];
    $c3_uadd = $contoller_data[2]['c_unit_add'];

    require_once APPPATH . '/Phpmodbus/ModbusMaster.php';

    $c3_connection = new ModbusMaster($c3_ip, "TCP");

    try
    {
      $c3_data = $c3_connection->readMultipleRegisters($c3_uid,$c3_uadd, 100);
      //$c3_data                                                                 =
array(0,0,0,0,0,0,0,0,333,333,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,340,341);

      // C3M1
      $c3_m1_r1 = $c3_data['8'];
      $c3_m1_r2 = $c3_data['9'];
      // C3M2
      $c3_m2_r1 = $c3_data['40'];
      $c3_m2_r2 = $c3_data['41'];

      $msg .= "c3_m1, $c3_m1_r1, $c3_m1_r2 ||| c3_m2, $c3_m2_r1, $c3_m2_r2";
    }
    catch (Exception $a )
    {
      // C1M1
      $c3_m1_r1 = '999';
      $c3_m1_r2 = '999';
      // C1M2
      $c3_m2_r1 = '999';
      $c3_m2_r2 = '999';
```

```
      $msg .= "c3_m1, 999, 999 ||| c3_m2, 999, 999";
    }

    // Call function analyze the registers
    $this->puft_model->regAnalyser('c3_m1_data', $c3_m1_r1, $c3_m1_r2, 1);
    $this->puft_model->regAnalyser('c3_m2_data', $c3_m2_r1, $c3_m2_r2, 1);

    echo $msg;
  }

  function plc_4_start()
  {
    $msg = '1:';
    $contoller_data = $this->puft_model->getContollerData();

    $c4_ip = $contoller_data[3]['c_ip'];
    $c4_uid = $contoller_data[3]['c_unit_id'];
    $c4_uadd = $contoller_data[3]['c_unit_add'];

    require_once APPPATH . '/Phpmodbus/ModbusMaster.php';

    $c4_connection = new ModbusMaster($c4_ip, "TCP");

    try
    {
      $c4_data = $c4_connection->readMultipleRegisters($c4_uid,$c4_uadd, 100);
      //$c4_data                                                              =
array(0,0,0,0,0,0,0,0,444,444,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,440,441);

      // C4M1
      $c4_m1_r1 = $c4_data['8'];
      $c4_m1_r2 = $c4_data['9'];
      // C4M2
      $c4_m2_r1 = $c4_data['40'];
      $c4_m2_r2 = $c4_data['41'];

      $msg .= "c4_m1, $c4_m1_r1, $c4_m1_r2 ||| c4_m2, $c4_m2_r1, $c4_m2_r2";
    }
    catch (Exception $a )
    {
      // C1M1
      $c4_m1_r1 = '999';
      $c4_m1_r2 = '999';
      // C1M2
      $c4_m2_r1 = '999';
      $c4_m2_r2 = '999';

      $msg .= "c4_m1, 999, 999 ||| c4_m2, 999, 999";
    }

    // Call function analyze the registers
    $this->puft_model->regAnalyser('c4_m1_data', $c4_m1_r1, $c4_m1_r2, 1);
    $this->puft_model->regAnalyser('c4_m2_data', $c4_m2_r1, $c4_m2_r2, 1);

    echo $msg;
  }
```

```
function plc_5_start()
{
  $msg = '1:';

  $contoller_data = $this->puft_model->getContollerData();

  $c5_ip = $contoller_data[4]['c_ip'];
  $c5_uid = $contoller_data[4]['c_unit_id'];
  $c5_uadd = $contoller_data[4]['c_unit_add'];

  require_once APPPATH . '/Phpmodbus/ModbusMaster.php';

  $c5_connection = new ModbusMaster($c5_ip, "TCP");

  try
  {
    $c5_data = $c5_connection->readMultipleRegisters($c5_uid,$c5_uadd, 100);
    //$c5_data                                                              =
array(0,0,0,0,0,0,0,0,555,555,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,540,541);

    // C5M1
    $c5_m1_r1 = $c5_data['8'];
    $c5_m1_r2 = $c5_data['9'];
    // C4M2
    $c5_m2_r1 = $c5_data['40'];
    $c5_m2_r2 = $c5_data['41'];

    $msg .= "c5_m1, $c5_m1_r1, $c5_m1_r2 ||| c5_m2, $c5_m2_r1, $c5_m2_r2";
  }
  catch (Exception $a )
  {
    // C1M1
    $c5_m1_r1 = '999';
    $c5_m1_r2 = '999';
    // C1M2
    $c5_m2_r1 = '999';
    $c5_m2_r2 = '999';

    $msg .= "c5_m1, 999, 999 ||| c5_m2, 999, 999";
  }

  // Call function analyze the registers
  $this->puft_model->regAnalyser('c5_m1_data', $c5_m1_r1, $c5_m1_r2, 1);
  $this->puft_model->regAnalyser('c5_m2_data', $c5_m2_r1, $c5_m2_r2, 1);

  echo $msg;
}

function plc_6_start()
{
  $msg = '1:';

  $contoller_data = $this->puft_model->getContollerData();

  $c6_ip = $contoller_data[5]['c_ip'];
  $c6_uid = $contoller_data[5]['c_unit_id'];
  $c6_uadd = $contoller_data[5]['c_unit_add'];
```

```
    require_once APPPATH . '/Phpmodbus/ModbusMaster.php';

    $c6_connection = new ModbusMaster($c6_ip, "TCP");

    try
    {
      $c6_data = $c6_connection->readMultipleRegisters($c6_uid,$c6_uadd, 100);
      //$c6_data                                                              =
array(0,0,0,0,0,0,0,0,666,666,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,640,641);

      // C5M1
      $c6_m1_r1 = $c6_data['8'];
      $c6_m1_r2 = $c6_data['9'];
      // C4M2
      $c6_m2_r1 = $c6_data['40'];
      $c6_m2_r2 = $c6_data['41'];

      $msg .= "c6_m1, $c6_m1_r1, $c6_m1_r2 ||| c6_m2, $c6_m2_r1, $c6_m2_r2";
    }
    catch (Exception $a )
    {
      // C1M1
      $c6_m1_r1 = '999';
      $c6_m1_r2 = '999';
      // C1M2
      $c6_m2_r1 = '999';
      $c6_m2_r2 = '999';

      $msg .= "c6_m1, 999, 999 ||| c6_m2, 999, 999";
    }

    // Call function analyze the registers
    $this->puft_model->regAnalyser('c6_m1_data', $c6_m1_r1, $c6_m1_r2, 1);
    $this->puft_model->regAnalyser('c6_m2_data', $c6_m2_r1, $c6_m2_r2, 1);

    echo $msg;
  }

  function plc_7_start()
  {
    $msg = '1:';

    $contoller_data = $this->puft_model->getContollerData();

    $c7_ip = $contoller_data[6]['c_ip'];
    $c7_uid = $contoller_data[6]['c_unit_id'];
    $c7_uadd = $contoller_data[6]['c_unit_add'];

    require_once APPPATH . '/Phpmodbus/ModbusMaster.php';

    $c7_connection = new ModbusMaster($c7_ip, "TCP");

    try
    {
      $c7_data = $c7_connection->readMultipleRegisters($c7_uid,$c7_uadd, 100);
```

```
    //$c7_data                                                                                    =
array(0,0,0,0,0,0,0,0,777,777,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,740,741);

    // C7M1
    $c7_m1_r1 = $c7_data['8'];
    $c7_m1_r2 = $c7_data['9'];
    // C7M2
    $c7_m2_r1 = $c7_data['40'];
    $c7_m2_r2 = $c7_data['41'];

    $msg .= "c7_m1, $c7_m1_r1, $c7_m1_r2 ||| c7_m2, $c7_m2_r1, $c7_m2_r2";
   }
   catch (Exception $a )
   {
    // C1M1
    $c7_m1_r1 = '999';
    $c7_m1_r2 = '999';
    // C1M2
    $c7_m2_r1 = '999';
    $c7_m2_r2 = '999';

    $msg .= "c7_m1, 999, 999 ||| c7_m2, 999, 999";
   }

   // Call function analyze the registers
   $this->puft_model->regAnalyser('c7_m1_data', $c7_m1_r1, $c7_m1_r2, 1);
   $this->puft_model->regAnalyser('c7_m2_data', $c7_m2_r1, $c7_m2_r2, 1);

   echo $msg;
  }
}
```

Main

```
<?php if ( ! defined('BASEPATH')) exit('No direct script access allowed');

class Main extends CI_Controller
{
  function Main()
  {
   parent::__construct();

   $this->load->model('puft_model');
                        $this->config->load('puft_config');
  }

  function index()
  {
   $now_ts = strtotime(date("D-m-y H:i:s"));

   $this->session->set_userdata('$m1_time_id', '0');
   $this->session->set_userdata('$m2_time_id', '0');
   $this->session->set_userdata('$m3_time_id', '0');
   $this->session->set_userdata('$m4_time_id', '0');
   $this->session->set_userdata('$m5_time_id', '0');
   $this->session->set_userdata('$m6_time_id', '0');
   $this->session->set_userdata('$m7_time_id', '0');
   $this->session->set_userdata('$m8_time_id', '0');
   $this->session->set_userdata('$m9_time_id', '0');
```

```
  $this->session->set_userdata('auto_new_shift', '0');
                    $this->session->set_userdata('send_curl_ctr', '0');
  $this->session->set_userdata('efficiency', '0');
  $this->session->set_userdata('drone', '');
  $this->session->set_userdata('drone_flag', '0');
  $this->session->set_userdata('cons_check', '0');
  $this->session->set_userdata('cons_red', 'n');
  $this->session->set_userdata('cons_red_id', '');
  $this->session->set_userdata('prod_set_refresh', '0');
  $this->session->set_userdata('enthalpy_alert', $now_ts);

  if ($this->session->userdata('mfd'))
  {

  }
  else
  {
    $this->session->set_userdata('mfd', '1');
    $this->session->set_userdata('m1_mfs', '0');
    $this->session->set_userdata('m2_mfs', '0');
    $this->session->set_userdata('m3_mfs', '0');
    $this->session->set_userdata('m4_mfs', '0');
    $this->session->set_userdata('m5_mfs', '0');
    $this->session->set_userdata('m6_mfs', '0');
    $this->session->set_userdata('m7_mfs', '0');
  }

  $data['title'] = 'Production Line Monitor';
  $data['main_content'] = 'main/index';

  // Fetch accumlator info
  $data['acm_data'] = $this->puft_model->getAccumulators();

  // Fetch machine info
  $data['mch_data'] = $this->puft_model->getMachines();

  $this->load->vars($data);
  $this->load->view('main/index',$data);
}

function prodLineData()
{
  // Variables
  $machine_data = array();

  // Check for pred set change
  $prod_set_refresh = $this->session->userdata('prod_set_refresh');

  // Set record time
  $record_time = date("Y-m-d H:i:s");
  $ts_record_time = strtotime($record_time);
  //$ts_record_time = $ts_record_time - 10;
  $record_time = date("Y-m-d H:i:s", $ts_record_time);

  $this->session->set_userdata('record_time', $record_time);

  // Drone check & reset
```

```
    $this->puft_model->drone_reset();

    // Auto refresh
    $auto_new_shift_ctr = $this->session->userdata('auto_new_shift');
    if ($auto_new_shift_ctr == 120)
    {
      $this->puft_model->autoNewShift();
      $this->session->set_userdata('auto_new_shift', '0');
    }
    else
    {
      $auto_new_shift_ctr++;
      $this->session->set_userdata('auto_new_shift', $auto_new_shift_ctr);
    }

    // Get machine data
    $machine_data = $this->puft_model->getMachines();

    // Get data from tables for all 7 machines
    $m1_time_id = $this->puft_model->pld_get_time_record('c1_m1_data', $record_time, '1');
    $m2_time_id = $this->puft_model->pld_get_time_record('c2_m1_data', $record_time, '2');
    $m3_time_id = $this->puft_model->pld_get_time_record('c4_m1_data', $record_time, '3');
    $m4_time_id = $this->puft_model->pld_get_time_record('c5_m1_data', $record_time, '4');
    $m5_time_id = $this->puft_model->pld_get_time_record('c6_m1_data', $record_time, '5');
    $m6_time_id = $this->puft_model->pld_get_time_record('c7_m1_data', $record_time, '6');
    $m7_time_id = $this->puft_model->pld_get_time_record('c7_m2_data', $record_time, '7');

    // echo "XXX: $m1_time_id > $m2_time_id > $m3_time_id > $m4_time_id > $m5_time_id >
$m6_time_id > $m7_time_id";

    // MACHINES
    // Machine 1 Calcs
    $mch_1_speed = '0@0';
    $m1_recs = $this->puft_model->getMchSpeedRecords($m1_time_id, 'c1_m1_data', '4', '1');

    if (count($m1_recs) != 0)
    {
      $mch_1_speed = $this->calMchSpeed($m1_recs, $machine_data[0]['m_counting_multiplier'],
$machine_data[0]['m_type'], $machine_data[0]['m_rated_speed'], 'c1_m1_data');
      $mch_1_rtr = $this->puft_model->getRTR('1', $m1_time_id, 'c1_m1_data');
    }
    else
    {
      $mch_1_speed = '0@0';
      $mch_1_rtr = 0;
    }

    $mch_1_enthalpy = $machine_data[0]['m_enthalpy'];
    $mch_1_actin = $m1_recs[0]['act_in'];
    $mch_1_ft = seconds($machine_data[0]['m_ft']);
    $mch_1_cons_status = $machine_data[0]['m_cons_status'];
    $mch_1_cons_time = $machine_data[0]['m_cons_time'];
    $mch_1_rated_speed = $machine_data[0]['m_rated_speed'];

    // Machine 1 efficiency
    $mch_1_efficiency = $this->puft_model->getEfficiency($machine_data[0]['m_rated_speed']);
    $this->session->set_userdata('efficiency', $mch_1_efficiency);
```

```
    // Machine 2 Calcs
    $mch_2_speed = '0@0';
    $m2_recs = $this->puft_model->getMchSpeedRecords($m2_time_id, 'c2_m1_data', '4', '2');

    if (count($m2_recs) != 0)
    {
      $mch_2_speed  =  $this->calMchSpeed($m2_recs,  $machine_data[1]['m_counting_multiplier'],
$machine_data[1]['m_type'], $machine_data[1]['m_rated_speed'], 'c2_m1_data');
      $mch_2_rtr = $this->puft_model->getRTR('2', $m2_time_id, 'c2_m1_data');
    }
    else
    {
      $mch_2_speed = '0@0';
      $mch_2_rtr = 0;
    }

