

Luke E



RESPONSIBILITY, OPERATIONAL AND MAINTENANCE ACTIVITIES

Process Engineering Practice

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Task 1 (LO1)

For task one you are required to demonstrate a knowledge and understanding of the operational and maintenance activities within a process engineering environment of your choice.

You should include operational and maintenance principles of key process equipment such as:

- Pumps,
- Compressors,
- Turbines,
- Heat Exchangers,
- Fired Heaters,
- Columns,
- Reactors,
- Tanks and Vessels,
- Valves and Piping,
- Motors.

Introduction

Within the petrochemical industry, operational and maintenance activities are an integral part of everyday work to ensure that the day to day running of the refinery and to keep essential pieces of equipment in good working condition.

Operational activities are carried out shiftly by operators within their own units and consist of routines which are set out and followed. This includes level checks, pump checks, sampling, draeger testing and overall visual checks of essential equipment. These are important as they will give an indication of how the unit is running and whether any immediate changes need to be made or any actions to be taken. There are also a number of maintenance activities which are carried out to ensure the

smooth running of the plant and essential equipment. These are carried out by the maintenance teams on a schedule and will be done to create as little disruption as possible.

Pumps

One piece of equipment which requires operational and maintenance activities to ensure the smooth running of a unit and to make sure the process can be completed is a pump. Pumps are found on every unit and are used to move fluids from one place to another. Operators will carry out daily checks on pumps as part of their rounds known as visual PM's. This includes checking the physical condition of the pump to check for any damage, recording whether the pump is in service, on standby or with maintenance and to also record pressures. Pumps will also need to undergo quarterly checks where the operator will measure the vibration levels and temperature of different components. Using a vibration tool and a temperature gun the operator will record the values and input them into the handheld device which is uploaded to the Valero system. This will allow for the condition of the pumps to be continuously monitored and any issues can be predetermined or predicted using trends. Another task which is carried out by operations on pumps is pump swaps. This is where the operator will start up the spare pump (if it is in standby) to ensure it runs correctly and to make sure it does not become seized.

As well as the operational activities that are carried out on the pumps, there are also a number of maintenance activities carried out by contractors from different departments. One maintenance activity which is carried out is pump PM's by the mechanical department, during this the contractors will carry out vibration and temperature checks (in more depth than the operators), a full change of lubrication oil and trip checks to ensure turbine driven pumps will cut out if they are running at too high of a speed.

Compressors

Another piece of equipment which requires continuous maintenance and operational activities is a compressor. Compressors are essential pieces of equipment on site as they are used to compress gasses into liquids by increasing the pressure. There are

a number of operational activities which are carried out on compressors to ensure they run efficiently and to prevent any issues from occurring. One activity which is carried out by operators is recording the temperature and pressure readings on gauges and entering them into the handheld device. Furthermore, checking the oil levels within the compressor is another activity carried out by operators. This is typically done during the operators' morning rounds in which all critical equipment is checked. It is important that the oil levels are kept to a good level so to ensure that there is sufficient lubrication for the moving parts so that they do not overheat. The operator will then also top up the oil level using air driven pumps to ensure that there is a good level. One other activity completed by operators with compressors is draining the excess liquid to the drains. This is typically done once or twice a day depending on the procedure for the compressor.

There are also a number of maintenance activities which are carried out on compressors to prevent damage or repair any issues which have occurred. One maintenance activity which is carried out is done by the instrument department who will complete routine checks of the instrumentation on the compressors to ensure they are working correctly and giving the correct readings. This will include checking digital gauges such as pressure gauges, temperature gauges and level gauges. To do this they liaise with the control operator for the unit to compare readings on both the panel and in the field. It is important for these checks to be completed to ensure that the indicators are calibrated correctly and will show the correct values on both the panel and in the field.

