

Process Engineering Practice Element 1

Learner Name: Harry Thomas-Dawe

Course: HNC Process Operations Engineering Year 2

Module Code: PCPO 4007

Module Name: Process Engineering Practice

Assignment: 1

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Introduction

The purpose of this assignment is to outline the tasks and maintenance undertaken by personnel within their working area. Also, to show an understanding into the maintenance and operation of key process equipment. As well as this, this assignment will depict the levels of responsibility of personnel within the process industry.



Task 1 (LO1)

When working in the process engineering environment on Valero refinery there are many operational and maintenance activities carried out that include a various amount of key process equipment some of this equipment is listed below.

- Compressors- used to compress a number of gasses and vapours in different areas
- Pumps- used to transport different substances all over the site
- Drivers- Motors, Turbines and engines
- Pressure vessels- Separators, Distillation towers, KO drums, surge drums etc.
- Auxiliary systems- Seal pots, Lubrication systems cooling systems
- Heat exchangers- Fans, tube and shell type, welded plate types used to efficiently heat or cool medium over site

Operations personnel (the author is referred to as operations personnel throughout the text), are required to carry out many tasks to ensure the processing plant runs safely and efficiently. During the normal working shift operations personnel complete tasks falling into categories such as maintenance, replacements and preparation of equipment for the maintenance personnel. At the start of each shift the operator completes a handover between the shift finishing and the starting shift to establish any conditions and occurrences that the new shift should be aware of. This is done in written and verbal form to allow for the ops to be able to refer back to turnover information.

Evidence of this

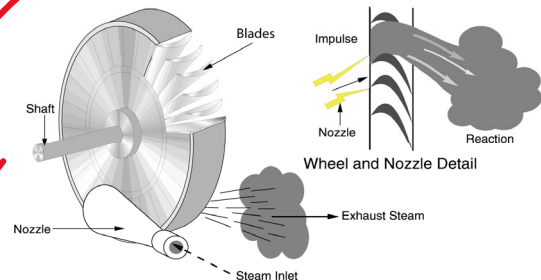
After the handover, ops personnel usually do a start of shift check on their area, during this check the operator should be noting process conditions on key pieces of equipment such as the pumps, motors, turbines, seal pots, compressors, heat exchangers, fired heaters and vessels. The purpose of noting these conditions is to identify any unusual conditions that could lead to process upset or equipment damage. Also, during the start of shift checks, the operations personnel should take samples of key areas such as feed and product to determine what is entering the unit and whether the end product is on spec before being sent to storage or other units. The next task on the start of shift check is to drain any knockout pots or separators/coalesces/absorbers of the media they are meant to be extracting from the process. The purpose of this is to keep the levels of these vessels within their

acceptable limits. When draining the knockout drums for equipment such as compressors it is important to ensure the level of liquid in the drum does not

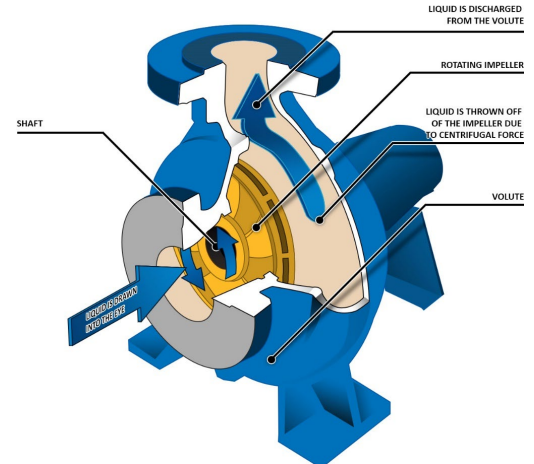
As well as a start of shift routine, operations personnel are assigned with tasks to help assist the maintenance departments. These tasks can consist of the following:

- Isolating Turbines
- Isolating Pumps
- Isolating Motors

The reason for isolating this equipment can range from planned maintenance to reactive maintenance due to equipment failure and all in-between. Steam turbines are used to convert steam flowing through the turbine into mechanical radial energy that can be used to drive equipment. Steam turbines follow two principles to convert the steam into radial energy, the first is; impulse action is used in the striking of the rotor blades by the steam. The second principle is that power is extracted when the steam escapes the blades at high velocity this is called reaction. Figure 1 shows the basic working principles of a steam turbine.