    $mch_2_enthalpy = $machine_data[1]['m_enthalpy'];
    $mch_2_actin = $m2_recs[0]['act_in'];
    $mch_2_ft = seconds($machine_data[1]['m_ft']);
                        $mch_2_cons_status = $machine_data[1]['m_cons_status'];
                        $mch_2_cons_time = $machine_data[1]['m_cons_time'];

    // Machine 3 Calcs
    $mch_3_speed = '0@0';
    $m3_recs = $this->puft_model->getMchSpeedRecords($m3_time_id, 'c4_m1_data', '4', '3');

    if (count($m3_recs) != 0)
    {
      $mch_3_speed  =  $this->calMchSpeed($m3_recs,  $machine_data[2]['m_counting_multiplier'],
$machine_data[2]['m_type'], $machine_data[2]['m_rated_speed'], 'c4_m1_data');
      $mch_3_rtr = $this->puft_model->getRTR('3', $m3_time_id, 'c4_m1_data');
    }
    else
    {
      $mch_3_speed = '0@0';
      $mch_3_rtr = 0;
    }

    $mch_3_enthalpy = $machine_data[2]['m_enthalpy'];
    $mch_3_actin = $m3_recs[0]['act_in'];
    $mch_3_ft = seconds($machine_data[2]['m_ft']);
                        $mch_3_cons_status = $machine_data[2]['m_cons_status'];
                        $mch_3_cons_time = $machine_data[2]['m_cons_time'];

    // Machine 4 Calcs
    $mch_4_speed = '0@0';
    $m4_recs = $this->puft_model->getMchSpeedRecords($m4_time_id, 'c5_m1_data', '4', '4');

    if (count($m4_recs) != 0)
    {
      $mch_4_speed  =  $this->calMchSpeed($m4_recs,  $machine_data[3]['m_counting_multiplier'],
$machine_data[3]['m_type'], $machine_data[3]['m_rated_speed'], 'c5_m1_data');
      $mch_4_rtr = $this->puft_model->getRTR('4', $m4_time_id, 'c5_m1_data');
    }
    else
    {
```

```
      $mch_4_speed = '0@0';
      $mch_4_rtr = 0;
    }

    $mch_4_enthalpy = $machine_data[3]['m_enthalpy'];
    $mch_4_actin = $m4_recs[0]['act_in'];
    $mch_4_ft = seconds($machine_data[3]['m_ft']);
                        $mch_4_cons_status = $machine_data[3]['m_cons_status'];
                        $mch_4_cons_time = $machine_data[3]['m_cons_time'];
                        $mch_4_multiplier = $machine_data[3]['m_counting_multiplier'];

    // Machine 5 Calcs
    $mch_5_speed = '0@0';
    $m5_recs = $this->puft_model->getMchSpeedRecords($m5_time_id, 'c6_m1_data', '4', '5');

    if (count($m5_recs) != 0)
    {
      $mch_5_speed = $this->calMchSpeed($m5_recs, $machine_data[4]['m_counting_multiplier'],
$machine_data[4]['m_type'], $machine_data[4]['m_rated_speed'], 'c6_m1_data');
      $mch_5_rtr = $this->puft_model->getRTR('5', $m5_time_id, 'c6_m1_data');
    }
    else
    {
      $mch_5_speed = '0@0';
      $mch_5_rtr = 0;
    }

    $mch_5_enthalpy = $machine_data[4]['m_enthalpy'];
    $mch_5_actin = $m5_recs[0]['act_in'];
    $mch_5_ft = seconds($machine_data[4]['m_ft']);
                        $mch_5_cons_status = $machine_data[4]['m_cons_status'];
                        $mch_5_cons_time = $machine_data[4]['m_cons_time'];

    // Machine 6 Calcs
    $mch_6_speed = '0@0';
    $m6_recs = $this->puft_model->getMchSpeedRecords($m6_time_id, 'c7_m1_data', '4', '6');

    if (count($m6_recs) != 0)
    {
      $mch_6_speed = $this->calMchSpeed($m6_recs, $machine_data[5]['m_counting_multiplier'],
$machine_data[5]['m_type'], $machine_data[5]['m_rated_speed'], 'c7_m1_data');
      $mch_6_rtr = $this->puft_model->getRTR('6', $m6_time_id, 'c7_m1_data');
    }
    else
    {
      $mch_6_speed = '0@0';
      $mch_6_rtr = 0;
    }

    $mch_6_enthalpy = $machine_data[5]['m_enthalpy'];
    $mch_6_actin = $m6_recs[0]['act_in'];
    $mch_6_ft = seconds($machine_data[5]['m_ft']);
                        $mch_6_cons_status = $machine_data[5]['m_cons_status'];
                        $mch_6_cons_time = $machine_data[5]['m_cons_time'];
                        $mch_6_multiplier = $machine_data[5]['m_counting_multiplier'];

    // Machine 7 Calcs
```

```
    $mch_7_speed = '0@0';
    $m7_recs = $this->puft_model->getMchSpeedRecords($m7_time_id, 'c7_m2_data', '4', '7');

    if (count($m7_recs) != 0)
    {
      $mch_7_speed  =  $this->calMchSpeed($m7_recs,  $machine_data[6]['m_counting_multiplier'],
$machine_data[6]['m_type'], $machine_data[6]['m_rated_speed'], 'c7_m2_data');
      $mch_7_rtr = $this->puft_model->getRTR('7', $m7_time_id, 'c7_m2_data');
    }
    else
    {
      $mch_7_speed = '0@0';
      $mch_7_rtr = 0;
    }

    $mch_7_enthalpy = $machine_data[6]['m_enthalpy'];
    $mch_7_actin = $m7_recs[0]['act_in'];
    $mch_7_ft = seconds($machine_data[6]['m_ft']);
                        $mch_7_cons_status = $machine_data[6]['m_cons_status'];
                        $mch_7_cons_time = $machine_data[6]['m_cons_time'];

    // Machine freetime efficiency
    $reset_flag = '0';
    $shift_times = $this->puft_model->getMFEShifts();
    $the_now_time = strtotime(date("H:i:s"));

    for ($i = 0; $i < count($shift_times); $i++)
    {
      $get_shift_time = $shift_times[$i]['from_time'];
      $the_shift_time = strtotime($get_shift_time);

      $diff = $the_now_time - $the_shift_time;

      if ($diff > -6 && $diff < 6)
      {
        $reset_flag++;
      }
    }

    if ($reset_flag > 0)
    {
      $this->session->set_userdata('mfd', '1');
      $this->session->set_userdata('m1_mfs', '0');
      $this->session->set_userdata('m2_mfs', '0');
      $this->session->set_userdata('m3_mfs', '0');
      $this->session->set_userdata('m4_mfs', '0');
      $this->session->set_userdata('m5_mfs', '0');
      $this->session->set_userdata('m6_mfs', '0');
      $this->session->set_userdata('m7_mfs', '0');

      $m1_mfe = 0;
      $m2_mfe = 0;
      $m3_mfe = 0;
      $m4_mfe = 0;
      $m5_mfe = 0;
      $m6_mfe = 0;
      $m7_mfe = 0;
```

```
    }
    else
    {
      $mfd = $this->session->userdata('mfd');
      $mfd++;
      $this->session->set_userdata('mfd', $mfd);

      // Calculate the MFS
      $m1_mfe = $this->puft_model->getMachineMFE('1', $machine_data[0]['m_cons_status'], $machine_data[0]['m_cons_time'], $machine_data[0]['m_cons_start'], $machine_data[0]['m_ft'], $mch_1_speed);
      $m2_mfe = $this->puft_model->getMachineMFE('2', $machine_data[1]['m_cons_status'], $machine_data[1]['m_cons_time'], $machine_data[1]['m_cons_start'], $machine_data[1]['m_ft'], $mch_2_speed);
      $m3_mfe = $this->puft_model->getMachineMFE('3', $machine_data[2]['m_cons_status'], $machine_data[2]['m_cons_time'], $machine_data[2]['m_cons_start'], $machine_data[2]['m_ft'], $mch_3_speed);
      $m4_mfe = $this->puft_model->getMachineMFE('4', $machine_data[3]['m_cons_status'], $machine_data[3]['m_cons_time'], $machine_data[3]['m_cons_start'], $machine_data[3]['m_ft'], $mch_4_speed);
      $m5_mfe = $this->puft_model->getMachineMFE('5', $machine_data[4]['m_cons_status'], $machine_data[4]['m_cons_time'], $machine_data[4]['m_cons_start'], $machine_data[4]['m_ft'], $mch_5_speed);
      $m6_mfe = $this->puft_model->getMachineMFE('6', $machine_data[5]['m_cons_status'], $machine_data[5]['m_cons_time'], $machine_data[5]['m_cons_start'], $machine_data[5]['m_ft'], $mch_6_speed);
      $m7_mfe = $this->puft_model->getMachineMFE('7', $machine_data[6]['m_cons_status'], $machine_data[6]['m_cons_time'], $machine_data[6]['m_cons_start'], $machine_data[6]['m_ft'], $mch_7_speed);
    }


    // ACCUMULATORS
    $accumulator_data = $this->puft_model->getAccumulators();

    // Accumulator 1 Calcs
    $acc_1_vol = $this->getAccumulatorVol('c1_m1_data', 'c2_m1_data', $machine_data[0]['m_counting_multiplier'], $accumulator_data[0]['a_correction'], '1', $accumulator_data[0]['a_max_level'], $machine_data[1]['m_counting_multiplier'], $machine_data[0]['m_correction'], $machine_data[1]['m_correction'], $m1_time_id, $m2_time_id, $machine_data[0]['m_enthalpy'], $machine_data[1]['m_enthalpy']);
    $new_1_cq = $accumulator_data[0]['a_cq'];
    $scr_1_val = ceil(((($new_1_cq / $accumulator_data[0]['a_max_level']) * 100) * 12) - 20);
    $acc_1_corr = $accumulator_data[0]['a_correction'];

    // Accumulator 2 Calcs
    $acc_2_vol = $this->getAccumulatorVol('c2_m1_data', 'c4_m1_data', $machine_data[1]['m_counting_multiplier'], $accumulator_data[1]['a_correction'], '2', $accumulator_data[1]['a_max_level'], $machine_data[2]['m_counting_multiplier'], $machine_data[1]['m_correction'], $machine_data[2]['m_correction'], $m2_time_id, $m3_time_id, $machine_data[1]['m_enthalpy'], $machine_data[2]['m_enthalpy']);
    $new_2_cq = $accumulator_data[1]['a_cq'];
    $scr_2_val = ceil(((($new_2_cq / $accumulator_data[1]['a_max_level']) * 100) * 12) - 20);
    $acc_2_corr = $accumulator_data[1]['a_correction'];

    // Accumulator 3 Calcs
```

```
$acc_3_vol = $this->getAccumulatorVol('c4_m1_data', 'c5_m1_data', $machine_data[2]['m_counting_multiplier'], $accumulator_data[2]['a_correction'], '3', $accumulator_data[2]['a_max_level'], $machine_data[3]['m_counting_multiplier'], $machine_data[2]['m_correction'], $machine_data[3]['m_correction'], $m3_time_id, $m4_time_id, $machine_data[2]['m_enthalpy'], $machine_data[3]['m_enthalpy']);
$new_3_cq = $accumulator_data[2]['a_cq'];
$scr_3_val = ceil(((($new_3_cq / $accumulator_data[2]['a_max_level']) * 100) * 12) - 20);
$acc_3_corr = $accumulator_data[2]['a_correction'];

// Accumulator 4 Calcs
$acc_4_vol = $this->getAccumulatorVol('c5_m1_data', 'c6_m1_data', $machine_data[3]['m_counting_multiplier'], $accumulator_data[3]['a_correction'], '4', $accumulator_data[3]['a_max_level'], $machine_data[4]['m_counting_multiplier'], $machine_data[3]['m_correction'], $machine_data[4]['m_correction'], $m4_time_id, $m5_time_id, $machine_data[3]['m_enthalpy'], $machine_data[4]['m_enthalpy']);
$new_4_cq = $accumulator_data[3]['a_cq'];
$scr_4_val = ceil(((($new_4_cq / $accumulator_data[3]['a_max_level']) * 100) * 12) - 20);
$acc_4_corr = $accumulator_data[3]['a_correction'];

// Accumulator 5 Calcs
$acc_5_vol = $this->getAccumulatorVol('c6_m1_data', 'c7_m1_data', $machine_data[4]['m_counting_multiplier'], $accumulator_data[4]['a_correction'], '5', $accumulator_data[4]['a_max_level'], $machine_data[5]['m_counting_multiplier'], $machine_data[4]['m_correction'], $machine_data[5]['m_correction'], $m5_time_id, $m6_time_id, $machine_data[4]['m_enthalpy'], $machine_data[5]['m_enthalpy']);
$new_5_cq = $accumulator_data[4]['a_cq'];
$scr_5_val = ceil(((($new_5_cq / $accumulator_data[4]['a_max_level']) * 100) * 12) - 20);
$acc_5_corr = $accumulator_data[4]['a_correction'];

// Accumulator 5 Calcs
$acc_6_vol = $this->getAccumulatorVol('c7_m1_data', 'c7_m2_data', $machine_data[5]['m_counting_multiplier'], $accumulator_data[5]['a_correction'], '6', $accumulator_data[5]['a_max_level'], $machine_data[6]['m_counting_multiplier'], $machine_data[5]['m_correction'], $machine_data[6]['m_correction'], $m6_time_id, $m7_time_id, $machine_data[5]['m_enthalpy'], $machine_data[6]['m_enthalpy']);
$new_6_cq = $accumulator_data[5]['a_cq'];
$scr_6_val = ceil(((($new_6_cq / $accumulator_data[5]['a_max_level']) * 100) * 12) - 20);
$acc_6_corr = $accumulator_data[5]['a_correction'];

// FREETIMES
$the_m1_ft = $this->puft_model->getM1Freetime($mch_1_rtr, $mch_2_rtr, $mch_3_rtr, $mch_4_rtr, $mch_5_rtr, $mch_6_rtr, $mch_7_rtr, $machine_data[0]['m_ft'], $acc_1_vol, $acc_2_vol, $acc_3_vol, $acc_4_vol, $acc_5_vol, $acc_6_vol, $new_1_cq, $new_2_cq, $new_3_cq, $new_4_cq, $new_5_cq, $new_6_cq);
$the_m2_ft = $this->puft_model->getM2Freetime($mch_1_rtr, $mch_2_rtr, $mch_3_rtr, $mch_4_rtr, $mch_5_rtr, $mch_6_rtr, $mch_7_rtr, $machine_data[1]['m_ft'], $acc_1_vol, $acc_2_vol, $acc_3_vol, $acc_4_vol, $acc_5_vol, $acc_6_vol, $new_1_cq, $new_2_cq, $new_3_cq, $new_4_cq, $new_5_cq, $new_6_cq);
$the_m3_ft = $this->puft_model->getM3Freetime($mch_1_rtr, $mch_2_rtr, $mch_3_rtr, $mch_4_rtr, $mch_5_rtr, $mch_6_rtr, $mch_7_rtr, $machine_data[2]['m_ft'], $acc_1_vol, $acc_2_vol, $acc_3_vol, $acc_4_vol, $acc_5_vol, $acc_6_vol, $new_1_cq, $new_2_cq, $new_3_cq, $new_4_cq, $new_5_cq, $new_6_cq);
$the_m4_ft = $this->puft_model->getM4Freetime($mch_1_rtr, $mch_2_rtr, $mch_3_rtr, $mch_4_rtr, $mch_5_rtr, $mch_6_rtr, $mch_7_rtr, $machine_data[3]['m_ft'], $acc_1_vol, $acc_2_vol, $acc_3_vol, $acc_4_vol, $acc_5_vol, $acc_6_vol, $new_1_cq, $new_2_cq, $new_3_cq, $new_4_cq, $new_5_cq, $new_6_cq);
```