Valves

Another type of equipment that is essential in the day to day running of the refinery is valves. They are used to control flow through a set of pipes and there are a number of different types of valves which are used. The most common type of valve is a gate valve. This is typically operated manually by turning a valve wheel using a wheel key. As these valves are used so often, it is important that they are regularly greased to ensure that they do not stick and can be operated smoothly. Furthermore, for valves that are not often used, it is important that they are exercised and greased to ensure that they do not seize and are able to be used when needed. This is part of

level one maintenance that is expected of operators on their unit to ensure that all the valves are in a good condition and able to be operated. Furthermore, control valves are often used to control the flow of fluids into vessels, it is essential that these valves are in good working order. To ensure that the valves are working correctly the control operator will exercise them. When doing this they will work with the instruments department to make sure that the position of the valve in the field and to calibrate it if it does not provide the same expected value.

Other Equipment

There are many other pieces of essential equipment that requires operational and maintenance tasks to be carried out regularly. One piece of equipment is a fired heater, they are used to heat up the process fluids before entering the reactors so that they are at a high enough temperature for the chemical reaction to take place. It is the role of the unit operator to regularly check the heaters to ensure that they are in a good and safe working condition and are free from any damage or visible signs of wear. During these checks, the operator will check using the peepholes on the sides of the heaters and will look inside to check the condition of the pipes to make sure there are no hot spots which would cause the tubes to become brittle and could cause them to burst. They are also checking to make sure that the flames are firing correctly and that the correct number of burners are on and that this matches up with what the panel operator sees.

Another type of equipment that is checked routinely by operators is vessels, this could include flare drums, surge drums, knockout pots and separator columns. It is important for the operator to check the level gauges or sight glasses on the sides of the vessels to ensure they give the same reading as is showing on the panel. If the levels do not match then there is most likely an issue with the transmitter and will need to be worked on by instrumentation. With a lot of vessels, it is important to drain off any fluids. For example, on a knockout pot, water will drop to the bottom as it is denser than the hydrocarbons, the operator will then open the valve to allow the water to be drained off.

Turbines and motors are critical parts of pumps as they are the drivers which cause the impellers to rotate and push the fluid through the pump. It is important that these

operate smoothly to ensure the pump can still run. There are a number of different tasks that are carried out to ensure the pumps and turbines work to their full potential and ensure they are reliable. One task carried out by operations checking the oil levels in the denco bottles and the governors, it is important that the oil levels are sufficient to allow for lubrication of the moving parts to ensure they do not get too hot. It is also important to ensure that if the pump running off the turbine is on standby that the warm up line is open to allow hot steam to flow through the turbine and ensure that it is warm so it can be started immediately if the main pump trips. Maintenance will also carry out a number of different activities on the turbines to check they are in a good working condition and will meet specific requirements. This includes carrying out trip checks by increasing the speed to make sure it will trip if it surpasses the set point. During this planned maintenance activity, the maintenance workers will also complete a full oil change where they will drain all of the current oil in the turbine (and the pump), and then fill it with new clean oil so that any sediment or solids which have accumulated in the oil can be removed.

Task 2 LO2

In order to demonstrate your knowledge, understanding and responsibility within the process industry, you are required to provide the following evidence

- **CV, current job description and person specification.**
- **Your current development action plan.**
- **Provide evidence to prove your technical competence. Evidence could include:**