Pumps are used to transport liquid around the plant. Pumps contain an enclosed system with an impeller that has vanes that transport product from the suction inlet by using centrifugal force to pull the product through the middle of the impeller and pushing it through the vanes and out of the discharge line. Figure 2 depicts a simple centrifugal pump. The most common type of pump used on site is the centrifugal pump, which is used due to its capability to pump large volumes of product at high velocity. Centrifugal pumps can be single stage or multi stage, this is as multistage pumps can increase the pressure more due to passing the product through multiple stages. As these pumps are centrifugal, there are a number of rotating elements within the equipment. This factor means that maintenance personnel have to maintain these components, common reasons for pumps being out of service for maintenance are:



Do you use more pumps?

- Seal failure

The seals on pumps and turbines can be mechanical, tandem or packing.

When a mechanical seal fails, there are two types of corrective action that can be initiated. The first job which is usually done when equipment needs to be repaired quickly is seals and bearings replacement. This is usually completed without removing the pump from its line. Therefore reducing the time and man power/resources used. Seal and Bearing jobs are exactly what is expected.

The job is completed by removing the bearing housings and seals and replacing the seal and bearings before refitting the bearing housing.

When a pump is taken out for full overhaul, the pump must be removed and transported to the workshop. As the pump is in for full overhaul, the pump is stripped completely before being inspected for damage/ wear etc. usually this happens when the issues of the pump cannot be solved by replacing the seals and bearings. The full overhaul of a pump is a long and complex task that can consist of stripping the equipment to sub assembly level, replacing or reworking worn and damaged parts, balancing and fitting new items, machining, hand fitting tasks, cleaning and re-building the equipment.

- Bearing failure

When bearings fail, pumps and turbines can become subject to high vibes, low outputs and high temps, this is as the rotating element that has been supporting the radial forces has become damaged or has failed completely. Bearing failure will mean that maintenance personnel would have to inspect the equipment before deciding if the damage created is bad enough to warrant a full overhaul or a simple replacement of the pump or turbine

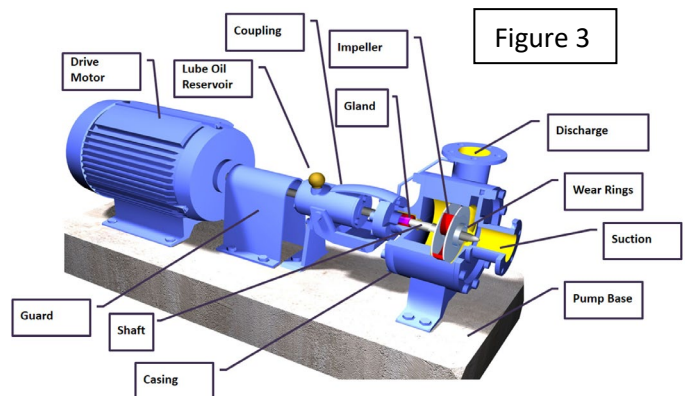
- Low flow

Low flow from pumps can depict that there may be a problem with the impeller of the pump. This would entail that the pump will need to be removed from service and the impeller will need to be inspected before the choice of replacement or repair is made.

- High vibes

This can be caused by issues such as bearing failure or contaminants in the pump and could lead to many future problems.

Isolating equipment is an essential task in operations tasks. The purpose of isolating equipment is to ensure the safety of the personnel working on the equipment. This task consists of ensuring the equipment has no power supply attached and there is no flow of product, cooling water, lube oil, seal flush media etc. Also, when isolating equipment such as turbines and pumps ops are tasked with



draining the equipment so it is empty from product/ steam etc. In figure 3, you can see that there are multiple components that need isolation when ensuring a common piece of process equipment is isolated ready for maintenance. In this case there are multiple isolations to be made to this pump, such as:

- Electrical Power
- Other sources of energy to the driver
- Suction and discharge of the pump

Preparation of Pressure Safety Valves for Removal, Testing and Refitting

PSV prep is an important part of operational tasks, the reason for preparing PSVs before removal is to ensure that it is safe to commence work on the PSV. When preparing a PSV for removal, operations are instructed to isolate the valve by blocking in the lines, de-pressure the valve and ensure the area is safe for maintenance to remove the PSV. Also, when preparing the PSV for return, the operator is tasked with ensuring the line is still isolated and de-pressured, this could consist of venting the lines again due to pressure build up.