```
    $the_m5_ft = $this->puft_model->getM5Freetime($mch_1_rtr, $mch_2_rtr, $mch_3_rtr,
$mch_4_rtr, $mch_5_rtr, $mch_6_rtr, $mch_7_rtr, $machine_data[4]['m_ft'], $acc_1_vol,
$acc_2_vol, $acc_3_vol, $acc_4_vol, $acc_5_vol, $acc_6_vol, $new_1_cq, $new_2_cq,
$new_3_cq, $new_4_cq, $new_5_cq, $new_6_cq);
    $the_m6_ft = $this->puft_model->getM6Freetime($mch_1_rtr, $mch_2_rtr, $mch_3_rtr,
$mch_4_rtr, $mch_5_rtr, $mch_6_rtr, $mch_7_rtr, $machine_data[5]['m_ft'], $acc_1_vol,
$acc_2_vol, $acc_3_vol, $acc_4_vol, $acc_5_vol, $acc_6_vol, $new_1_cq, $new_2_cq,
$new_3_cq, $new_4_cq, $new_5_cq, $new_6_cq);
    $the_m7_ft = $this->puft_model->getM7Freetime($mch_1_rtr, $mch_2_rtr, $mch_3_rtr,
$mch_4_rtr, $mch_5_rtr, $mch_6_rtr, $mch_7_rtr, $machine_data[6]['m_ft'], $acc_1_vol,
$acc_2_vol, $acc_3_vol, $acc_4_vol, $acc_5_vol, $acc_6_vol, $new_1_cq, $new_2_cq,
$new_3_cq, $new_4_cq, $new_5_cq, $new_6_cq);

    // Startup trigger
    $cons_red = $this->session->userdata('cons_red');
    $cons_red_id = $this->session->userdata('cons_red_id');

    if ($cons_red == 'y' && $cons_red_id != '')
    {
      $cons_red_status = $this->puft_model->consRedStatus($cons_red_id);
    }
    else
    {
      $cons_red_status = '0';
    }

    if ($cons_red_status == '0')
    {
      $this->puft_model->constraintMachineCalcs($machine_data[0]['m_ft'], $the_m1_ft,
$machine_data[0]['m_enthalpy'], $machine_data[0]['m_cons_status'], $machine_data[1]['m_ft'],
$the_m2_ft, $machine_data[1]['m_enthalpy'], $machine_data[1]['m_cons_status'],
$machine_data[2]['m_ft'], $the_m3_ft, $machine_data[2]['m_enthalpy'],
$machine_data[2]['m_cons_status'], $machine_data[3]['m_ft'], $the_m4_ft,
$machine_data[3]['m_enthalpy'], $machine_data[3]['m_cons_status'], $machine_data[4]['m_ft'],
$the_m5_ft, $machine_data[4]['m_enthalpy'], $machine_data[4]['m_cons_status'],
$machine_data[5]['m_ft'], $the_m6_ft, $machine_data[5]['m_enthalpy'],
$machine_data[5]['m_cons_status'], $machine_data[6]['m_ft'], $the_m7_ft,
$machine_data[6]['m_enthalpy'], $machine_data[6]['m_cons_status']);
    }

    // Write record to ft_history
    list($the_1_status, $the_1_speed) = explode('@', $mch_1_speed);
    list($the_2_status, $the_2_speed) = explode('@', $mch_2_speed);
    list($the_3_status, $the_3_speed) = explode('@', $mch_3_speed);
    list($the_4_status, $the_4_speed) = explode('@', $mch_4_speed);
    list($the_5_status, $the_5_speed) = explode('@', $mch_5_speed);
    list($the_6_status, $the_6_speed) = explode('@', $mch_6_speed);
    list($the_7_status, $the_7_speed) = explode('@', $mch_7_speed);

    $mch_1_timesteps = $machine_data[0]['m_ft_timesteps'];
    $mch_2_timesteps = $machine_data[1]['m_ft_timesteps'];
    $mch_3_timesteps = $machine_data[2]['m_ft_timesteps'];
    $mch_4_timesteps = $machine_data[3]['m_ft_timesteps'];
    $mch_5_timesteps = $machine_data[4]['m_ft_timesteps'];
    $mch_6_timesteps = $machine_data[5]['m_ft_timesteps'];
    $mch_7_timesteps = $machine_data[6]['m_ft_timesteps'];
```

```
// Get cons time to save to ft_history
$the_cons_time = $this->puft_model->getConsTime();

$this->db->query(""
    . "INSERT INTO "
    . "ft_history "
    . "SET "
    . "read_time = '$record_time', "
    . "cons_time = '$the_cons_time', "
    . "efficiency = '$mch_1_efficiency', "
    . "m1_ft = '$mch_1_ft', "
    . "m1_mfe = '$m1_mfe', "
    . "m1_timesteps = '$mch_1_timesteps', "
    . "m1_actin = '$mch_1_actin', "
    . "m1_status = '$the_1_status', "
    . "m1_speed = '$the_1_speed', "
    . "m1_enthalpy = '$mch_1_enthalpy', "
    . "a1_lev = '$acc_1_vol', "
    . "a1_cq = '$new_1_cq', "
    . "m2_ft = '$mch_2_ft', "
    . "m2_mfe = '$m2_mfe', "
    . "m2_timesteps = '$mch_2_timesteps', "
    . "m2_actin = '$mch_2_actin', "
    . "m2_status = '$the_2_status', "
    . "m2_speed = '$the_2_speed', "
    . "m2_enthalpy = '$mch_2_enthalpy', "
    . "a2_lev = '$acc_2_vol', "
    . "a2_cq = '$new_2_cq', "
    . "m3_ft = '$mch_3_ft', "
    . "m3_mfe = '$m3_mfe', "
    . "m3_timesteps = '$mch_3_timesteps', "
    . "m3_actin = '$mch_3_actin', "
    . "m3_status = '$the_3_status', "
    . "m3_speed = '$the_3_speed', "
    . "m3_enthalpy = '$mch_3_enthalpy', "
    . "a3_lev = '$acc_3_vol', "
    . "a3_cq = '$new_3_cq', "
    . "m4_ft = '$mch_4_ft', "
    . "m4_mfe = '$m4_mfe', "
    . "m4_timesteps = '$mch_4_timesteps', "
    . "m4_actin = '$mch_4_actin', "
    . "m4_status = '$the_4_status', "
    . "m4_speed = '$the_4_speed', "
    . "m4_enthalpy = '$mch_4_enthalpy', "
    . "a4_lev = '$acc_4_vol', "
    . "a4_cq = '$new_4_cq', "
    . "m5_ft = '$mch_5_ft', "
    . "m5_mfe = '$m5_mfe', "
    . "m5_timesteps = '$mch_5_timesteps', "
    . "m5_actin = '$mch_5_actin', "
    . "m5_status = '$the_5_status', "
    . "m5_speed = '$the_5_speed', "
    . "m5_enthalpy = '$mch_5_enthalpy', "
    . "a5_lev = '$acc_5_vol', "
    . "a5_cq = '$new_5_cq', "
    . "m6_ft = '$mch_6_ft', "
    . "m6_mfe = '$m6_mfe', "
```

```
        . "m6_timesteps = '$mch_6_timesteps', "
        . "m6_actin = '$mch_6_actin', "
        . "m6_status = '$the_6_status', "
        . "m6_speed = '$the_6_speed', "
        . "m6_enthalpy = '$mch_6_enthalpy', "
        . "a6_lev = '$acc_6_vol', "
        . "a6_cq = '$new_6_cq', "
        . "m7_ft = '$mch_7_ft', "
        . "m7_mfe = '$m7_mfe', "
        . "m7_timesteps = '$mch_7_timesteps', "
        . "m7_actin = '$mch_7_actin', "
        . "m7_status = '$the_7_status', "
        . "m7_speed = '$the_7_speed', "
        . "m7_enthalpy = '$mch_7_enthalpy'"
        . "");

    // Do enthalpy check and email auto alert
    $this->enthalpyAlert();

                // Send curl every 30 seconds
    $send_curl_ctr = $this->session->userdata('send_curl_ctr');
    if ($send_curl_ctr == 6)
    {
      $this->load->library('curl');
      $pack_size = $this->puft_model->getActiveProdset();
      $curl_data = $record_time . ',' . $pack_size . ',' . $mch_1_rated_speed . ',' . $mch_1_actin . ',' .
$the_1_status . ',' . timeToSeconds($mch_1_ft) . ',' . $mch_1_cons_status . ',' . $the_2_status . ',' .
timeToSeconds($mch_2_ft) . ',' . $mch_2_cons_status . ',' . $the_3_status . ',' .
timeToSeconds($mch_3_ft) . ',' . $mch_3_cons_status . ',' . $the_4_status . ',' .
timeToSeconds($mch_4_ft) . ',' . $mch_4_cons_status . ',' . $the_5_status . ',' .
timeToSeconds($mch_5_ft) . ',' . $mch_5_cons_status . ',' . $the_6_status . ',' .
timeToSeconds($mch_6_ft) . ',' . $mch_6_cons_status . ',' . $the_7_status . ',' .
timeToSeconds($mch_7_ft) . ',' . $mch_7_cons_status . ',' . $mch_1_cons_time . ',' .
$mch_2_cons_time . ',' . $mch_3_cons_time . ',' . $mch_4_cons_time . ',' . $mch_5_cons_time . ',' .
$mch_6_cons_time . ',' . $mch_7_cons_time . ',' . $mch_4_multiplier . ',' . $mch_6_multiplier . ',' .
$mch_6_actin . ',' . $m1_mfe . ',' . $m2_mfe . ',' . $m3_mfe . ',' . $m4_mfe . ',' . $m5_mfe . ',' . $m6_mfe
. ',' . $m7_mfe;
      //$this->curl->simple_get('http://localhost/puft_dashboard/io/postit.php?d=' .
urlencode($curl_data));
                          $this->curl->simple_get('http://www.ftsc.pro/dashboard/io/postit.php?d=' .
urlencode($curl_data));

      $this->session->set_userdata('send_curl_ctr', '0');
    }
    else
    {
      $send_curl_ctr++;
      $this->session->set_userdata('send_curl_ctr', $send_curl_ctr);
    }

    // Echo output for prodline graph
    echo
"$mch_1_speed,$mch_2_speed,$mch_3_speed,$mch_4_speed,$mch_5_speed,$mch_6_speed,$
mch_7_speed,$acc_1_vol,$acc_2_vol,$acc_3_vol,$acc_4_vol,$acc_5_vol,$acc_6_vol,$mch_1_rtr
,$mch_2_rtr,$mch_3_rtr,$mch_4_rtr,$mch_5_rtr,$mch_6_rtr,$mch_7_rtr,$scr_1_val,$new_1_cq,$
scr_2_val,$new_2_cq,$scr_3_val,$new_3_cq,$scr_4_val,$new_4_cq,$scr_5_val,$new_5_cq,$scr
_6_val,$new_6_cq,$mch_1_enthalpy,$mch_2_enthalpy,$mch_3_enthalpy,$mch_4_enthalpy,$mch
```

```
_5_enthalpy,$mch_6_enthalpy,$mch_7_enthalpy,$mch_1_actin,$mch_2_actin,$mch_3_actin,$mc
h_4_actin,$mch_5_actin,$mch_6_actin,$mch_7_actin,$acc_1_corr,$acc_2_corr,$acc_3_corr,$acc
_4_corr,$acc_5_corr,$acc_6_corr,$mch_1_ft,$mch_2_ft,$mch_3_ft,$mch_4_ft,$mch_5_ft,$mch_6
_ft,$mch_7_ft,$mch_1_efficiency,$prod_set_refresh";
 }

 function calMchSpeed($mch_data, $mch_multiplier, $mch_type, $mch_rated_speed, $coll_table)
 {
  $mch_speed = '0@0';

  // Latest record
  $id_1 = $mch_data[0]['id'];
  $status_1 = $mch_data[0]['status'];
  $act_in_1 = $mch_data[0]['act_in'];
  $read_time_1 = $mch_data[0]['read_time'];

  // Older record
  $status_2 = $mch_data[1]['status'];
  $act_in_2 = $mch_data[1]['act_in'];
  $read_time_2 = $mch_data[1]['read_time'];
  $speed_2 = $mch_data[1]['speed'];

  switch ($status_1)
  {
   case "0": // Comm error
    $mch_speed = '0@0';
   break;
   case "1": // Idle
    $mch_speed = '1@0';
   break;
   case "2": // Normal
    $ts_1 = strtotime($read_time_1);
    $ts_2 = strtotime($read_time_2);

    $tot_time = $ts_1 - $ts_2;
    $tot_act_in = $act_in_1 - $act_in_2;

    if ($tot_time != 0)
    {
     $tot_per_sec = ($tot_act_in * $mch_multiplier) / $tot_time;
    }
    else
    {
     $tot_per_sec = 0;
    }

    if ($tot_per_sec < 1)
    {
     $tot_per_sec = 0;
    }

    $mch_speed = $status_1 . '@' . $tot_per_sec;

    // Machine is waiting - act in is the same but still running
    if ($speed_2 == '') { $speed_2 = '2@0'; }
    if (($act_in_1 == $act_in_2) && $status_1 == '2')
    {
```

```
      $mch_speed = $speed_2;
    }

    // If the machine type = 2
    if ($mch_type == '2')
    {
      $mch_speed = '2@' . $mch_rated_speed;
    }

    //echo "XXX: $tot_time = $ts_1 - $ts_2 >>> <br>";
    //echo "$tot_per_sec = ceil( ( $tot_act_in * $mch_multiplier) / $tot_time ) >>> <br><br>";
  break;
 }