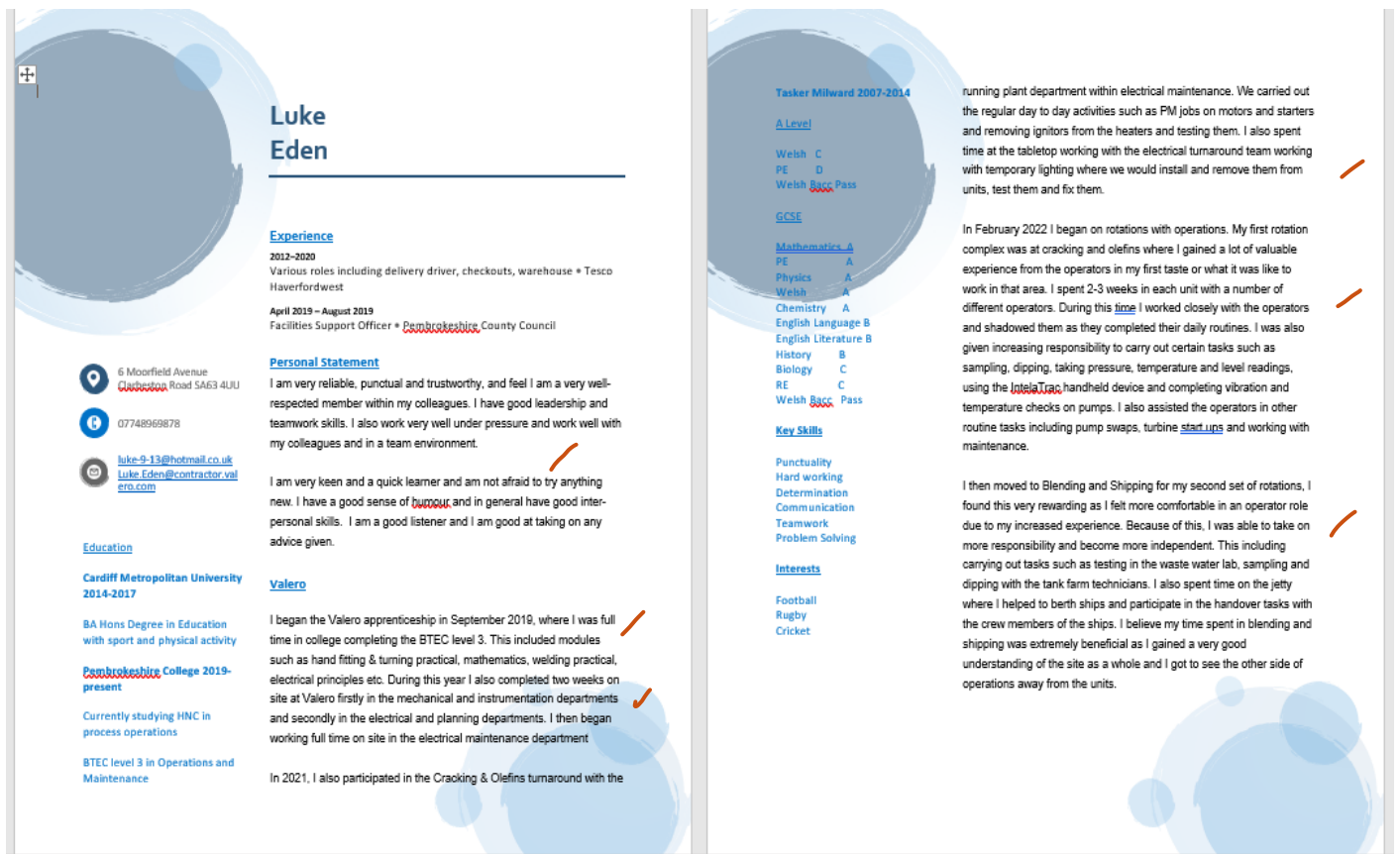
- i. **Competence framework, copies of company,**
 - ii. **Appraisals or any assessments,**
 - iii. **Key certificates and training records,**
 - iv. **Samples of relevant work undertaken,**
 - v. **Plans and evidence of work preparation,**
 - vi. **Evaluation of work outcomes and personal effectiveness.**
- **Recognition of the results of your work and your achievements.**
 - **Evidence of application of knowledge and skills as well as your responsibilities and autonomy when carrying out key work activities.**

Job Description

Training as an operator on the Platformer unit in refining on B shift.

Specification

Carry out routine duties on the unit including equipment checks, sampling, completing handheld procedures. Liaising with maintenance department to complete work orders. Responding to calls to make moves on valves and pumps.



