

Learner Name : Matthew Thomas.

Course : HNC Process Operations Engineering, Year 2.

Module Code : PCPO4007.

Module Name : Process Engineering Practice.

Assignment : Responsibility, Operational and Maintenance Activities.

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Introduction.

Two Pieces of Work shall be completed within this Assignment. Each section is divided within this Assignment and has its own Contents and Introduction.

The two sections are :

- Demonstrating of Knowledge and Understanding the Operational and Maintenance Activities within The First Milk Cheese Company Ltd
- Demonstrating of Knowledge and Understanding the Levels of Responsibility within The First Milk Cheese Company Ltd

The first section will be a brief overview of a production line within The First Milk Cheese Company Ltd, Haverfordwest Creamery, explaining the operational and maintenance activities within that line.

The second section is a detailed account of my knowledge and understanding that allows me to complete my job within the Engineering Department at The First Milk Cheese Company Ltd, Haverfordwest Creamery.

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Part 1 : Report Demonstrating of Knowledge and Understanding the Operational and Maintenance Activities within The First Milk Cheese Company Ltd.

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Introduction

The focus of this Report will be the Operational and Maintenance Activities carried out on a Production Line within The First Milk Cheese Company Ltd, Haverfordwest Creamery. The Line in question is the Whey Concentrate Line that takes Whey (a by-product in the Cheese Production process) and turns it into a suitable product for sale.

Task 1 : Demonstrating of Knowledge and Understanding the Operational and Maintenance Activities within The First Milk Cheese Company Ltd.

Within “The First Milk Cheese Company Ltd, Haverfordwest Creamery” there is a single production line that makes 20kg blocks of cheese, but there are two by-product lines that come off this main line. One of these turns the fats into cream, the second turns whey into whey concentrate. The whey concentrate line is going to be the focus of this report. The aim of the production line is to turn the whey from a concentration rate of 6% up to 30% which makes it a viable product to sell on for further processing. This is done by removing impurities and water from the liquid until a balance of 30% whey is left. During the production of the 20kg blocks of cheese, whey is collected and pumped into one of two collection silos. These silos being labelled “6% whey silo 1” and “6% whey silo 2”. In order to keep the machinery running smoothly at The First Milk Cheese Company Ltd, Haverfordwest Creamery, all items have a continually reviewed maintenance schedule. All maintenance at “The First Milk Cheese Company Ltd, Haverfordwest Creamery” is divided into four different types of tasks.

They are :

- Operator checks
- Engineering planned preventive maintenance
- Engineering / OEM routine servicing
- Cleaning

Items are checked by Operators, Engineers or both frequently and have regular preventive maintenance and servicing. All of these tasks will be recorded when completed and feedback given to Engineering Management if required to allow follow up works to be planned in. Engineering and servicing tasks will be recorded on the site Planned Maintenance System whilst the Operator Checks will be held within Production Records. Plant Cleaning is generally done at the end of each production run, but some items have different schedules due to a higher risk of bacteria growth. For these silos, the below tasks are completed :

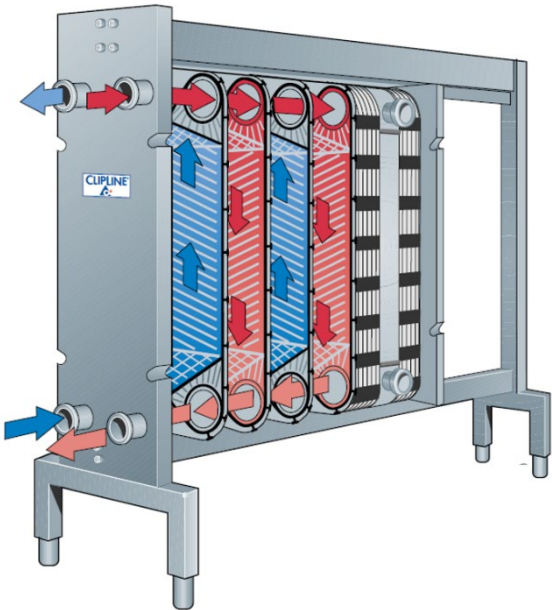
Type	Task	Reason
Operator checks	daily internal check for cleanliness	The cleanliness of all internal surfaces within the food production line is of the utmost importance at “The First Milk Cheese Company Ltd, Haverfordwest Creamery”. As such, it is important to make sure that all cleaning processes have the desired effect. This can only be done by manually inspecting the surfaces after each clean.