 $this->db->query("UPDATE $coll_table SET speed = '$mch_speed' WHERE id = '$id_1'");

 return $mch_speed;
}

function getAccumulatorVol($tbl_from, $tbl_to, $mch_from_multiplier, $acc_correction, $acc_id,
$acc_max_level, $mch_to_multiplier, $mch_from_correction, $mch_to_correction, $from_actin_id,
$to_actin_id, $mch_from_enthalpy, $mch_to_enthalpy)
{
 $act_in_from = $this->puft_model->getCollectorActIn($tbl_from, $from_actin_id);
 $act_in_to = $this->puft_model->getCollectorActIn($tbl_to, $to_actin_id);

 //$i = $act_in_from - ($act_in_to * $mch_to_multiplier);
 $acc_vol = ((($act_in_from - $mch_from_correction) * $mch_from_multiplier) - (($act_in_to -
$mch_to_correction) * $mch_to_multiplier)) + $acc_correction;

 //echo "[[[ $from_actin_id ]]] >>> [[[ $to_actin_id ]]]$acc_vol = ((($act_in_from -
$mch_from_correction) * $mch_from_multiplier) - (($act_in_to - $mch_to_correction) *
$mch_to_multiplier)) + $acc_correction; <br>";

                        if ($mch_from_enthalpy == '100' && $mch_to_enthalpy == '100')
 //if ($mch_from_enthalpy < '100' && $mch_to_enthalpy < '100')
 {
   if ($acc_vol > $acc_max_level)
   {
     $new_correction = $acc_max_level - $acc_vol;
     $acc_vol = $acc_vol + $new_correction;
     $this->db->query("UPDATE accumulator_setup SET a_correction = a_correction +
$new_correction WHERE id = '$acc_id'");

     //$this->db->query("UPDATE accumulator_setup SET a_correction = $new_correction
WHERE id = '$acc_id'"); DELETE THIS LINE
   }
   else if ($acc_vol < 0)
   {
     $new_correction = 0 - $acc_vol;
     $acc_vol = $acc_vol + $new_correction;
     $this->db->query("UPDATE accumulator_setup SET a_correction = a_correction +
$new_correction WHERE id = '$acc_id'");

     //$acc_vol = $acc_vol + $acc_correction; DELETE THIS LINE
   }
 }
```

```
  return $acc_vol;
 }

 function ft_all()
 {
  $data['title'] = 'Production Line: Freetime - All Machines';

  $data['mach_data'] = $this->puft_model->getFTMachines();
  $data['drone_id'] = $this->session->userdata('drone');
  $data['drone_array'] = array('blank', 'Filler', 'Labeller', 'Wrapper', 'Packer', 'Palitiser', 'Stretch
Wrap', 'Forklift');

  $this->load->vars($data);
  $this->load->view('main/ft_all', $data);
 }

 function ft_all_start()
 {
  $output = '';
  $output_mfe = '';
  $avg_mfe = 0;
  $efficiency = $this->session->userdata('efficiency');

  $drone_array = array('blank', 'Filler', 'Labeller', 'Wrapper', 'Packer', 'Palitiser', 'Stretch Wrap',
'Forklift');
  if ($this->session->userdata('drone'))
  {
   $drone_id = $this->session->userdata('drone');
  }
  else
  {
   $drone_id = 0;
  }
  $drone_name = $drone_array[$drone_id];


  if ($drone_id == '')
  {
   $drone_id = '0';
  }

  $results = $this->puft_model->getFTMachines();

  for ($i = 0; $i < count($results); $i++)
  {
   $the_id = $results[$i]['id'];
   $the_name = $results[$i]['m_short_name'];
   $the_active = $results[$i]['m_active'];
   $the_ft = $results[$i]['m_ft'];
   $the_timesteps = $results[$i]['m_ft_timesteps'];
   $the_colour = $results[$i]['m_ft_colour'];
   $the_mfe = $results[$i]['m_mfe'];

   if ($the_active == '1')
   {
```

```
        $output .= $the_id . ',' . $the_name . ',' . $the_active . ',' . seconds($the_ft) . ',' . $the_timesteps
. ',' . $the_colour . ',';
        $output_mfe .= floor($the_mfe) . ',';
        $avg_mfe = $avg_mfe + $the_mfe;
      }
    }

    $avg_mfe = floor($avg_mfe / 7);

    echo $output . $drone_id . ',' . $drone_name . ',' . $output_mfe . $avg_mfe . ',' . $efficiency;
  }

  function ft_add()
  {
    $m_id = $this->uri->segment(3);
    $amount = $this->uri->segment(4);

    if ($amount == 'd')
    {
      $this->session->set_userdata('drone', $m_id);
      $this->session->set_userdata('drone_flag', '1');
    }
    else
    {
      $this->puft_model->ftAdd($m_id, $amount);
    }

    redirect('main/ft/' . $m_id);
  }

  function ft_add_all()
  {
    $m_id = $this->session->userdata('drone');
    $amount = $this->uri->segment(3);

    $this->puft_model->ftAdd($m_id, $amount);

    $this->session->set_userdata('drone_flag', '2');

    $this->ft_all();
  }

  function newshift()
  {
    $this->load->view('main/new_shift');
  }

  function shift_setup()
  {
    $edit_id = $this->uri->segment(3);

    if ($edit_id != '')
    {
      $data['edit_id'] = $edit_id;
      $data['edit_record'] = $this->puft_model->getShiftRecord($edit_id);
    }
    else
```

```
    {
      $data['edit_id'] = '';
    }

    $data['title'] = 'Production Line: Shift Setup';

    $data['shifts'] = $this->puft_model->getShifts();

    $this->load->vars($data);
    $this->load->view('main/shift_setup', $data);
  }

  function shift_save()
  {
    $this->puft_model->saveShift();
    redirect('main/shift_setup');
  }

  function efficiency()
  {
    $data['effeciency'] = $this->session->userdata('efficiency');

    $this->load->vars($data);
    $this->load->view('main/efficiency', $data);
  }

  function effeciency_update()
  {
    echo $this->session->userdata('efficiency');
  }

  function prodLineReset()
  {
    $this->puft_model->newShift();

    redirect('main/newshift');
  }

  function ft()
  {
    $data['title'] = 'Production Line: Freetime';

    $mach = $this->uri->segment(3);

    $mach_info = $this->puft_model->getMchInfo($mach);

    // Get prod sets
    $data['prod_sets'] = $this->puft_model->getProdSets();

    $m_shortname = $mach_info['m_short_name'];
    $m_active = $mach_info['m_active'];
    $m_id = $mach_info['id'];
    $m_cons_status = $mach_info['m_cons_status'];
    $m_ft = $mach_info['m_ft'];

    switch ($m_shortname)
    {
```

```
case "M1":
 if ($m_active == '1')
 {
  $new_freetime = seconds($m_ft);
 }
 else
 {
  $new_freetime = '00:00:00';;
 }
 break;
case "M2":
 if ($m_active == '1')
 {
  $new_freetime = seconds($m_ft);
 }
 else
 {
  $new_freetime = 'na';
 }
 break;
case "M3":
 if ($m_active == '1')
 {
  $new_freetime = seconds($m_ft);
 }
 else
 {
  $new_freetime = 'na';
 }
 break;
case "M4":
 if ($m_active == '1')
 {
  $new_freetime = seconds($m_ft);
 }
 else
 {
  $new_freetime = 'na';
 }
 break;
case "M5":
 if ($m_active == '1')
 {
  $new_freetime = seconds($m_ft);
 }
 else
 {
  $new_freetime = 'na';
 }
 break;
case "M6":
 if ($m_active == '1')
 {
  $new_freetime = seconds($m_ft);
 }
 else
 {
```

```
        $new_freetime = 'na';
      }
      break;
    case "M7":
      if ($m_active == '1')
      {
        $new_freetime = seconds($m_ft);
      }
      else
      {
        $new_freetime = 'na';
      }
      break;
    case "M8":
      if ($m_active == '1')
      {
        $new_freetime = seconds($m_ft);
      }
      else
      {
        $new_freetime = 'na';
      }
      break;
    case "M9":
      if ($m_active == '1')
      {
        $new_freetime = seconds($m_ft);
      }
      else
      {
        $new_freetime = 'na';
      }
      break;
  }

  $data['mach'] = $mach;
  $data['mach_name'] = $mach_info['m_short_name'];
  $data['mach_cons_status'] = $m_cons_status;
  //$data['mach_cons_status'] = '2';
  $data['mach_cons_time'] = seconds($mach_info['m_cons_time']);
  //$data['mach_freetime'] = '00:00:00';
  $data['mach_freetime'] = substr($new_freetime, 1);
  $data['arrows'] = "0-0-0-0-0";