During 2022, I began on rotations with operations, in which I would move around the different units on site and follow the operators on each unit as they carried out their daily tasks. During this time, I would learn the role of the operators and the jobs that were specific to each unit. I was given a task list at the beginning of the rotations with a number of different familiarisation, and practical tasks to carry out and complete a review of to show our understanding of the topic and to show what we had looked at to complete the review. The table below shows my development plant which was created at the start of the rotations to track my progress, it outlines what I achieved at each stage and what my next step was. This was completed alongside my mentor who would discuss with myself where he believed I was working well and what I needed to improve on or complete to enhance my progress.

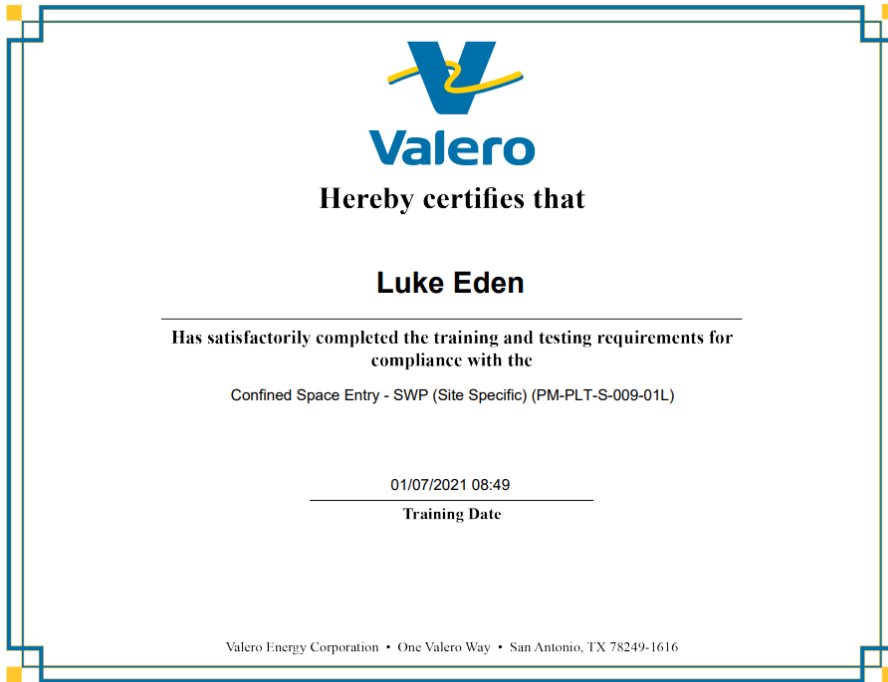
Achievements	Next Steps
<u>February</u> Familiarisation with pumps, valves	<u>February</u> Complete operations task on pumps and valves
<u>March</u> Completed operations tasks for pumps and valves	<u>March</u> Complete familiarisation with operator duties
<u>April</u> Completed familiarisation with operator duties	<u>April</u> Complete operations task for open and closed loop sampling
<u>May</u> Completed operations task for open and close loop sampling	<u>May</u> Complete familiarisation of instrumentation
<u>June</u> Completed familiarisation of instrumentation	<u>June</u> Complete week of lab training
<u>July</u> Completed week of lab training	<u>July</u> Begin work on operations assignments set by mentor
<u>August</u> Began to work on operations assignments (LOTO & Unit descriptions)	<u>August</u> Complete work on LOTO and Unit descriptions. Begin work on starting up a turbine

<u>September</u> Completed work on LOTO assignment and Unit description assignment	<u>September</u> Complete Fired Heater & Turbine assignment
<u>October</u> Completed assignments for Fired Heaters & Turbines	<u>October</u> Prepare for interview on 22/11
<u>November</u> Prepared for interview by going over previous training and learning procedures/ safety information	<u>November</u> Continue on rotations and continue to learn about different units and procedures

Certificates

The Images below show some of the certificates I have achieved since working at Valero. We undergo regular training to ensure that we retain the knowledge that we have attained whilst on site.





College Certs.