	daily internal check for evidence of cracks	Any cracks in the internal surfaces of the silo could allow bacteria to begin growing as it is likely that food products will get stuck in the crack and not properly cleaned out. Regular checking for cracks helps to detect them early and allow repairs to be carried out before any bacteria can grow.
Engineering planned preventive maintenance	3 weekly condition monitoring check on silo agitator and motor	By taking the vibration and temperature levels from the silo agitator, deterioration can be identified quickly and before failure. This will allow the agitator to be replaced prior to failure.
	3 weekly condition monitoring check on outlet pump and motor	See pump maintenance checks in table "table 6 : maintenance checks on pumps"
	Quarterly inspection of inlet and outlet valve seals	See valve maintenance checks in table "table 7 : maintenance checks on valves".
	annual calibration of  level probes	Without calibrating the level probes, they accuracy of the probes will eventually wonder from its correct position. This could lead to the vessel overflowing or running empty.
	2 yearly replacement of seals on silo agitator	Historic testing at site has proved that the seals used on site at the first milk cheese company ltd, Haverfordwest creamery last a minimum of 2 years, so to reduce the risk of failure, all seals are replaced on a 2-yearly routine.
	2 yearly replacement of seals on outlet pump	See pump maintenance checks in table "table 6 : maintenance checks on pumps".
	2 yearly replacement of seals on inlet and outlet valves	See valve maintenance checks in table "table 7 : maintenance checks on valves".
Engineering / OEM routine servicing	annual non-destructive testing of vessel	Whilst operators inspect each silo for internal cracks daily, sometimes cracks are so small that they cannot be seen during normal inspection. To counter this once a year a non-destructive test is

		carried out to identify these cracks and allow repairs to be carried out. this is done by spraying a penetrative food safe chemical all over the internal of the vessel and then shining a black light over it. the penetration fluid will gather in any cracks allowing them to be seen and marked up for repairs.
Cleaning	Daily production clean	When the silo empties an automatic C.I.P (Cleaning in Place) sequence begins. This flushes the silo with water, then caustic before a final flush out again. This is done to remove any old product, debris and bacteria within the silo. Old product could contaminate future production runs (different colour for example) whilst debris and bacteria could be a foreign body or microbiological contamination for a consumer.

table 1 : maintenance checks on whey silos.

Once a silo is full, the whey empties out from the silo and is then pumped over, and its production process begins. First it goes through a heat exchanger. The reason for this is to help with the separation of the whey that happens in the next step. The hotter the whey, the easier it separates from water. A heat exchanger is a set of plates that runs product down one side and a heating agent such as hot water or steam down the other. The heat passes through the plates heating the product but neither the product nor heating agent will meet.



For this heat exchanger, the below tasks are completed :