  $this->load->vars($data);
  $this->load->view('main/ft_view', $data);
}

function ft_start()
```

APPENDIX H:
PROGRAMMING APPROACH

1. Number the points of interruption from the first automated machine including the forklifts to the last machine following the flow of material. Make sure the points of interruption have at least a conveyor with some accumulation between them.
2. Determine the linear and cycle machines to apply the relevant throughput calculation method.
3. Identify the bottleneck on the line (This is also called the drum machine).
4. Assign machines with relevant type: type-1, type-2, type-3, and type-4 or type-5 (See Chapter 4 for V-profile explanations of the type of machines).
5. Each machine needs to count and store the total number of units leaving the production machine.
6. Each machine needs to detect, calculate, store and update in real time the following variables:
    a. The machine state (running or stopped)
    b. The machine's current throughput rate
    c. The machine's relevant throughput rate
    d. The machine's historic throughput rate
    e. The accumulation quantity
    f. The accumulators downstream from the drum machine's clear quantity
    g. The accumulators upstream from the drum machine's prime quantity
    h. The accumulator states
    i. The accumulator statuses
    j. The production line enthalpy
    k. Each machine's current entropic uncertainty
    l. Breakdown free time at the bottleneck machine
    m. Breakdown free time confidence factor at each machine
7. From this data, and knowing its machine type, the machine will be able to calculate its dynamic free time in minutes and seconds, using the free-time calculations for the various type machines.
8. From the information in 6, the current constraint machine can also be identified.

APPENDIX I:
OPERATOR ACTIONS IN USING FREE TIME

Operators can use free time productively; in practice, however, it requires a rigorous routine of observing the production process as a whole. With free time displayed at each operator station, the operator need only to carry out the instructions in the flowchart below to improve the overall efficiency of the production process.

The flow chart below demonstrates the flow of operator actions when using free time.

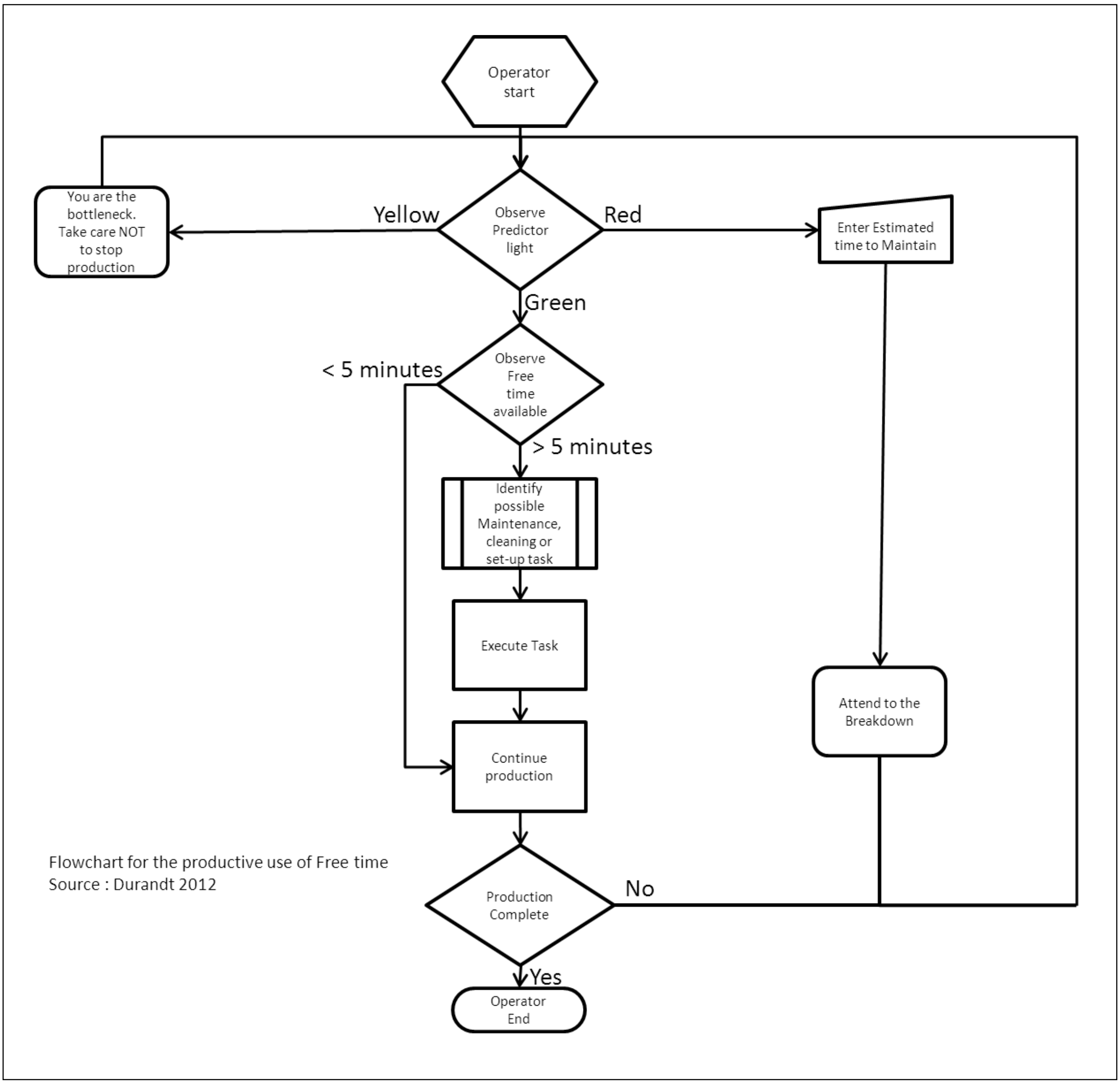


Figure I.1: Flowchart of operator's actions for the Productive Use of Free Time (PUFT)

Source: Researcher's own illustration.

Operation start

The operator starts the process by starting the production machine. The process should ideally be started when the machine is fully primed and the discharge conveyor has sufficient space to accommodate product. During start-up, the free-time display will show the operator the free time available before start-up. The free-time calculation will be displayed in the form of a second-by-second countdown to the ideal moment when the start-up should be executed. This time can be used by the operator to prepare the production machine for a good, efficient run. When the machine starts running, the operator must observe the predictor light indicator. This light can be green, yellow or red.

Observe predictor light

The predictor light can be green, yellow or red. If the light is green, there will be free time available for the operator to do useful activities. The free-time indicator will display the total free time to the operator’s disposal. If the light is yellow, the system has calculated the production station to be the bottleneck and the operators must endeavour to keep the process running. There is thus no free time available for productive use. If the light is red, the production station has no free time and is currently not running. The production station is thus causing the total production process to lose efficiency.

Enter estimated time to maintain

When the red light is first observed the operator must do an evaluation of how long he anticipates the stoppage will last. This time must be entered into the predictor and will be shared with the other operators in real time. It is important that a conservative estimation is best. Operators who are skilled and well experienced will be able to estimate the downtime with increased accuracy. There will be times that the operator does not have the required information to estimate the anticipated downtime. This typically happens when the reason for the stoppage is out of the control of the operator. An example of this is typically when the machine does not have raw material or product to produce. The knowledge of the anticipated downtime in these cases resides with the supervisor or logistics controller. A drone predictor is placed with the supervisor and/or logistics controller. The operator will escalate the anticipated downtime estimation request by indicating this on the predictor with the red light on his production station. The supervisor/controller will be able to estimate the anticipated downtime and this time will be shared with all the production machine operators including the current constraint machine.

Attend to the breakdown

After the estimated breakdown time has been entered, the operator must attend to the breakdown. The operator will continue to be flagged with the red light as he will continue to be the reason for the production process losing efficiency while he attends to the breakdown. The time he has entered into the predictor will be shared with all the other operators. The other operators in the production process are encouraged to use the same free time during this breakdown. Once the breakdown has been fixed, production can resume immediately. The operator needs to run the production machine at its maximum output.

You are the bottleneck. Take care not to stop production

If the operator observes a yellow light at the production station, this production station has been identified as the current bottleneck. The current bottleneck machine will have no free time and will be yellow only if the machine is running. All resources in the production process must focus on this machine. This is where the Theory of Constraints is 100 per cent relevant. The supervisor must focus on this machine and ensure the operator is fully supported by maintenance, logistics and relief operators. The moment this machine stops, the red light will go on and this should be avoided.

