

LEVEL 4 ASSESSMENT SPECIFICATION

Student name:	HENRY RICHARDS	Student ID number:	
Programme:	HNC Process Operations Engineering		
Module:	Process Safety Systems		
Module code:	PCPO4006	Contribution to Overall Module Assessment (%):	50%
Lecturer:	Yan Mills	Internal Verifier:	L. Rutherford
Assignment Title:	Safe Systems of Work	Word count (or equivalent):	2000
Submission deadline:	05/05/2022	Return date of provisional marks & written feedback:	26/05/2022
Submission method:	All written assessments, where practical and possible, must be submitted via Turnitin unless otherwise instructed by the Lecturer. (Please DO NOT put this assessment specification into Turnitin or it will match many similarities with other students' submissions.) Alternative submission method (if applicable): Late submission of the assessment will result in a late penalty mark. Penalties for late submission: Up to one week late, maximum mark of 40%. Over one week late, 0%. Only the Extenuating Circumstances Panel may approve a change to submission dates.		
Academic honesty / referencing:	Academic honesty is required. In the main body of your submission you must give credit to authors on whose research and ideas your work is based. Append to your submission a reference list that indicates the books, articles, etc. that you have used, cited or quoted in order to complete this assessment.		

Module Learning Outcomes (from module syllabus)

- Explain the elements required to ensure the safe operation of an industrial process.
- Explain the strategies and procedures required to ensure an industrial process meets legal and regulatory requirements, and how safe systems of work are established.

STUDENT FEEDBACK FORM

Generic Assessment Criteria	Marks available	Marks awarded
1. Engagement with Literature Skills		
Engagement with a wide range of literature, including sources retrieved independently. Selection of relevant and credible sources. Generally sound referencing.	20	12
2. Knowledge and Understanding Skills		
Competent knowledge of the basic underlying concepts and principles	30	20
3. Cognitive and Intellectual Skills		
Sound evaluation of the underlying concepts and principles. Can interpret qualitative and quantitative data accurately. Ability to devise arguments using evidence to make mostly appropriate and valid judgements.	30	20
4. Practical Application Skills		
A very good application of a range of basic methods, materials, tools and/or techniques. Very good consideration of the context of the application.	10	6
5. Transferable Skills for Life and Professional Practice		
Work is accurate, coherent, fluent, well-structured and organised. Can work effectively independently and/or as part of a team, with very good contribution to group activities. Demonstrates very good skills for employment requiring the exercise of some personal responsibility, with just occasional minor weakness	10	6

Assessment Mark (Assessment marks are subject to ratification at the Exam Board. These comments and marks are to give feedback on module work and are for guidance only until they are confirmed.)

Late Submission Penalties (tick if appropriate)

Up to 1 week late (40% Max)

Over 1 week late (0%)

64%



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Process Safety Systems

By Henry Richards

Word Count - 1847

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Introduction

The aim of this assignment is to analyse elements required to help control high risk activities in a process environment. To do this the assignment has been broken up into two sections. The first section of the assignment will explain how layers of protection failure and human factors can lead to process safety failure; this will investigate the Swiss cheese diagram which explains how having multiple layers of safety can ensure a reduced number of incidents. The second part of the assignment will look at safe working practices and permit to work systems in my place of work, which is Valero energy's Pembroke refinery.

Task one.

Throughout Valero refinery there are a lot of potentially dangerous products, which can cause short- and long-term harm to you or those around you. To prevent an incident from occurring there are several safety barriers in place. It is vital to have several barriers in place as one will not be able to prevent certain incidents, but the other layers will be able to prevent an incident. Each layer has holes where the next one doesn't so this model is known as the Swiss cheese model of process safety.