Filling Lube Oil Systems

Within the refinery there are multiple types of lubrication systems for many different pieces of process equipment. The use of multiple forced oil and wet sump lubrication systems mean that the operations personnel must ensure that the oil levels in all lubrication systems from pumps, motors, compressors and turbines are kept to the correct level to avoid the degradation of process equipment. The theory behind

lubrication systems is to prolong the life by cooling the system, reducing friction between mating faces and displacing material entrained in the system.

Filling Seal Pots

Seal pots are important parts of equipment fitted to the pumps with the purpose of stopping the process fluid flowing through the pump from leaking out of the pumps. Some of these pumps are fitted with “Thermo siphon” seal pots. These seal pots work by using a fluid which flows in a circuit through the seal and back to the pot. This circuit flows by the heat transfer that occurs when the cooler heavier liquid flows in a downwards direction towards the seal where it absorbs heat whilst cooling the seal then, the warmer lighter fluid rises upwards and back into the pot, where the heat is released into the vapour space. If this level is not maintained in the pot at the correct level the seal can leak, causing a large number of problems. As shown in figure 4, the thermosiphon pot circulates oil through the system.

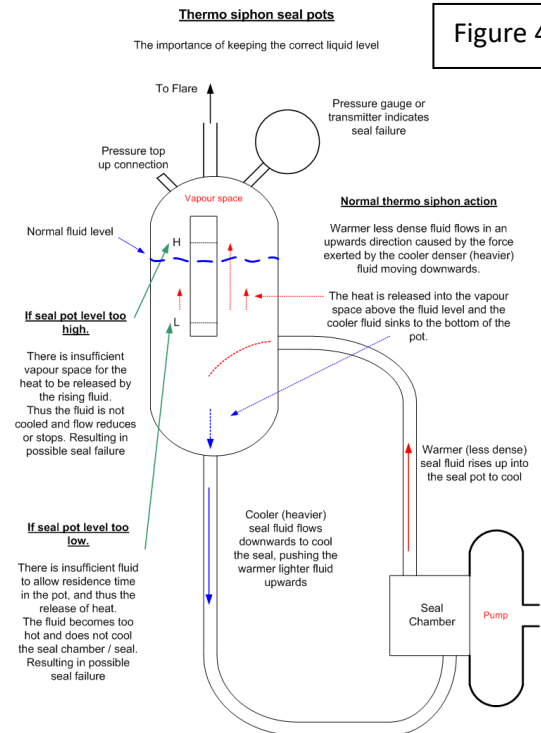


Figure 4

Permits: Operators on plant are required to undergo gas and area tests to ensure that maintenance personnel can carry out their work in a safe environment. The purpose of the gas test is to ensure the area is safe for hot works which include the use of non-intrinsically safe equipment by checking the oxygen levels, the CO₂ levels, the H₂S levels and the level of explosive limit within the area. The area checks ensure that the area is safe from hazards that will cause health and safety risks when work is done in the area. If there are any implications which mean the following checks are failed, for instance high H₂S or explosive level, then the permit cannot be issued until the issue is resolved. Also, the operators issue the permits to the maintenance staff and ensure they fully understand and comply with the permits whilst undergoing work in the area and on the permitted equipment. To accompany the checks, equipment must be isolated so there can be no energy supplied to the equipment that could cause a health and safety complication.

In conclusions, as an operator on Valero Pembroke refinery there is a wide array of tasks to undertake in order to ensure that the plant can run and be maintained with minimum risk, disturbance and loss of profit and energy.

Any evidence of you carrying out these tasks?