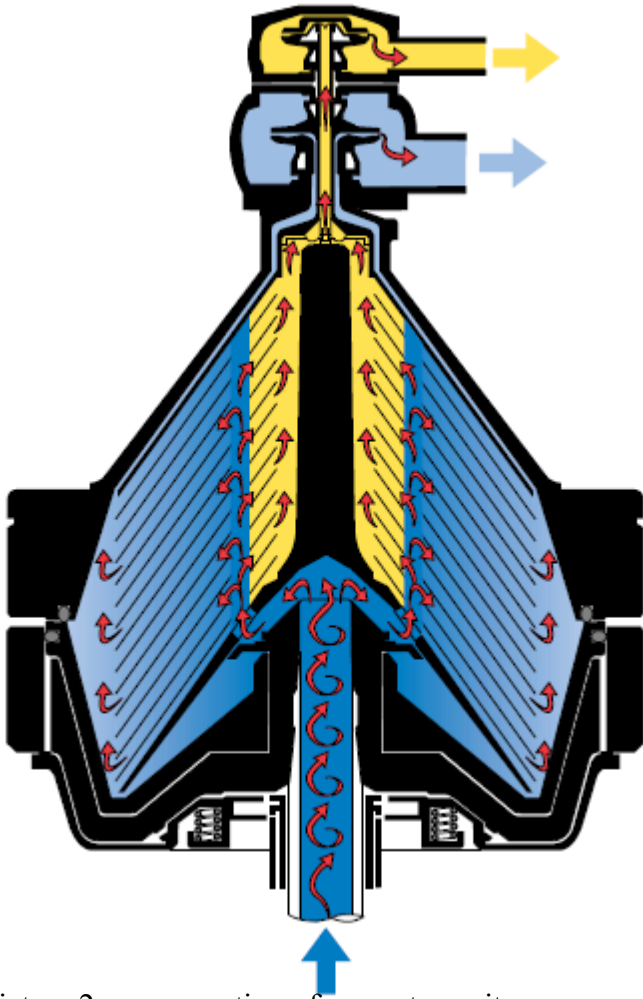
picture 1 : cross section of plate pack

Type	Task	Reason
operator checks	hourly temperature checks	food safety law dictates that products are heated to a set temperature to ensure that there is no bacteria in them. as such, it is hugely important that the temperature of the product coming out of

		the heat exchanger is checked regularly by operators.
Engineering planned preventive maintenance	3 weekly condition monitoring check on outlet pump and motor	See pump maintenance checks in table "table 6 : maintenance checks on pumps"
	Quarterly inspection of inlet and outlet valve seals	See valve maintenance checks in table "table 7 : maintenance checks on valves".
	6 monthly calibration of temperature probes	to help the operators checking the temperature, it is important that they have accurate temperature probes. as such, the temperature probes are calibrated every 6 months.
	2 yearly replacement of seals on outlet pump	See pump maintenance checks in table "table 6 : maintenance checks on pumps".
	2 yearly replacement of seals on inlet and outlet valves	See valve maintenance checks in table "table 7 : maintenance checks on valves".
Engineering / OEM routine servicing	annual integrity testing of plate pack	any cracks in the plate surfaces of the heat exchanger could allow bacteria to begin growing as it is likely that food products will get stuck in the crack and not properly cleaned out. it could result in cross contamination, where the whey runs into the hot water, or hot water into the whey. this could affect the quality of the product produced. to counter this once a year a non-destructive test is carried out to identify these cracks and allow repairs to be carried out. this is done by pumping water through both sides of the heat exchangers and then adding a reactive agent to one side. if the agent is detected in the other side, it indicates a crack. the plates are then split off into sections to identify the damaged plate(s), which are replaced.
	annual holding time test	to ensure that the product reaches the right temperature before moving forward, it needs to

		travel through the heat exchanger for the correct amount of time. this is a food safety feature to ensure that no bacteria can harm anyone who eats our products. using a standard flow rate, water is pumped through the heat exchanger and a small reactive agent added. the time it takes for this reactive agent to be detected at the end of the heat exchanger is then recorded and checked to ensure it is longer than the food safe time requirement.
	2 yearly replacement of plate pack rubbers	historic testing at site has proved that the seals used on site at “The First Milk Cheese Company Ltd, Haverfordwest Creamery” last a minimum of 2 years, so to reduce the risk of failure, all seals are replaced on a 2 yearly routine.
Cleaning	Daily production clean	When production run finished an automatic C.I.P (Cleaning in Place) sequence begins. This flushes the heat exchanger with water, then caustic before a final flush out again. This is done to remove any old product or bacteria on the plates that could cause harm to consumers.

table 2 : maintenance checks on heat exchangers.