Observe free time available

Operators must continue to monitor the predictors during a green light situation. A green light indicates that free time is available and if not used productively, may become idle time. Idle time is unpredictable and the operator might not be able to fully utilise this time when it arrives. If the free time available is less than five (5) minutes, the operator is encouraged to continue with production and ensure product quality is maintained at optimum levels. If there is more than five (5) minutes free time available, the operator is encouraged to use the free time productively.

Identify possible opportunistic maintenance, cleaning or set-up task

Free time exceeding five (5) minutes can be used productively. Maintenance, cleaning and set-up tasks must be timed and prepared for each production station. Tasks can be executed when there is sufficient free time to execute the task. The current constraint machine could create free time exceeding five (5) minutes at a green position by entering its anticipated downtime. This can happen with no notice. Operators are therefore trained to be mindful of the free time displayed at a production station at all times. If the current constraint machine anticipates a stoppage of one hour, the green production station will be given this hour in addition to its current dynamic free time. The operator must do as many tasks as possible during the free time. During task execution, the operator must continue to take note of the free-time indicator. An update on the anticipated time can come through at any time. If a new update indicates a longer free-time period, the operator should replan the free-time duties in the light of the new information. If all the opportunistic maintenance, cleaning and set-up tasks are executed, the operator should continue with production if product is available and the discharge conveyor is ready to receive product.

APPENDIX J:

COLOUR-CODED FREE-TIME CALCULATION DETAIL FOR PAROW AND HEIDELBERG PRODUCTION LINES WITH BLOCKING AND STARVATION

Parow Machine (1,1)

Calculations

$$X_1 = \frac{AL_{A_{(1,1)}} - PQ_{A_{(1,1)}}}{RTR_{M_{(2,1)}}}, if\ X_1 < 0, then\ X_1 = 0, else\ X_1 = X_1$$

$$X_2 = \frac{AL_{A_{(2,1)}} - PQ_{A_{(2,1)}}}{RTR_{M_{(2,2)}}}, if\ X_2 < 0, then\ X_2 = 0, else\ X_2 = X_2$$

$$X_3 = \frac{AL_{A_{(2,2)}} - PQ_{A_{(2,2)}}}{RTR_{M_{(2,3)}}}, if\ X_3 < 0, then\ X_3 = 0, else\ X_3 = X_3$$

$$X_4 = \frac{AL_{A_{(2,3)}} - PQ_{A_{(2,3)}}}{RTR_{M_{(2,4)}}}, if\ X_4 < 0, then\ X_4 = 0, else\ X_4 = X_4$$

$$X_5 = \frac{AL_{A_{(3,1)}} - PQ_{A_{(3,1)}}}{RTR_{M_{(3,1)}}}, if\ X_5 < 0, then\ X_5 = 0, else\ X_5 = X_5$$

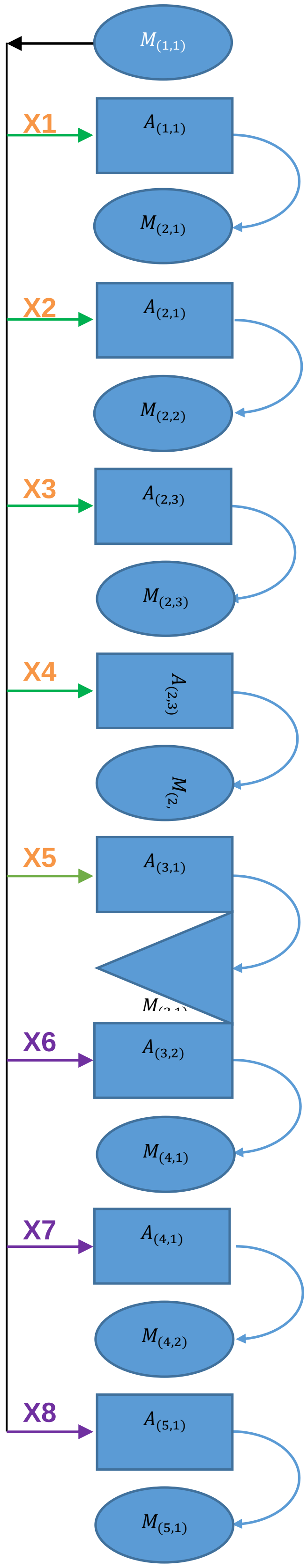
$$X_6 = \frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}}, if\ X_6 < 0$$

$then\ Y_6 = X_6 and\ then\ X_6 = 0, else\ X_6 = X_6 and\ Y_6 = 0$

$$X_7 = \frac{AL_{A_{(4,1)}} - CQ_{A_{(4,1)}}}{RTR_{M_{(4,2)}}} + Y_6, if\ X_7 < 0$$

$then\ Y_7 = X_7 and\ then\ X_7 = 0, else\ X_7 = X_7 and\ Y_7 = 0$

$$X_8 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_7, if\ X_8 < 0, then\ X_8 = 0, else\ X_8 = X_8$$



Parow Machine (2,1)

Calculations

$$X_1 = \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}}$$

$$X_2 = \frac{AL_{A_{(2,1)}} - PQ_{A_{(2,1)}}}{RTR_{M_{(2,2)}}}, if\ X_2 < 0, then\ X_2 = 0, else\ X_2 = X_2$$

$$X_3 = \frac{AL_{A_{(2,2)}} - PQ_{A_{(2,2)}}}{RTR_{M_{(2,3)}}}, if\ X_3 < 0, then\ X_3 = 0, else\ X_3 = X_3$$

$$X_4 = \frac{AL_{A_{(2,3)}} - PQ_{A_{(2,3)}}}{RTR_{M_{(2,4)}}}, if\ X_4 < 0, then\ X_4 = 0, else\ X_4 = X_4$$

$$X_5 = \frac{AL_{A_{(3,1)}} - PQ_{A_{(3,1)}}}{RTR_{M_{(3,1)}}}, if\ X_5 < 0, then\ X_5 = 0, else\ X_5 = X_5$$

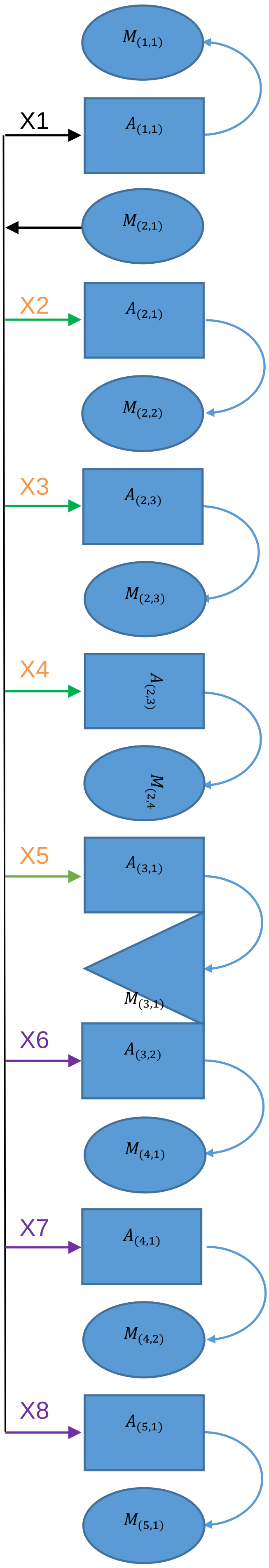
$$X_6 = \frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}}, if\ X_6 < 0,$$

$$then\ Y_6 = X_6 and\ then\ X_6 = 0, else\ X_6 = X_6 and\ Y_6 = 0$$

$$X_7 = \frac{AL_{A_{(4,1)}} - CQ_{A_{(4,1)}}}{RTR_{M_{(4,2)}}} + Y_6, if\ X_7 < 0,$$

$$then\ Y_7 = X_7 and\ then\ X_7 = 0, else\ X_7 = X_7 and\ Y_7 = 0$$

$$X_8 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_7, if\ X_8 < 0, then\ X_8 = 0, else\ X_8 = X_8$$



Parow Machine (2,2)

Calculations

$$X_1 = \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} + Y_2$$

$$X_2 = \frac{PQ_{A_{(2,1)}} - AL_{A_{(2,1)}}}{RTR_{M_{(2,1)}}}, if\ X_2 < 0,$$

$$then\ Y_2 = X_2\ and\ then\ X_2 = 0, else\ X_2 = X_2\ and\ Y_2 = 0$$

$$X_3 = \frac{AL_{A_{(2,2)}} - PQ_{A_{(2,2)}}}{RTR_{M_{(2,3)}}}, if\ X_3 < 0, then\ X_3 = 0, else\ X_3 = X_3$$

$$X_4 = \frac{AL_{A_{(2,3)}} - PQ_{A_{(2,3)}}}{RTR_{M_{(2,4)}}}, if\ X_4 < 0, then\ X_4 = 0, else\ X_4 = X_4$$

$$X_5 = \frac{AL_{A_{(3,1)}} - PQ_{A_{(3,1)}}}{RTR_{M_{(3,1)}}}, if\ X_5 < 0, then\ X_5 = 0, else\ X_5 = X_5$$

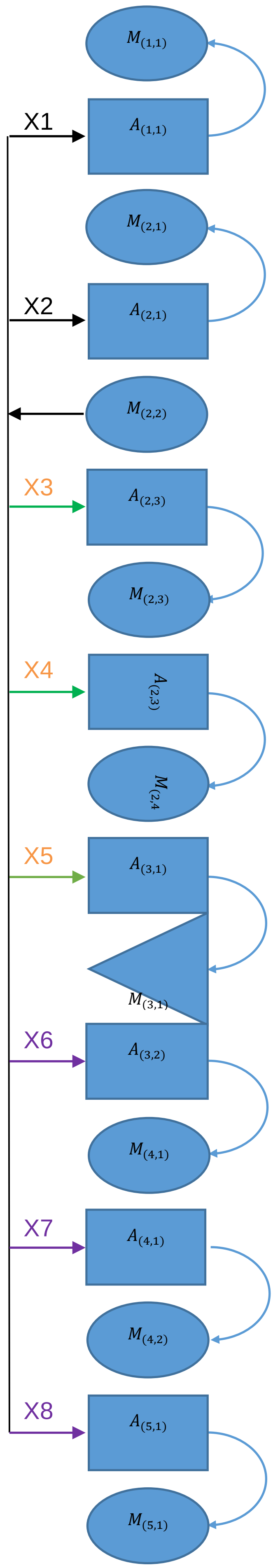
$$X_6 = \frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}}, if\ X_6 < 0,$$

$$then\ Y_6 = X_6 and\ then\ X_6 = 0, else\ X_6 = X_6 and\ Y_6 = 0$$

$$X_7 = \frac{AL_{A_{(4,1)}} - CQ_{A_{(4,1)}}}{RTR_{M_{(4,2)}}} + Y_6, if\ X_7 < 0,$$

$$then\ Y_7 = X_7 and\ then\ X_7 = 0, else\ X_7 = X_7 and\ Y_7 = 0$$

$$X_8 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_7, if\ X_8 < 0, then\ X_8 = 0, else\ X_8 = X_8$$



Parow Machine (2,3)

Calculations

$$X_1 = \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} + Y_2$$

$$X_2 = \frac{PQ_{A_{(2,1)}} - AL_{A_{(2,1)}}}{RTR_{M_{(2,1)}}}, if\ X_2 < 0,$$

$then\ Y_2 = X_2\ and\ then\ X_2 = 0, else\ X_2 = X_2\ and\ Y_2 = 0$

$$X_3 = \frac{PQ_{A_{(2,2)}} - AL_{A_{(2,2)}}}{RTR_{M_{(2,2)}}}, if\ X_3 < 0,$$

$then\ Y_3 = X_3\ and\ then\ X_3 = 0, else\ X_3 = X_3\ and\ Y_3 = 0$

$$X_4 = \frac{AL_{A_{(2,3)}} - PQ_{A_{(2,3)}}}{RTR_{M_{(2,4)}}}, if\ X_4 < 0, then\ X_4 = 0, else\ X_4 = X_4$$

$$X_5 = \frac{AL_{A_{(3,1)}} - PQ_{A_{(3,1)}}}{RTR_{M_{(3,1)}}}, if\ X_5 < 0, then\ X_5 = 0, else\ X_5 = X_5$$

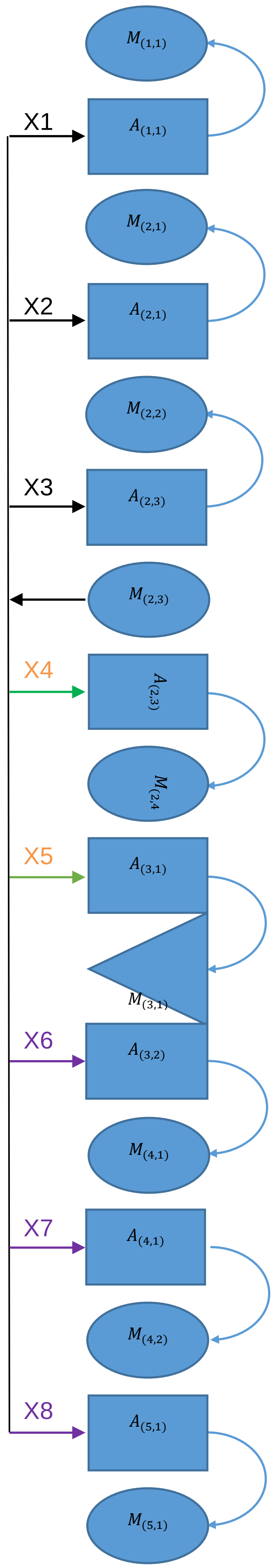
$$X_6 = \frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}}, if\ X_6 < 0,$$

$then\ Y_6 = X_6 and\ then\ X_6 = 0, else\ X_6 = X_6 and\ Y_6 = 0$

$$X_7 = \frac{AL_{A_{(4,1)}} - CQ_{A_{(4,1)}}}{RTR_{M_{(4,2)}}} + Y_6, if\ X_7 < 0,$$

$then\ Y_7 = X_7 and\ then\ X_7 = 0, else\ X_7 = X_7 and\ Y_7 = 0$

$$X_8 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_7, if\ X_8 < 0, then\ X_8 = 0, else\ X_8 = X_8$$



Parow Machine (2,4)