Task 2 LO2

Curriculum Vitae

Harry Thomas-Dawe

5 Woodbine Terrace □ Pembroke, Pembrokeshire, SA71
4PQ

Phone: 01646 683077 □ Mob: 07585 906504 □ E-Mail:

harrydawe8@gmail.com

DOB: 24/08/1999

Full UK Driving Licence

Objective

To have the opportunity to build upon my education and use my qualifications to secure a stable financial future for myself. To be part of an organization that is prepared to invest in my future at the same time gaining knowledge and experience to repay that investment back, and by showing dedication and loyalty.

Work Experience

The Dial Inn, Lamphey

04/2015 – 01/2016

Employed as a waiter in a local restaurant, duties included customer relations, taking orders, assisting all staff and carrying out general duties in a busy environment

Oakwood Theme Park

2016-2017

Employed as a catering assistant for the 2016 and the 2017 seasons.

South Hook LNG

Participated in a weeks work experience to gain knowledge and skills within the gas industry.

Undertook work with JOP civil engineering for 1 month August-September 2018.

3 Years of an operations and maintenance apprenticeship at Valero Pembroke Refinery in which I have undertaken city and guilds level 2 and 3 courses and a HNC in operations as well as spent time with the maintenance department and the operations department to assist and learn the work done by both departments.

Education

Pembroke School

09/2011 to 08/2017

Mathematics – C

Figure 5a

Figure 5b

English Language - C

English Literature - B

Science - C

Additional Science - B

Geography - C

History - C

Spanish - C

Welsh Language – B

Welsh Baccalaureate – Intermediate Diploma

Sports Studies BTEC level 2– Merit

Sport Studies level 3- Merit

Learning Area Program: BTEC 90-Credit Diploma in Engineering & New Advanced Welsh Baccalaureate Pembrokeshire College September 2016- June 2017. Grade: Distinction, Merit.

- Pembrokeshire College.
 - Units Studied: Health & Safety in the Engineering Workplace, Mathematics for Engineering Technicians, Mechanical Principles, Electrical & Electronic Principles, Properties & Applications of Engineering Materials, Applications of Mechanical Systems in Engineering, Engineering Drawing for Technicians in Engineering, Engineering Secondary and Finishing Techniques, Welding Technology & Machining Techniques.
- **BTEC 90-Credit Extended Diploma in Engineering & New Advanced Welsh Baccalaureate Pembrokeshire College September 2017- June 2018.** Grade: Merit, Merit, Pass
- **Level 2-** City And Guilds In Mechanical Engineering
- **Level 3-** City And Guilds In Mechanical Engineering

Figure 5c



Hobbies

I am a good team player having represented Pembroke at Rugby, currently playing for the senior team. I like participating in most types of sports and enjoy keeping fit by going to the gym and running. My hobbies also include cycling and kayaking.

References

Contact: William Bateman Engineering Lecturer.

Address: Merlins Bridge
Haverfordwest
Pembrokeshire
SA61 1SZ

Telephone: 01437753420

Job Description

Process Operator:

Pembroke refinery employs staff in order to run the industrial process in a safe and efficient manner. The use of operations staff allows for 24/7 coverage of the units within the refinery. The base description of an operator entails the tasks of running a unit to ensure the process and products meet the required standards by looking after equipment, liaising with maintenance staff, measuring and adjusting process variables and maintaining a safe and reliable process for their unit.

Person Specification

21 Year old process operations apprentice working on Valero Pembroke Refinery.

Relevant Knowledge

Due to previous experience working within an industrial process environment at South Hook LNG Terminal, a level of understanding into industrial process, process environment safety, organisational emergency requirements under COMAH regulations, hazard recognition and prevention in dangerous process environment and an acquired understanding of the importance of environmental factors of industrial process has been obtained whilst proving the ability to work safely and efficiently in an industrial environment. As well as work experience into the roles of process operations, mechanical engineers, environmental and safety representatives and chemical engineers whilst at South Hook LNG Terminal.

Currently starting the third year of a process engineering apprenticeship which depicts a level of learning over the first two years and further learning within the third year to ensure a proper understanding into working within the refinery environment.

Skills and Attributes

Hard working in a team and individually with the ambitions of bettering self-knowledge and being involved in the improvement of the workplace in any way that can be helpful to colleagues and company.