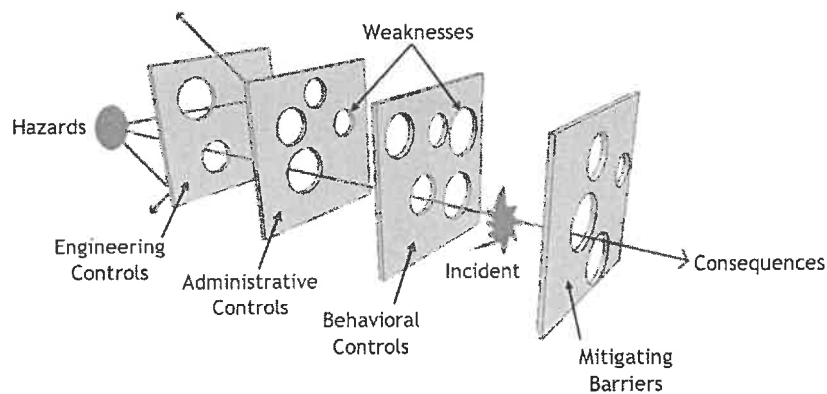


Fig 1 shows the swiss cheese model

For an incident to occur there must be vulnerability in each layer to allow the hazards through. Each layer has some vulnerability which is represented by the holes in the cheese. The weaker and less effective the layer is the more holes and larger holes within the cheese. The four barriers that are common throughout the industry are

- Engineering controls
- Administrative controls
- Behavioural controls

- Mitigating Barriers

The first three barriers are in place to prevent an accident occurring but mitigating barriers is in place to try and control or contain an accident once it has occurred. Each layer is as important as the last, the first three have the aim of preventing an incident from occurring while the last barrier aims to control the incident once it has occurred. Engineering controls are things like pressure safety valves (PSV), emergency de-pressure valves and guards on rotating equipment. Administrative controls are things like procedures being written to a safe standard and proofread by complex managers and operation supervisors. The third barrier, behavioural controls are things like safe working practices, adequate training, and correct PPE for dangerous jobs. The last barrier which is mitigating barriers aims to control incidents once they have occurred, these are things like spill kits, emergency BA and fire monitors. These barriers are used in everyday operation to prevent incidents from occurring. I will now demonstrate how these barriers are used if a vessel were to overpressure. If a vessel were to begin to overpressure it would send alarms to the panel operator alerting them of an issue if they can not stop it in time then the vessel would pressurise to an unsafe level and potentially fail, therefore as an engineering barrier PSVs are fitted to each vessel so in the case of high pressure the vessel can be vented either to flare or to atmosphere. If the vessel fails, this will cause a leak. In the event of a leak all employees, besides trained personnel must muster whilst those who can deal with the leak. The leak is then identified and dealt with in the safest possible manner. The emergency leak response procedure is then followed until the leak is contained; this is the administrative controls barrier. When dealing with a leak it is vital to do it safely, you are taught to check for wind direction, classify the leak and remain clear unless necessary these behaviours are taught to you to help you remain safe, this is the behavioural controls barrier. To contain the leak there are spill kits for smaller leaks but if it is large the fire hydrants placed in various spots around the unit are used to help wash away the area, it will also control a fire if the leak were to ignite. This has shown how a failure to include sufficient barriers will lead to a catastrophic failure and has shown some of the barriers Valero has in place to prevent an incident from escalating.

Task Two

In the petrochemical industry there are several dangerous products and pieces of equipment, all of which could cause serious harm if not controlled correctly. These bits of equipment require regular maintenance to make sure the refinery is functioning at optimum efficiency; this means breaking containment into pipework and vessels that at one stage held a dangerous inventory. These jobs are perfectly safe if the preparation to make them safe is done correctly and the job is carried out safely.

This part of the assignment will discuss how Valero's Pembroke refinery ensure the safe of its workers by using two major tools, safe working practices and the permit to work system.