Calculations

$$X_1 = \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} + Y_2$$

$$X_2 = \frac{PQ_{A_{(2,1)}} - AL_{A_{(2,1)}}}{RTR_{M_{(2,1)}}} + Y_3, if\ X_2 < 0,$$

$then\ Y_2 = X_2\ and\ then\ X_2 = 0, else\ X_2 = X_2\ and\ Y_2 = 0$

$$X_3 = \frac{PQ_{A_{(2,2)}} - AL_{A_{(2,2)}}}{RTR_{M_{(2,2)}}} + Y_4, if\ X_3 < 0,$$

$then\ Y_3 = X_3\ and\ then\ X_3 = 0, else\ X_3 = X_3\ and\ Y_3 = 0$

$$X_4 = \frac{PQ_{A_{(2,3)}} - AL_{A_{(2,3)}}}{RTR_{M_{(2,3)}}}, if\ X_4 < 0,$$

$then\ Y_4 = X_4\ and\ then\ X_4 = 0, else\ X_4 = X_4\ and\ Y_4 = 0$

$$X_5 = \frac{AL_{A_{(3,1)}} - PQ_{A_{(3,1)}}}{RTR_{M_{(3,1)}}}, if\ X_5 < 0, then\ X_5 = 0, else\ X_5 = X_5$$

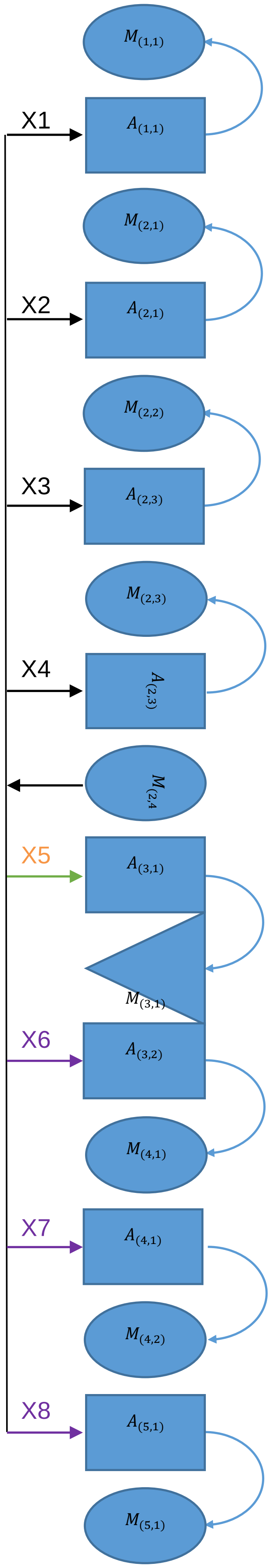
$$X_6 = \frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}}, if\ X_6 < 0,$$

$then\ Y_6 = X_6 and\ then\ X_6 = 0, else\ X_6 = X_6 and\ Y_6 = 0$

$$X_7 = \frac{AL_{A_{(4,1)}} - CQ_{A_{(4,1)}}}{RTR_{M_{(4,2)}}} + Y_6, if\ X_7 < 0,$$

$then\ Y_7 = X_7 and\ then\ X_7 = 0, else\ X_7 = X_7 and\ Y_7 = 0$

$$X_8 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_7, if\ X_8 < 0, then\ X_8 = 0, else\ X_8 = X_8$$



Parow Machine (3,1)

Calculations

$$X_1 = \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} + Y_2$$

$$X_2 = \frac{PQ_{A_{(2,1)}} - AL_{A_{(2,1)}}}{RTR_{M_{(2,1)}}} + Y_3, if\ X_2 < 0,$$

$$then\ Y_2 = X_2\ and\ then\ X_2 = 0, else\ X_2 = X_2\ and\ Y_2 = 0$$

$$X_3 = \frac{PQ_{A_{(2,2)}} - AL_{A_{(2,2)}}}{RTR_{M_{(2,2)}}} + Y_4, if\ X_3 < 0,$$

$$then\ Y_3 = X_3\ and\ then\ X_3 = 0, else\ X_3 = X_3\ and\ Y_3 = 0$$

$$X_4 = \frac{PQ_{A_{(2,3)}} - AL_{A_{(2,3)}}}{RTR_{M_{(2,3)}}} + Y_5, if\ X_4 < 0,$$

$$then\ Y_4 = X_4\ and\ then\ X_4 = 0, else\ X_4 = X_4\ and\ Y_4 = 0$$

$$X_5 = \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,4)}}}, if\ X_5 < 0,$$

$$then\ Y_5 = X_5\ and\ then\ X_5 = 0, else\ X_5 = X_5\ and\ Y_5 = 0$$

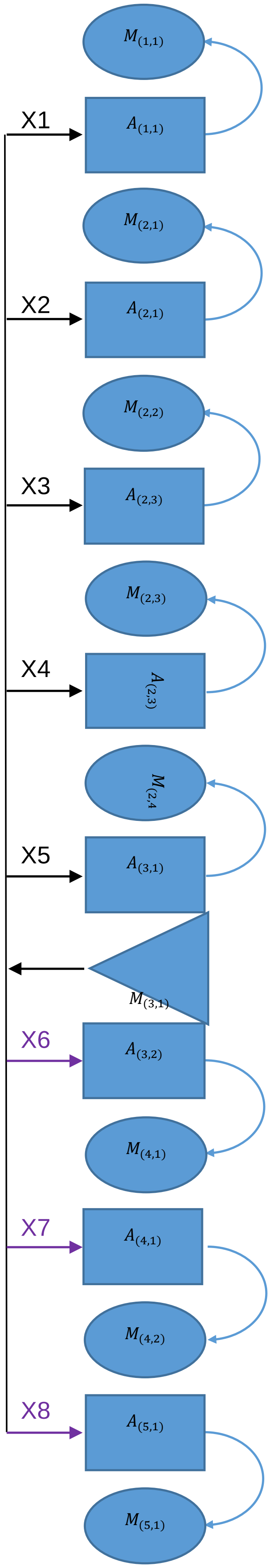
$$X_6 = \frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}}, if\ X_6 < 0,$$

$$then\ Y_6 = X_6 and\ then\ X_6 = 0, else\ X_6 = X_6 and\ Y_6 = 0$$

$$X_7 = \frac{AL_{A_{(4,1)}} - CQ_{A_{(4,1)}}}{RTR_{M_{(4,2)}}} + Y_6, if\ X_7 < 0,$$

$$then\ Y_7 = X_7 and\ then\ X_7 = 0, else\ X_7 = X_7 and\ Y_7 = 0$$

$$X_8 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_7, if\ X_8 < 0, then\ X_8 = 0, else\ X_8 = X_8$$



Parow Machine (4,1)

Calculations

$$X_1 = \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} + Y_2$$

$$X_2 = \frac{PQ_{A_{(2,1)}} - AL_{A_{(2,1)}}}{RTR_{M_{(2,1)}}} + Y_3, if\ X_2 < 0,$$

$$then\ Y_2 = X_2\ and\ then\ X_2 = 0, else\ X_2 = X_2\ and\ Y_2 = 0$$

$$X_3 = \frac{PQ_{A_{(2,2)}} - AL_{A_{(2,2)}}}{RTR_{M_{(2,2)}}} + Y_4, if\ X_3 < 0,$$

$$then\ Y_3 = X_3\ and\ then\ X_3 = 0, else\ X_3 = X_3\ and\ Y_3 = 0$$

$$X_4 = \frac{PQ_{A_{(2,3)}} - AL_{A_{(2,3)}}}{RTR_{M_{(2,3)}}} + Y_5, if\ X_4 < 0,$$

$$then\ Y_4 = X_4\ and\ then\ X_4 = 0, else\ X_4 = X_4\ and\ Y_4 = 0$$

$$X_5 = \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,4)}}}, if\ X_5 < 0,$$

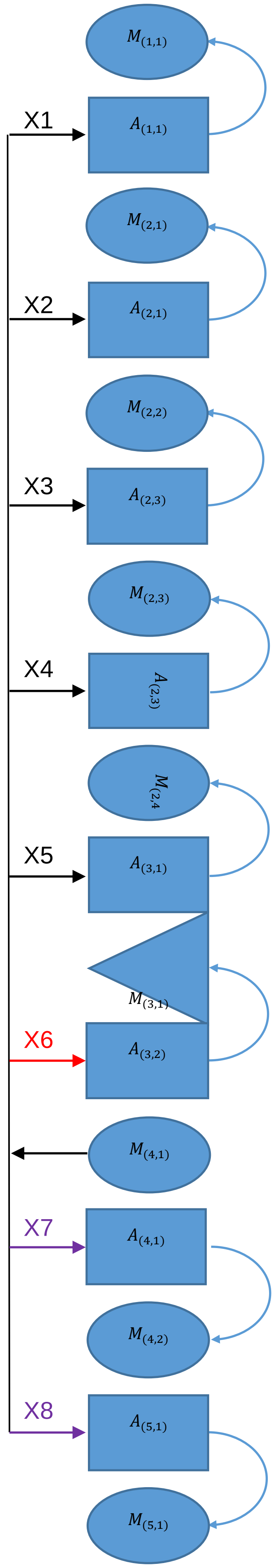
$$then\ Y_5 = X_5\ and\ then\ X_5 = 0, else\ X_5 = X_5\ and\ Y_5 = 0$$

$$X_6 = \frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}}, if\ X_6 < 0, then\ X_6 = 0, else\ X_6 = X_6$$

$$X_7 = \frac{AL_{A_{(4,1)}} - CQ_{A_{(4,1)}}}{RTR_{M_{(4,2)}}} + Y_6, if\ X_7 < 0,$$

$$then\ Y_7 = X_7 and\ then\ X_7 = 0, else\ X_7 = X_7 and\ Y_7 = 0$$

$$X_8 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_7, if\ X_8 < 0, then\ X_8 = 0, else\ X_8 = X_8$$



Parow Machine (4,2)

Calculations

$$X_1 = \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} + Y_2$$

$$X_2 = \frac{PQ_{A_{(2,1)}} - AL_{A_{(2,1)}}}{RTR_{M_{(2,1)}}} + Y_3, if\ X_2 < 0,$$

$$then\ Y_2 = X_2\ and\ then\ X_2 = 0, else\ X_2 = X_2\ and\ Y_2 = 0$$

$$X_3 = \frac{PQ_{A_{(2,2)}} - AL_{A_{(2,2)}}}{RTR_{M_{(2,2)}}} + Y_4, if\ X_3 < 0,$$

$$then\ Y_3 = X_3\ and\ then\ X_3 = 0, else\ X_3 = X_3\ and\ Y_3 = 0$$

$$X_4 = \frac{PQ_{A_{(2,3)}} - AL_{A_{(2,3)}}}{RTR_{M_{(2,3)}}} + Y_5, if\ X_4 < 0,$$

$$then\ Y_4 = X_4\ and\ then\ X_4 = 0, else\ X_4 = X_4\ and\ Y_4 = 0$$

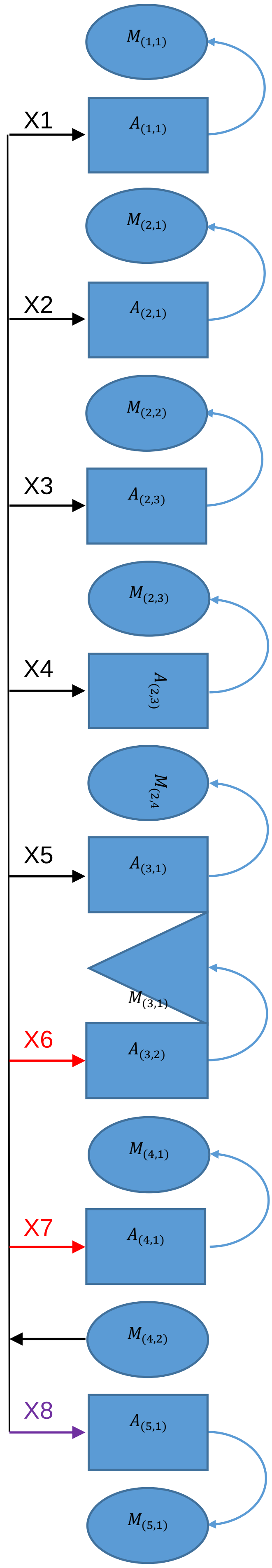
$$X_5 = \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,4)}}}, if\ X_5 < 0,$$

$$then\ Y_5 = X_5\ and\ then\ X_5 = 0, else\ X_5 = X_5\ and\ Y_5 = 0$$

$$X_6 = \frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}}, if\ X_6 < 0, then\ X_6 = 0, else\ X_6 = X_6$$

$$X_7 = \frac{CQ_{A_{(4,1)}} - AL_{A_{(4,1)}}}{RTR_{M_{(4,1)}}}, if\ X_7 < 0, then\ X_7 = 0, else\ X_7 = X_7$$

$$X_8 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}}, if\ X_8 < 0, then\ X_8 = 0, else\ X_8 = X_8$$



Parow Machine (5,1)

Calculations

$$X_1 = \frac{PQ_{A_{(1,1)}} - AL_{A_{(1,1)}}}{RTR_{M_{(1,1)}}} + Y_2$$

$$X_2 = \frac{PQ_{A_{(2,1)}} - AL_{A_{(2,1)}}}{RTR_{M_{(2,1)}}} + Y_3, if\ X_2 < 0,$$

$$then\ Y_2 = X_2\ and\ then\ X_2 = 0, else\ X_2 = X_2\ and\ Y_2 = 0$$

$$X_3 = \frac{PQ_{A_{(2,2)}} - AL_{A_{(2,2)}}}{RTR_{M_{(2,2)}}} + Y_4, if\ X_3 < 0,$$

$$then\ Y_3 = X_3\ and\ then\ X_3 = 0, else\ X_3 = X_3\ and\ Y_3 = 0$$

$$X_4 = \frac{PQ_{A_{(2,3)}} - AL_{A_{(2,3)}}}{RTR_{M_{(2,3)}}} + Y_5, if\ X_4 < 0,$$

$$then\ Y_4 = X_4\ and\ then\ X_4 = 0, else\ X_4 = X_4\ and\ Y_4 = 0$$

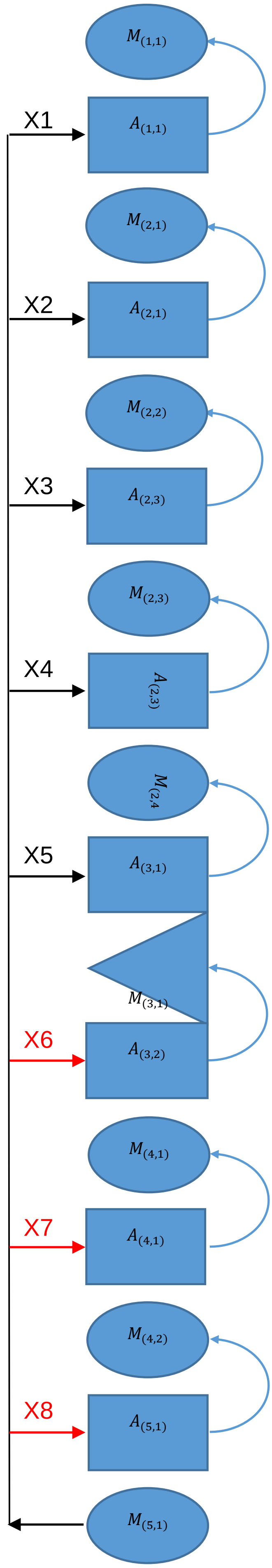
$$X_5 = \frac{PQ_{A_{(3,1)}} - AL_{A_{(3,1)}}}{RTR_{M_{(2,4)}}}, if\ X_5 < 0,$$

$$then\ Y_5 = X_5\ and\ then\ X_5 = 0, else\ X_5 = X_5\ and\ Y_5 = 0$$

$$X_6 = \frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}}, if\ X_6 < 0, then\ X_6 = 0, else\ X_6 = X_6$$

$$X_7 = \frac{CQ_{A_{(4,1)}} - AL_{A_{(4,1)}}}{RTR_{M_{(4,1)}}}, if\ X_7 < 0, then\ X_7 = 0, else\ X_7 = X_7$$

$$X_8 = \frac{CQ_{A_{(5,1)}} - AL_{A_{(5,1)}}}{RTR_{M_{(4,2)}}}, if\ X_8 < 0, then\ X_8 = 0, else\ X_8 = X_8$$



Valpré Machine (3,1)

Calculations

$$X_1 = \frac{AL_{A_{(3,2)}} - CQ_{A_{(3,2)}}}{RTR_{M_{(4,1)}}}, if\ X_1 < 0$$

$$then\ Y_1 = X_1\ and\ then\ X_1 = 0, else\ X_1 = X_1\ and\ Y_1 = 0$$

$$X_2 = \frac{AL_{A_{(4,1)}} - CQ_{A_{(4,1)}}}{RTR_{M_{(4,2)}}} + Y_1, if\ X_2 < 0$$

$$then\ Y_2 = X_2\ and\ then\ X_2 = 0, else\ X_2 = X_2\ and\ Y_2 = 0$$

$$X_3 = \frac{AL_{A_{(4,2)}} - CQ_{A_{(4,2)}}}{RTR_{M_{(4,3)}}} + Y_2, if\ X_3 < 0$$

$$then\ Y_3 = X_3\ and\ then\ X_3 = 0, else\ X_3 = X_3\ and\ Y_3 = 0$$

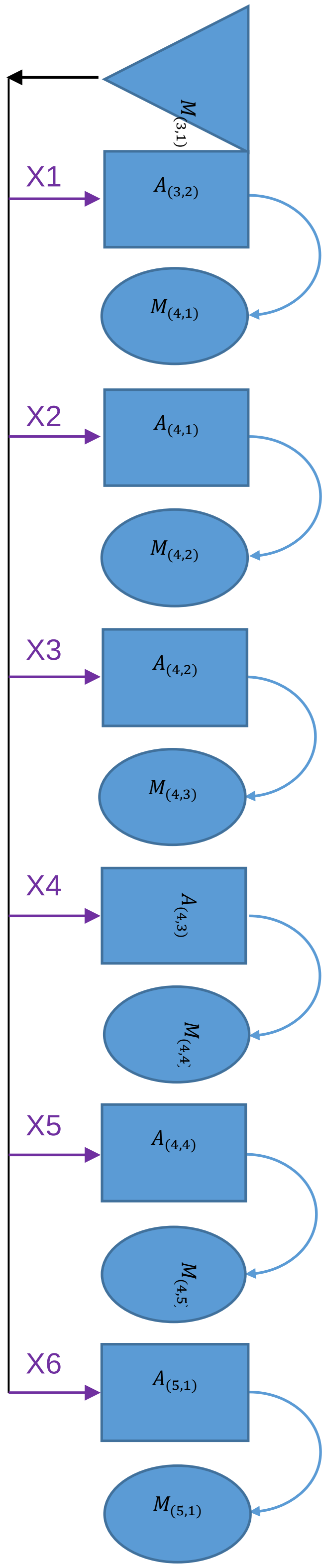
$$X_4 = \frac{AL_{A_{(4,3)}} - CQ_{A_{(4,3)}}}{RTR_{M_{(4,4)}}} + Y_3, if\ X_4 < 0$$