Once the whey has been heated, it continues along until it gets to one of two whey separators (also called centrifuges) where the whey is filtered out from water and any bits of cheese or debris that accidentally got drawn into this production line. This is done by spinning the liquid in a hooded bowl up to approx. 5000rpm. There is a set of cone shaped plates within the Bowl that have set micron gaps between them. The whey, water and debris all have different sizes and so are filtered by these plates. Whey leaves through one pipe and continues on the production line, water is sent for cleaning in the site RO and Polisher Plant and re-used for pre-cleaning flushes whilst debris is sent to drain. The separators, called "Whey sep 1" and "Whey sep 2" have a split production run. "Whey sep 1" begins the production run and half way through the day the production is switched over to "Whey Sep 2". This is done to allow more time for cleaning on the units and to make sure that all maintenance checks are completed. It also

picture 2 : cross section of separator unit

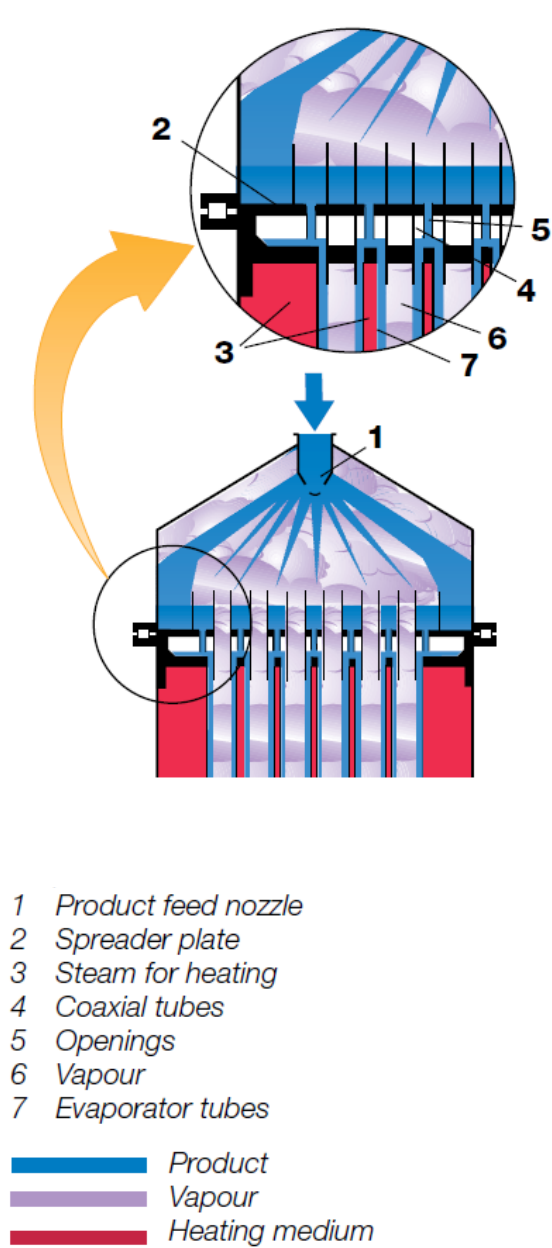
increases the longevity of the units and ensures the risk of downtime between servicing is kept to a minimum. The operational checks on both units are mostly monitored via automatic online systems (on the First Milk SCADA) but there are a few manual maintenance tasks that are completed on each unit :

Type	Task	Reason
operator checks	hourly discharge check	for the separator to work correctly it needs to discharge any build up of debris or waste products regularly. the operators perform a discharge check on each unit every hour to make sure it has discharged. without removing these items, they could build up and block the separator or could a build up of vibration which would automatically shut down the machine.
Engineering planned preventive maintenance	weekly condition monitoring check on drive motor	by taking the vibration and temperature levels from the drive motor, deterioration can be

		identified quickly and before failure. this will allow the motor to be replaced prior to failure.
	3 weekly condition monitoring check on outlet pump and motor	See pump maintenance checks in table "table 6 : maintenance checks on pumps"
	Quarterly inspection of inlet and outlet valve seals	See valve maintenance checks in table "table 7 : maintenance checks on valves".
	2 yearly replacement of seals on outlet pump	See pump maintenance checks in table "table 6 : maintenance checks on pumps".
	2 yearly replacement of seals on inlet and outlet valves	See valve maintenance checks in table "table 7 : maintenance checks on valves".
	3 yearly replacement of drive motor	the drive motor for each unit is put under a lot of stress when running these machines. should they fail in production the time to replace would mean stopping production. to prevent this, a routine 3 yearly replacement of the drive motor for a serviced spare motor is completed.
Engineering / OEM routine servicing	6 monthly full service	with the importance of these machines it is important for them to have regular OEM servicing. this is done every 6 months where each machine is stripped down and every seal changed. this task takes 2 engineers over 8 hours to complete and can't be done without shutting down production. as such it is hugely important that these services keep the machine going until the next due service.
Cleaning	Daily production clean	When the separator empties an automatic C.I.P (Cleaning in Place) sequence begins. This flushes the separator with water, then caustic before a final flush out again. This is done to remove any old product, debris and bacteria within the bowl. Old product could contaminate future production runs (different colour for