A safe working practices is when the employees carrying out the job work in a safe and controlled manor. To know the safe working practices on site the employer gives out the relevant training and guidance. A vital safe working practice for anyone carrying out a job is to first obtain the relevant procedure and read it to understand the job. Once you arrive at a job you must carry out a Loss Prevention Self-Assessment (LPSA). An LPSA encourages you to identify all potential hazards before beginning a task and mitigate these hazards, if the hazards cannot be controlled to the point that the job is safe then any person on site could use their stop work authority, this a safety tool that gives anyone the ability to stop a job if they think it is not safe to carry out. An LPSA is quick self-risk assessment. But a before a job is carried a much more in-depth risk assessment to confirm the job is safe to carry out, the LPSA then ensures conditions have not changed before carrying the job out. Once the safety of the job has been established before carrying out the work the employees doing the work must work within the health and safety guidelines on site. Valero has a set of life saving rules that must be followed at all times to ensure the work environment remains a safe place. the seven live saving rules are

- Always work with a valid permit
- Only smoke in designated areas
- Use relevant live saving equipment
- Obtain authorization before bypassing as safety system
- Obtain authorization before entering a confined space
- Ensure energy isolation before beginning work
- Protecting yourself from a fall when working at height

If these rules are followed by every employee on site during the day, then it will ensure that the site remains a safe place to work. to put these rules into a real-life scenario I will now discuss how they are applied when working on a fin fan. Before work can begin a permit must be obtained. Before the permit can be issued the operations team must first go and gas test the area in and around the fan check for any hydrocarbons or harmful gases. Ops must then check the fan is isolated and sign a zero-energy tag to confirm this. Once ops have confirmed the job is safe to go ahead a permit can then be issued, anyone working on that job must then sign on to the permit. The permit states a number of things, such as the PPE required for the job and any additional equipment, such as battery tools or lifting equipment that is required. When working on a fin fan the plenum is classed as a confined space so if it was to be entering a qualified standby man must be in place. the plenum

is also considered at height so a harness must be used to protect yourself when carrying out the job. Whilst working on a fan there is potential pinch points so impact gloves and the appropriate PPE must be worn to protect yourself.

This part of the assignment has shown how safe working practices are always there and help to protect you whilst working on something that could be dangerous. The next part of this task will discuss the permit to work system at Valero and show how that helps to protect everyone working on site. The permit to work system at Valero is run by a program called RAP. RAP is used by a variety of parties before a permit can be issued. Every job requires a lot of behind the scenes planning before a permit can be issued. Firstly, the Operations Maintenance Coordinators (OMC) decide which jobs will be happening over the week, so each day ops are given a list of equipment preps to complete. For each job there is a LOTO pack, this pack contains all the isolations that must be completed for that piece of equipment. Once the equipment is prepped the operator can then sign off in RAP to say the isolations are complete, depending on the job you may have electrical isolations that will need to be completed by the electrical department. Once all isolations are signed off that job can then be put onto the permit board for the next day.

During the next day shift then the outside operator will look on RAP to see what jobs are taking place on their unit. Some jobs require a gas test whilst others don't, but all have a general area check to make sure they are safe to go ahead. Whilst an operator is doing the gas tests, they are looking for any seal in the process, such as glands on valves gaskets and plugs in pipework. All these have the potential to leak and if so deem the job unsafe to go ahead. Once the area checks and gas tests have been completed to a satisfactory standard then the operator can go and sign in RAP to confirm they are happy with the area and gas test, they must also sign that they are happy with the conditions the job is being carried out in and the PPE. The PPE is stated on the permit before being issued and is set by whoever has built the job, generally the asset techs or supervisors. If the operator sees something they are unhappy with, such as a critical piece of PPE missing then they can hold off on issuing the permit until the correct PPE is set for that job. This helps to save lives as a lot of the products used at site are extremely harmful and must be treated with caution. If the operator is happy with the permit, then they can issue it. Once it has been issued it is down to the maintenance staff to follow the requirements of it, such as PPE and external equipment. They must also work within the timeframe of the permit. All permits have an expiry time and it's important to know when that is to ensure you are always working under a valid permit.

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