$$then\ Y_4 = X_4\ and\ then\ X_4 = 0, else\ X_4 = X_1\ and\ Y_4 = 0$$

$$X_5 = \frac{AL_{A_{(4,4)}} - CQ_{A_{(4,4)}}}{RTR_{M_{(4,5)}}} + Y_4, if\ X_5 < 0$$

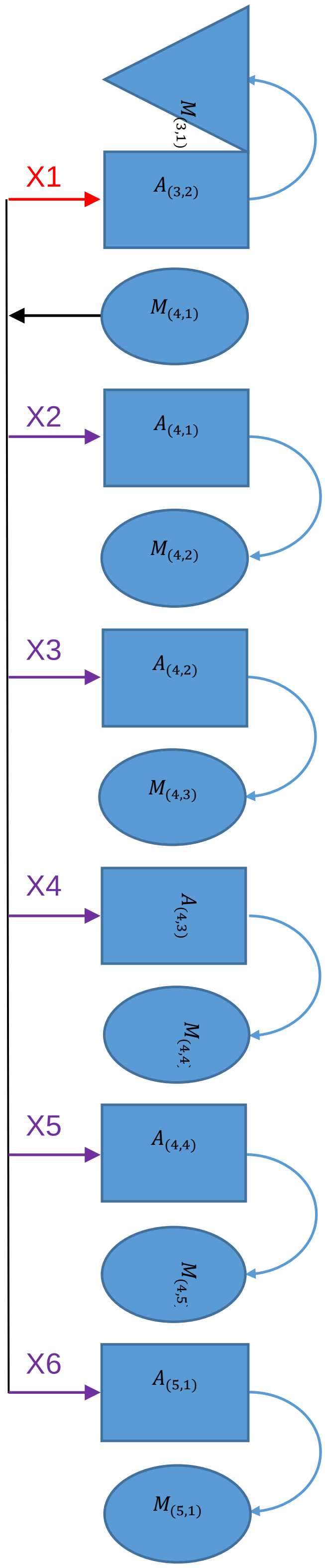
$$then\ Y_5 = X_5\ and\ then\ X_5 = 0, else\ X_5 = X_5\ and\ Y_5 = 0$$

$$X_6 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_5, if\ X_6 < 0\ then\ X_6 = 0, else\ X_6 = X_6$$



Valpré Machine (4,1)

Calculations



$$X_1 = \frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}}, if\ X_1 < 0\ then\ X_1 = 0, else\ X_1 = X_1$$

$$X_2 = \frac{AL_{A_{(4,1)}} - CQ_{A_{(4,1)}}}{RTR_{M_{(4,2)}}}, if\ X_2 < 0$$

$$then\ Y_2 = X_2\ and\ then\ X_2 = 0, else\ X_2 = X_2\ and\ Y_2 = 0$$

$$X_3 = \frac{AL_{A_{(4,2)}} - CQ_{A_{(4,2)}}}{RTR_{M_{(4,3)}}} + Y_2, if\ X_3 < 0$$

$$then\ Y_3 = X_3\ and\ then\ X_3 = 0, else\ X_3 = X_3\ and\ Y_3 = 0$$

$$X_4 = \frac{AL_{A_{(4,3)}} - CQ_{A_{(4,3)}}}{RTR_{M_{(4,4)}}} + Y_3, if\ X_4 < 0$$

$$then\ Y_4 = X_4\ and\ then\ X_4 = 0, else\ X_4 = X_1\ and\ Y_4 = 0$$

$$X_5 = \frac{AL_{A_{(4,4)}} - CQ_{A_{(4,4)}}}{RTR_{M_{(4,5)}}} + Y_4, if\ X_5 < 0$$

$$then\ Y_5 = X_5\ and\ then\ X_5 = 0, else\ X_5 = X_5\ and\ Y_5 = 0$$

$$X_6 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_5, if\ X_6 < 0\ then\ X_6 = 0, else\ X_6 = X_6$$

Valpré Machine (4,2)

Calculations

$$X_1 = \frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}}, if\ X_1 < 0\ then\ X_1 = 0, else\ X_1 = X_1$$

$$X_2 = \frac{CQ_{A_{(4,1)}} - AL_{A_{(4,1)}}}{RTR_{M_{(4,1)}}}, if\ X_2 < 0\ then\ X_2 = 0, else\ X_2 = X_2$$

$$X_3 = \frac{AL_{A_{(4,2)}} - CQ_{A_{(4,2)}}}{RTR_{M_{(4,3)}}}, if\ X_3 < 0$$

$$then\ Y_3 = X_3\ and\ then\ X_3 = 0, else\ X_3 = X_3\ and\ Y_3 = 0$$

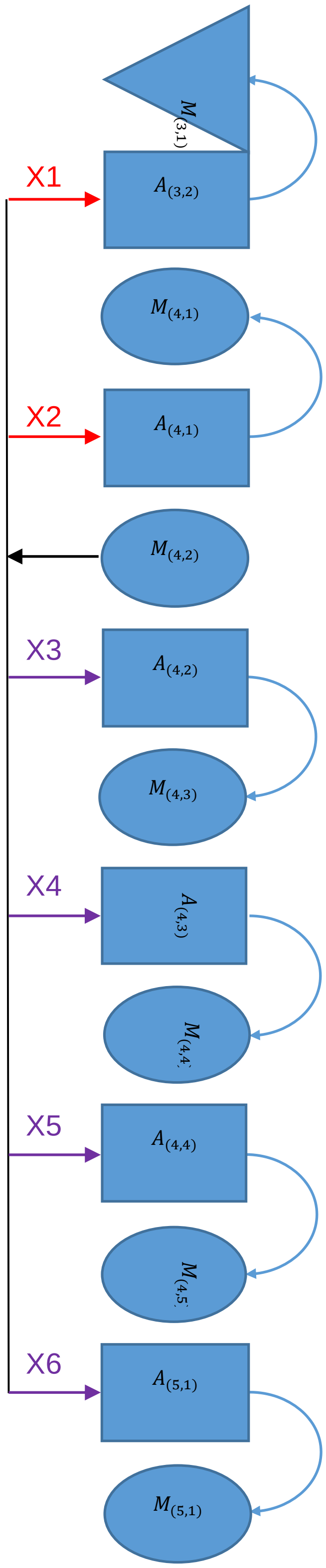
$$X_4 = \frac{AL_{A_{(4,3)}} - CQ_{A_{(4,3)}}}{RTR_{M_{(4,4)}}} + Y_3, if\ X_4 < 0$$

$$then\ Y_4 = X_4\ and\ then\ X_4 = 0, else\ X_4 = X_1\ and\ Y_4 = 0$$

$$X_5 = \frac{AL_{A_{(4,4)}} - CQ_{A_{(4,4)}}}{RTR_{M_{(4,5)}}} + Y_4, if\ X_5 < 0$$

$$then\ Y_5 = X_5\ and\ then\ X_5 = 0, else\ X_5 = X_5\ and\ Y_5 = 0$$

$$X_6 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_5, if\ X_6 < 0\ then\ X_6 = 0, else\ X_6 = X_6$$



Valpré Machine (4,3)

Calculations

$$X_1 = \frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}}, if\ X_1 < 0\ then\ X_1 = 0, else\ X_1 = X_1$$

$$X_2 = \frac{CQ_{A_{(4,1)}} - AL_{A_{(4,1)}}}{RTR_{M_{(4,1)}}}, if\ X_2 < 0\ then\ X_2 = 0, else\ X_2 = X_2$$

$$X_3 = \frac{CQ_{A_{(4,2)}} - AL_{A_{(4,2)}}}{RTR_{M_{(4,2)}}}, if\ X_3 < 0\ then\ X_3 = 0, else\ X_3 = X_3$$

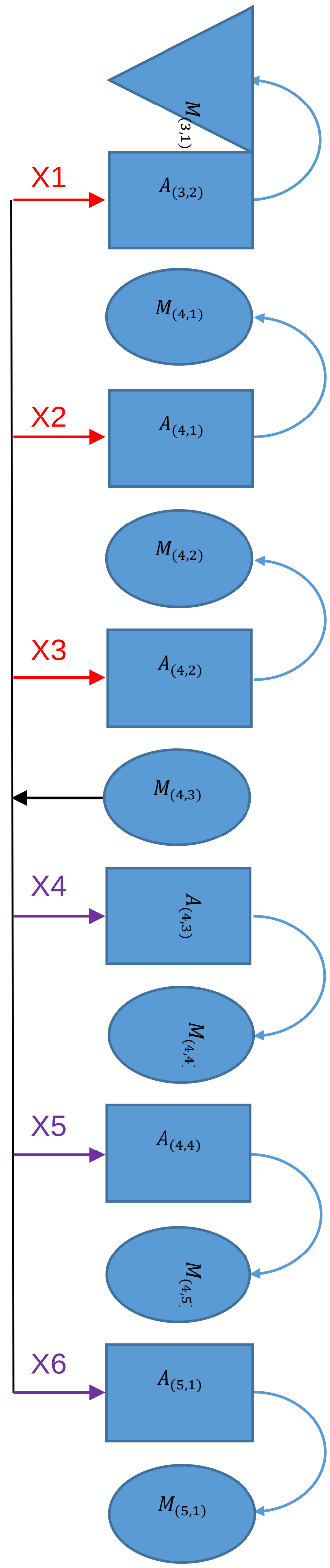
$$X_4 = \frac{AL_{A_{(4,3)}} - CQ_{A_{(4,3)}}}{RTR_{M_{(4,4)}}}, if\ X_4 < 0$$

$$then\ Y_4 = X_4\ and\ then\ X_4 = 0, else\ X_4 = X_1\ and\ Y_4 = 0$$

$$X_5 = \frac{AL_{A_{(4,4)}} - CQ_{A_{(4,4)}}}{RTR_{M_{(4,5)}}} + Y_4, if\ X_5 < 0$$

$$then\ Y_5 = X_5\ and\ then\ X_5 = 0, else\ X_5 = X_5\ and\ Y_5 = 0$$

$$X_6 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_5, if\ X_6 < 0\ then\ X_6 = 0, else\ X_6 = X_6$$



Valpré Machine (4,4)

Calculations

$$X_1 = \frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}}, if\ X_1 < 0\ then\ X_1 = 0, else\ X_1 = X_1$$

$$X_2 = \frac{CQ_{A_{(4,1)}} - AL_{A_{(4,1)}}}{RTR_{M_{(4,1)}}}, if\ X_2 < 0\ then\ X_2 = 0, else\ X_2 = X_2$$

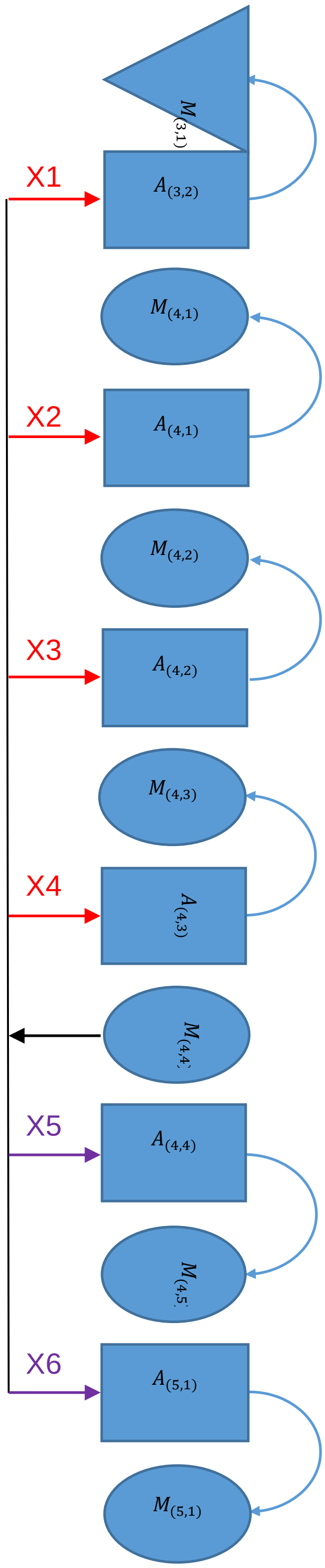
$$X_3 = \frac{CQ_{A_{(4,2)}} - AL_{A_{(4,2)}}}{RTR_{M_{(4,2)}}}, if\ X_3 < 0\ then\ X_3 = 0, else\ X_3 = X_3$$

$$X_4 = \frac{CQ_{A_{(4,3)}} - AL_{A_{(4,3)}}}{RTR_{M_{(4,3)}}}, if\ X_4 < 0\ then\ X_4 = 0, else\ X_4 = X_4$$

$$X_5 = \frac{AL_{A_{(4,4)}} - CQ_{A_{(4,4)}}}{RTR_{M_{(4,5)}}}, if\ X_5 < 0$$

$$then\ Y_5 = X_5\ and\ then\ X_5 = 0, else\ X_5 = X_5\ and\ Y_5 = 0$$

$$X_6 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}} + Y_5, if\ X_6 < 0\ then\ X_6 = 0, else\ X_6 = X_6$$



Valpré Machine (4,5)

Calculations

$$X_1 = \frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}}, if\ X_1 < 0\ then\ X_1 = 0, else\ X_1 = X_1$$

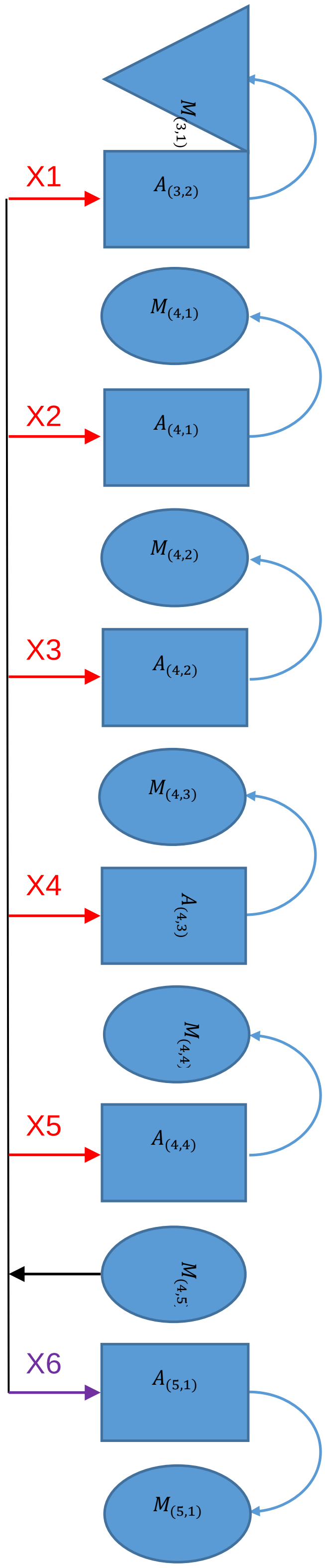
$$X_2 = \frac{CQ_{A_{(4,1)}} - AL_{A_{(4,1)}}}{RTR_{M_{(4,1)}}}, if\ X_2 < 0\ then\ X_2 = 0, else\ X_2 = X_2$$

$$X_3 = \frac{CQ_{A_{(4,2)}} - AL_{A_{(4,2)}}}{RTR_{M_{(4,2)}}}, if\ X_3 < 0\ then\ X_3 = 0, else\ X_3 = X_3$$

$$X_4 = \frac{CQ_{A_{(4,3)}} - AL_{A_{(4,3)}}}{RTR_{M_{(4,3)}}}, if\ X_4 < 0\ then\ X_4 = 0, else\ X_4 = X_4$$

$$X_5 = \frac{CQ_{A_{(4,4)}} - AL_{A_{(4,4)}}}{RTR_{M_{(4,4)}}}, if\ X_5 < 0\ then\ X_5 = 0, else\ X_5 = X_5$$

$$X_6 = \frac{AL_{A_{(5,1)}} - CQ_{A_{(5,1)}}}{RTR_{M_{(5,1)}}}, if\ X_6 < 0\ then\ X_6 = 0, else\ X_6 = X_6$$



Valpré Machine (5,1)

Calculations

$$X_1 = \frac{CQ_{A_{(3,2)}} - AL_{A_{(3,2)}}}{RTR_{M_{(3,1)}}}, if\ X_1 < 0\ then\ X_1 = 0, else\ X_1 = X_1$$

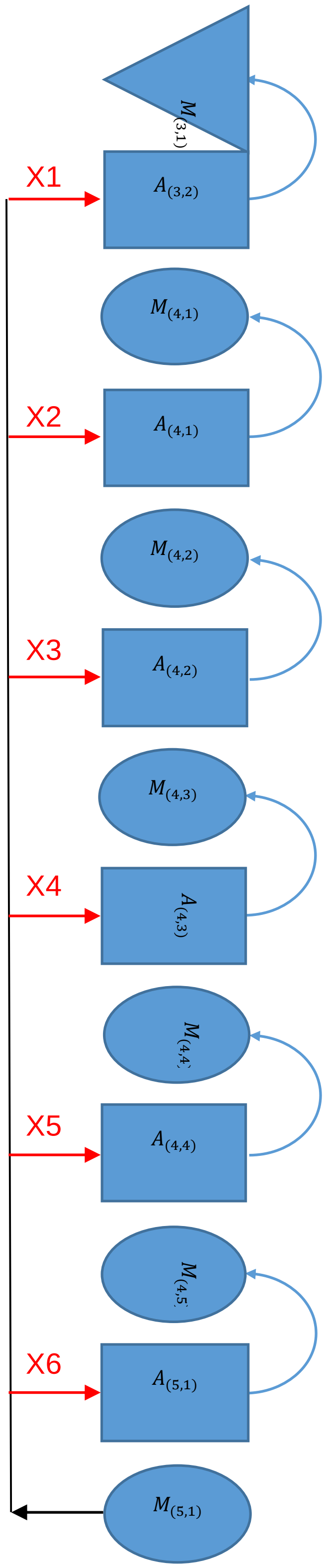
$$X_2 = \frac{CQ_{A_{(4,1)}} - AL_{A_{(4,1)}}}{RTR_{M_{(4,1)}}}, if\ X_2 < 0\ then\ X_2 = 0, else\ X_2 = X_2$$

$$X_3 = \frac{CQ_{A_{(4,2)}} - AL_{A_{(4,2)}}}{RTR_{M_{(4,2)}}}, if\ X_3 < 0\ then\ X_3 = 0, else\ X_3 = X_3$$

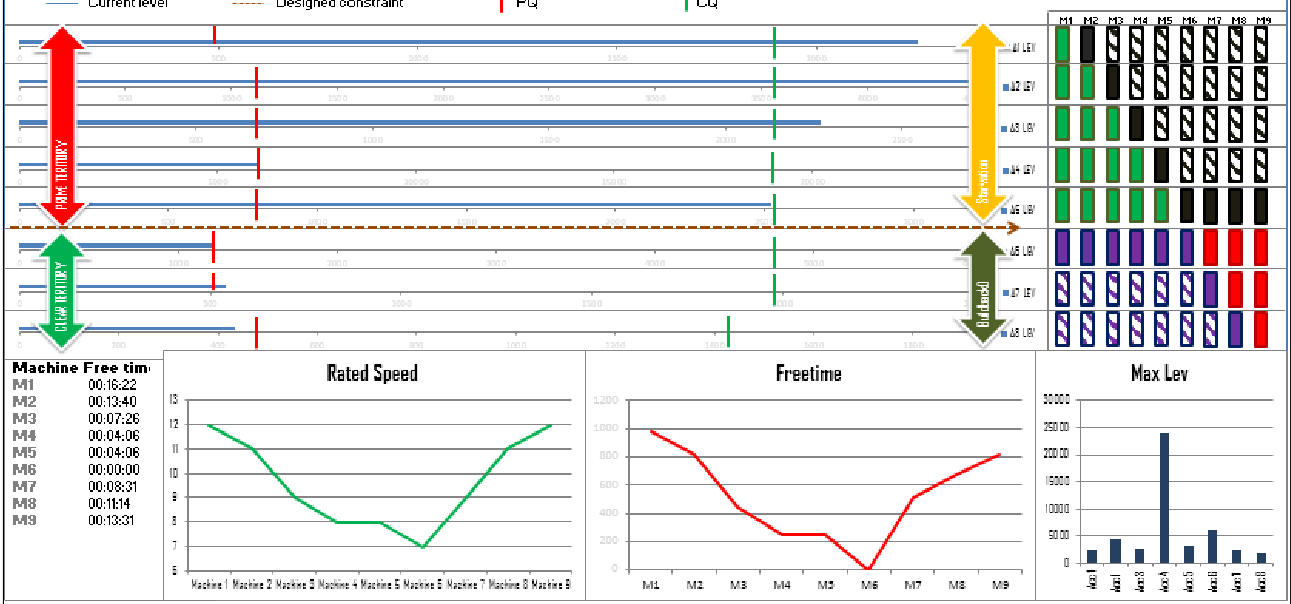
$$X_4 = \frac{CQ_{A_{(4,3)}} - AL_{A_{(4,3)}}}{RTR_{M_{(4,3)}}}, if\ X_4 < 0\ then\ X_4 = 0, else\ X_4 = X_4$$

$$X_5 = \frac{CQ_{A_{(4,4)}} - AL_{A_{(4,4)}}}{RTR_{M_{(4,4)}}}, if\ X_5 < 0\ then\ X_5 = 0, else\ X_5 = X_5$$

$$X_6 = \frac{CQ_{A_{(5,1)}} - AL_{A_{(5,1)}}}{RTR_{M_{(4,5)}}}, if\ X_6 < 0\ then\ X_6 = 0, else\ X_6 = X_6$$



M1 CTR	A1 LEV	M2 CTR	A2 LEV	M3 CTR	A3 LEV	M4 CTR	A4 LEV	M5 CTR	A5 LEV	M6 CTR	A6 LEV	M7 CTR	A7 LEV	M8 CTR	A8 LEV	M9 CTR
12	2255	11	4495	9	2270	8	6000	8	2525	7	1220	9	540	0	435	0



	X1	X2	Y2	X3	Y3	X4	Y4	X5	Y5	X6	Y6	X7	Y7	X8
M1	161.36	374.4		199.4		0		246.4		0	-398	0	-597	0
M2	0	374.4		199.4		0		246.4		0	-398	0	-597	0
M3	0	0	-306	199.4		0		246.4		0	-398	0	-597	0
M4	0	0	-484	0	-177	0		246.4		0	-398	0	-597	0
M5	0	0	-484	0	-177	0	0	246.4		0	-398	0	-597	0
M6	0	0	-699	0	-393	0	-216	0	-216	0	-398	0	-597	0
M7	0	0	-699	0	-393	0	-216	0	-216	511.4		0	-199	0
M8	0	0	-699	0	-393	0	-216	0	-216	511.4		162.2		0
M9	0	0	-699	0	-393	0	-216	0	-216	511.4		162.2		137

	Type 1 FT	Type 2 FT	Type 3 FT		Type 4 FT	Zero	MAXA FT
M1			981.6		0	0	981.61
M2	0		820.2		0	0	820.25
M3	0		445.8		0	0	445.8
M4	0		246.4		0	0	246.43
M5	0		246.4		0	0	246.43
M6	0				0	0	0
M7	0	511.4			0	0	511.43
M8	0	673.7			0	0	673.65
M9	0	810.7				0	810.7

Figure J.1: Snapshot of the Excel-based simulation for Parow Line 6