		example) whilst debris and bacteria could be a foreign body or microbiological contamination for a consumer. Also any build up of debris within the bowl would cause the bowl to vibrate excessively during start up. This would likely trip the vibration alarms on the unit and cause the machine to shut down. This can't be rectified without stripping down the machine.
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table 3 : maintenance checks on whey separators..



picture 3 : workings of NIRO evaporator

Type	Task	Reason
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After the whey has been through either of the separators, it gets pumped into another set of collection silos, these being the 12% whey silos and are labelled as “12% whey silo 1” and “12% whey silo 2”. The maintenance completed on these silos mirrors that completed on the 6% whey silos (see table “table 1 : maintenance checks on whey silos”). When the silo is full, the whey is transferred over to the NIRO evaporator plant via a pump. The NIRO evaporator plant consists of seven approx. twelve-metre-high vessels each with numerous tubes running from top to bottom within them. These vessels are known as the “Effects” and are labelled as the “First Effect” up to the “Seventh Effect”. Whey enters the first vessel at the top and runs across a spreader plate into one of the multiple tubes within. Around each of these tubes is a void full of steam that is used to heat the tube. This causes the water to evaporate off out of the whey and it leaves via an outlet at the top of the vessel and is collected as condensate and returned to the boiler house. The whey reaches the bottom of the vessel and is then pumped up to the next vessel after which the process is repeated. This continues through all vessels, each time removing more water and concentrating up the whey. The maintenance tasks completed on the NIRO evaporator are :

operator checks	hourly steam pressure checks	if the steam pressure fell then the efficiency of the plant would fall. the steam pressure needs to be right to ensure that the temperature is kept high in the vessels. any fall in pressure needs to be immediately highlighted so that the steam plant can be checked and corrected.
	hourly flow checks	due to the size of the tubes, they are unfortunately liable to blocking. as such it is important that the flow coming out of the vessels is checked. blockages will slow the outlet flow quickly and a decision can be made on whether a clean is needed.
Engineering planned preventive maintenance	3 weekly condition monitoring check on each vessel outlet pump and motor	See pump maintenance checks in table "table 6 : maintenance checks on pumps"
	Quarterly inspection of inlet and outlet valve seals	See valve maintenance checks in table "table 7 : maintenance checks on valves".
	2 yearly replacement of seals on each vessel outlet pump	See pump maintenance checks in table "table 6 : maintenance checks on pumps".
	2 yearly replacement of seals on inlet and outlet valves	See valve maintenance checks in table "table 7 : maintenance checks on valves".
Engineering / OEM routine servicing	annual jet out of vessel tubes	once a year each tube is jetting out with a high pressure jet washer. ~~this~~ clears any blockages and brings the plant ~~back up~~ to full capacity.
Cleaning	Daily production clean	When production run finished an automatic C.I.P (Cleaning in Place) sequence begins. This flushes the vessels with water, then caustic before a final flush out again. This is done to remove any bacteria within the tubes that could cause harm to consumers.

table 4 : maintenance checks on NIRO evaporator.

After the last vessel, the whey is pumped through a chiller unit before being collected into the last set of collection silos. The chiller unit is a plate pack like a heat exchanger, but with chilled water running through it rather than steam or hot water. This unit is used to begin chilling the whey down to stop bacteria growth within it. The maintenance tasks completed on the chiller unit mirror those completed on the heat exchangers mentioned previously (see table “table 2 : maintenance checks on heat exchangers”). The two collection silos, labelled as “30% whey silo 1” and “30% whey silo 2”, in the whole mirror the checks completed on the previously mentioned collection silos ((see table “table 1 : maintenance checks on whey silos”), but there is an additional element on these silos which require some additional checks. Due to the product needing to be kept chilled, there is a secondary skin around these silos where chilled water runs. This means that the below tasks are also completed on the silos :