Qualifications (relevant to job specs)

GCSE:

Maths - C

Science - B

Additional Science - B

Welsh Baccalaureate Level 3 - Merit

BTEC Level 3 Extended Diploma in Mechanical Engineering – Merit, Merit

City & Guilds Level 2 and Level 3 in Mechanical Engineering – Merit, Merit

Certificate of NVQ Level 3 in Mechanical Engineering

Completion of various listed cite based training modules found in appendix.

Evidence supplied in appendix.

Figure 6

Development Plan

What are my big goals?	Which goals need to happen first?	When do I want to achieve this?	What obstacles might get in <u>my</u> way?	How can I improve my chances of meeting my goal?	Where can I go for support?	Review: How am I doing?
Finish Apprenticeship	- Complete College learning - Complete operator training	By the end date of the apprenticeship (2022)	Not completing the set work and not performing in the working environment	Work hard, perform in work and in college	- College tutors - Training and development staff on site - Other staff on site with experience and valuable knowledge	Making Progress
Gain Employment	Complete Apprenticeship	At the end of the apprenticeship	Not finishing my apprenticeship	Perform in work and in college to ensure I have the required knowledge, experience and qualifications	- College tutors - Training and development staff on site - Other staff on site with experience and valuable knowledge	Progressing through apprenticeship at desired employers
Progress Through the Ranks	- Complete apprenticeship - Gain employment	After employment	Not gaining employment	Perform in apprenticeship and continue to perform when gaining employment	- Training staff - Other staff with valuable knowledge and information	Completing apprenticeship and relevant training
Improve My Learning and Experience	- Gain employment to further experience - Finish college and	During and after apprenticeship and in job	Not finishing college, in work training and apprenticeship.	Perform in college and in work and take on extra training to further knowledge	- Training staff - Other staff with valuable knowledge and information	Completing apprenticeship and relevant training

Appendix

Candidate Information									
Season: Summer 2015									
Name: Harry Andrew Thomas Dawe (Dawe)									
Candidate Number: 4204									
UCI: 682760124204K									
Exam Results									
Board	Level	Exam Code	Title	Assessment Duration Unit 4	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8
AOA	GCSE/B	ASAP	Additional Science Unit 4	30 m					
AOA	GCSE/B	BL2HP	Biology Unit 2 Test M	45 m					
AOA	GCSE/B	CH2HP	Chemistry Unit 2 Test M	45 m					
AOA	GCSE/B	PH2HP	Physics Unit 2 Test M	45 m					

TYSTYSGRIF GYFFREDINOL ADDYSG UWCHRADD
GENERAL CERTIFICATE OF SECONDARY EDUCATION

Arholiad Mehefin 2015 June Examination

Hyn sydd i dystio bod
This is to certify that
HARRY ANDREW THOMAS DAWE

PEMBROKE SCHOOL, PEMBROKE

wed cyrraedd y salonau a nodir yn y pynciau a ganlyn:
obtained the seven results shown in the following subjects:

600/9686/X LLEWYDDIAETH SAESNEG	ENGLISH LITERATURE	B(0)
600/5647/2 DAEARDDIAETH	GEOGRAPHY	CC(0)
601/0174/X HANES	HISTORY	CC(0)
500/8506/2 MATHEMATEG	MATHEMATICS	CC(0)
600/5550/9 SBAENEG	SPANISH	CC(0)
600/7095/X SAESNEG IAITH	ENGLISH LANGUAGE	CC(0)

TGAU(CWRS BYR)/GCSE(SHORT COURSE)
500/7408/8 CYMRAEG AIL IAITH

WELSH SECOND LANGUAGE B(0)

J. McGill
CAERBYDD, CAAC
CHAIR, WJEC

G. E. Preece
PRIE WJEC
CHIEF EXECUTIVE, WJEC

Llywodraeth Cymru
Welsh Government

Accreditation

68276 04204 240899

682760124204K 28/09/15 1501701



CERTIFICATE OF UNIT CREDIT
Level 3 NVQ Extended Diploma in
Engineering Maintenance

is awarded to
Harry Thomas-Dawe

who attended
Pembroke College, Haverfordwest

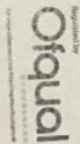
and was successful in the following 11 modules