Type	Task	Reason
operator checks	hourly temperature checks	the customers purchasing this whey from the first milk cheese company ltd want their product at a certain chilled temperature. as such, it is hugely important that the temperature of the product in the silos is checked regularly by operators.
Engineering planned preventive maintenance	3 weekly condition monitoring check on chilled water pump and motor	See pump maintenance checks in table “table 6 : maintenance checks on pumps”
	2 yearly replacement of seals on chilled water pump	See pump maintenance checks in table “table 6 : maintenance checks on pumps”

table 5 : maintenance checks on 30% whey silos.

Once the desired temperature is obtained the whey is dispatched to a customer for further processing. This is done by the whey being pumped from the 30% whey silos into a customer tanker lorry. There are numerous pumps and valves used within this process. “The First Milk Cheese Company Ltd, Haverfordwest Creamery” uses a standard maintenance programme for each of these items. The tasks completed on the pumps used are listed below :

Type	Task	Reason
Engineering planned preventive maintenance	3 weekly condition monitoring check on pump and motor	by taking the vibration and temperature levels from the pump, deterioration can be identified quickly and before failure. this will allow the pump to be replaced prior to failure.

	2 yearly replacement of seals on pump	historic testing at site has proved that the seals used on site at “The First Milk Cheese Company Ltd, Haverfordwest Creamery” last a minimum of 2 years, so to reduce the risk of failure, all seals are replaced on a 2 yearly routine.
Cleaning	Daily plant clean	Pumps are internally cleaned as part of the plant C.I.P schedule.

table 6 : maintenance checks on pumps.

The tasks completed on valves are as below :

Type	Task	Reason
Engineering planned preventive maintenance	Quarterly inspection of valve seals	A failure of a seal is not only a problem due to the leakage of product, but the rubber could end up in the food product. As such, all seals are inspected on a quarterly basis and any seals showing signs of wear are replaced as soon as possible to ensure food safety and standards are kept at all times.
	2 yearly replacement of valve seals	historic testing at site has proved that the seals used on site at “The First Milk Cheese Company Ltd, Haverfordwest Creamery” last a minimum of 2 years, so to reduce the risk of failure, all seals are replaced on a 2 yearly routine.
Cleaning	Daily plant clean	Valves are internally cleaned as part of the plant C.I.P schedule.

table 7 : maintenance checks on valves.

All of the tasks mentioned in this report help to ensure the smooth operation of the whey concentrate production line. If this line stopped working, then it would also cause the main 20kg blocks of cheese production line to close. Whey is a natural by-production of the cheese production method and if The First Milk Cheese Company Ltd could not process this, then it would have to be tankered off site and sold at a loss. It can not even be sent down to the site effluent plant as this amount of whey would overrun the bacteria within the effluent plant and cause it to cease working.

Any more you could include?

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Course : HNC Process Operations Engineering, Year 2.

Module Code : PCPO4007.

Module Name : Process Engineering Practice.

Assignment : Responsibility, Operational and Maintenance Activities.

Part 2 : Demonstrating of Knowledge and Understanding the Levels of Responsibility within The First
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Introduction

Within this section of the Report will be a detailed account of my role within The First Milk Cheese Company Ltd and my history and training to be able to complete the role that I do on Site.



Task 2 : Demonstrating of Knowledge and Understanding the Levels of Responsibility within The First Milk Cheese Company Ltd

My role within "The First Milk Cheese Company Ltd, Haverfordwest Creamery" is as the "Planned Maintenance Manager" within the Engineering Department. My role within the team is to control, manage and enhance the Planned Maintenance System on Site and plan in all Engineering and Contractor Works on Site.

My career within engineering began shortly after my 19th birthday when I started working with the engineering department of The Haverfordwest Cheese Company Ltd (later to become The First Milk Cheese Company Ltd, Haverfordwest Creamery). My title was "Engineering Information Controller" and my role started off as inputting task feedback onto a planned maintenance system. This role soon grew to cover many other tasks, such as creation and sorting of work orders and stock taking. These tasks allowed me to develop an understanding of the types of tasks required at site and the method of repair and also to begin to recognise and identify spares used within the factory.

After over 5 years in this role, I was promoted to the role of "Engineering Stores Controller". My main tasks here were the ordering of all engineering spares and production ingredients and packaging requirements. This role grew whilst I was there to also include shutdown planning. During this role I was to plan tasks, spares and contractor servicing requirements for our annual maintenance shutdowns. These tasks allowed me to further understand the spares requirements for the factory and also to know the difference between the different versions, makes and models of spares. I also developed planning skills, which were required to ensure that production didn't run out of ingredients or packaging for their runs and also to plan our maintenance shutdown.

This role continued to grow until 2014, when the role was split into two. I took on the new role of "Maintenance Planner", dedicated to the planning of maintenance tasks on site. For this role I assisted in the development and roll out of a new planned maintenance system and the review and upgrade of all tasks within the system. During this time we also introduced a new condition monitoring routine that helped reduce our downtime. Due to increased production demands, the requirement for effective and efficient maintenance was huge. My role was to work with the engineering manager and assistant engineering manager to get all planned maintenance tasks completed, and if required, follow up works planned in. I was responsible for the creation and distribution of work orders and arranging of contractor servicing tasks. This all helped to further increase my planning skills and also to expose me to more technical engineering aspects whilst discussing preventative maintenance and servicing tasks. I still assisted the engineering stores controller with cover and knowledge, so still kept myself updated with new spares.

In 2018, I was promoted to "Planned Maintenance Manager". With this promotion came the responsibility of managing the engineering stores. This has allowed me to develop some management skills. I also find myself more involved in the engineering management, which has allowed me to further understand

engineering requirements and the pressures the department face. As I now also have more responsibility within the department, I study the plant more and also the feedback from engineers. This allows me to be able to better understand and direct tasks to prevent breakdown.

Within my career, I have steadily built-up knowledge and understanding of engineering requirements, tasks and spares within the factory that has lead to me being able to undertake the role that I currently do.

Job Description :

Job Description	
Job Title	Planned Maintenance Manager
Reports To	Engineering Manager
Job Holder	Matthew Thomas
Date	August 2018
Purpose	
To schedule and forward plan the sites maintenance activities whilst ensuring that suitable and sufficient inventory is in place to support such activities. Line Management responsibility for the Engineering Store Person Role.	
Principal Accountabilities	
Responsible for the week by week and month by month scheduling of maintenance activities to ensure key items plant is serviced by the on-site team / external bodies in line with agreed frequencies. Close liaison with the site production team to ensure availability of maintenance windows Contacting of key contractors and booking their time. Arranging and delivering site inductions for new / returning contractor and suppliers Checking / ensuring that contractor RESET data is up to date for contractors / organisations used. Compliance with the site contractor control procedures and issuing / management of authority to work on site permits Provision of general administration support to the site wide team i.e., creation, amendment of SOP's, letter writing, report writing Responsible for the effective running of the site wide document archives	
Dimensions	

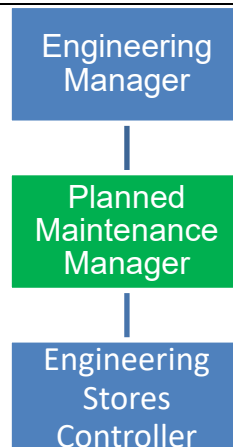
Factory efficiency and performance improvements due to continuous improvements to planned and preventative Maintenance systems.

PPM plan attainment.

Hours attributed to planned maintenance

Inventory availability

Organisation Chart



Knowledge, Skills and Experience

No formal qualifications are required but the job holder must have demonstrable organisational skills

Previous experience in a similar role preferably in a complex FMCG processing environment is highly desirable

Experience of working with multi-functional teams to work within disciplined processes and timeframes

Contextual Information

Proficient in the use of computers and packages such as Microsoft Word, Excel & Powerpoint.

Advanced ECDL and previous experience of working in a busy engineering / manufacturing business would be a distinct advantage.

A proactive individual with excellent communication and people skills

Ability to work alone and in a team environment

Results oriented focussed on efficiency and KPI delivery

Any development plan, certificates etc.