Level 2 Complying with Statutory Regulations and Organisational Safety Requirements (5 credits)	AA6015013	Pass
Level 2 Using and Interpreting Engineering Data and Documentation (5 credits)	Y460125102	Pass
Level 2 Working Efficiently and Effectively in Engineering (5 credits)	K46015055	Pass
Level 2 Working Over and Confirming Completion of Maintenance Activities (20 credits)	T46005516	Pass
Level 3 Carrying Out Fault Diagnosis on Mechanical Equipment (50 credits)	T46005331	Pass
Level 3 Maintaining Mechanical Equipment (70 credits)	H46005544	Pass
Level 3 Maintaining Mechanical Components to Usable Condition by Regrains (47 credits)	AA6005551	Pass
Level 3 Carrying Out Preventative Planned Maintenance on Mechanical Equipment (20 credits)	AA6005555	Pass
Level 2 Producing Components using Hand Fitting Techniques (15 credits)	J5046349	Pass
Level 2 Preparing and Using Lathe for Turning Operations (15 credits)	V5046372	Pass
Level 2 Preparing and Using Milling Machines (15 credits)	K5046375	Pass

Awarded 28 October 2020

281020/1788-80/068239/ZJRS628/M/24/08/99

SS0281 68264380



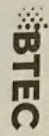


Kriste Donnelly MBE
Kriste Donnelly MBE
 Director-General and Chief Executive Officer
 The City and Guilds of London Institute

David Phillips
David Phillips
 Managing Director
 City & Guilds

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Awarded by
 The City and Guilds of London Institute



Pearson
BTEC Level 3
Extended Diploma

In MECHANICAL ENGINEERING (QCF)
 WITH THE TRIPLE GRADE MERIT PASS
 is awarded to
HARRY THOMAS-DAWE
 who has completed an approved programme at
PEMBROKE COLLEGE

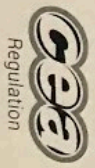
AWARDED : OCTOBER 2018

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Registered by
Ofqual









Derek Richardson
Derek Richardson
 Responsible Officer
 Pearson Education Ltd



Hereby certifies that

Harry Thomas-Dawe

**Has satisfactorily completed the training and testing requirements for
compliance with the**

Pembroke - Steam hammer training for operations 2016 (Site Specific) (PM-PLT-S-000-24B)

09/11/2020 08:18

Training Date

Valero Energy Corporation • One Valero Way • San Antonio, TX 78249-1616



Hereby certifies that

Harry Thomas-Dawe

**Has satisfactorily completed the training and testing requirements for
compliance with the**

Recertification test for generic plant operator duties (PM-ART-Q-000-05T)

12/02/2020 07:17

Training Date

Valero Energy Corporation • One Valero Way • San Antonio, TX 78249-1616



Valero

Hereby certifies that

Harry Thomas-Dawe

**Has satisfactorily completed the training and testing requirements for
compliance with the**

Confined Space Entry - SWP (Site Specific) (PM-PLT-S-009-01L)

10/14/2020 02:32

Training Date

Valero Energy Corporation • One Valero Way • San Antonio, TX 78249-1616

References

- Centrifugal Pumps Working and Applications (online). Available at: <https://www.elprocus.com/centrifugal-pumps-working-types-and-applications/#:~:text=Centrifugal%20Pump%20Working%20Principle%20The%20centrifugal%20pump%20working,increase%20within%20rotating%20liquid%20pressure%20head%20takes%20place>. (Accessed: 20/10/2020)
- (2017) *Valero Energy Basic Operator Training Booklet Vol.3a*.
- (2017) *Valero Energy Basic Operator Training Booklet Vol.3b*.
- (2015) *Valero Energy Basic Operator Training Manual, Refining, Platformer*.
- Valero Pembroke refinery(online). Available at: <https://www.valero.com/en-us/Pages/Pembroke.aspx> (Accessed: 28/10/2020)

Word Count

Word count without references, intro, contents and title page = 2081

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referred.

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referencing
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