

LEVEL 4 ASSESSMENT SPECIFICATION

Student name:	Hywel Baker	Student ID number:	141824
Programme:	HNC Process Operations Engineering		
Module:	Environmental Protection and Sustainable Manufacturing Systems		
Module code:	PCPO4003	Contribution to Overall Module Assessment (%):	100%
Lecturer:	Richard Wray	Internal Verifier:	Lance Rutherford
Assignment Title:	Research Report	Word count (or equivalent):	2000
Submission deadline:	15/05/19	Return date of provisional marks & written feedback:	29/05/19
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)

LO1, LO2.

TASK DESCRIPTION

Investigative report

There are many examples of industrial manufacturing plant, equipment and process that pose a potential risk to the environment and/or where operations may meet or fall short of the requirements for sustainable manufacturing.

For this assignment you are required to analyse a chosen industrial process at your place of work with respect to environmental protection and sustainable manufacturing systems.

Research Guidance

- Fully research the industrial plant, equipment and manufacturing process design and operation
- Evaluate specific aspects associated with meeting environmental protection, legal requirements and best practice
- Evaluate specific aspects associated with ensuring sustainable manufacture can be achieved through efficient equipment, plant and process operation
- Develop conclusions and recommendations on how the process could be improved with respect to environmental protection and manufacturing sustainability

Note: When choosing a work-based plant, equipment or process please ensure you have your employers permission to use relevant information in your assignment. Do not include names of personnel or commercially sensitive information.

Research evaluation

You will produce the written report in a clearly structured and professional manner. The report should evaluate the findings of your research and present logical arguments and conclusions. It is expected that you will organize your report following a pattern to that suggested below:

- A brief abstract
- An introductory section outlining the background, the scope and intended readership
- A clear statement of the aim and objectives of the report
- Central sections, explaining any findings, arguments and outcomes
- A suitably structured conclusion that draws together the findings of your research and any recommendations you are making

When writing your report make sure that you:

- Use acceptable academic language and tone
- Check spelling and grammar
- Show that you can evaluate evidence from reference sources and use this material to make a logical and consistent argument
- Make sure that you analyse and evaluate arguments and evidence in a way that meets your stated outcomes and objectives

Report structure

The report document must be constructed in a formal and professional manner using an appropriate word-processed program. The completed report should contain the following sections:

- A cover page or document title page
- A table of contents page
- Sections or paragraph headings related to each aspect of the report
- Headers on each page with the title of your report
- Paragraphs should be spaced using '1.5 line spacing'
- Footers on each page with the author's name on the right hand side and 'Page ... of ...' on the left
- A references page and bibliography as appropriate
- Appendices where appropriate for larger quantities of data
- Diagrams, charts or tables, suitably incorporated and labelled
- The text format should be Times New Roman or Ariel with a font size of 12
- A word count of 2000 words ($\pm 10\%$)

GUIDANCE FOR STUDENTS IN THE COMPLETION OF TASKS

NOTE: The guidance offered below is linked to the five generic assessment criteria overleaf.

1. Engagement with Literature Skills

Your work must be informed and supported by scholarly material that is *relevant* to and *focused* on the task(s) set. You should provide evidence that you have accessed an appropriate *range* of sources, which may be academic, governmental and industrial; these sources may include academic journal articles, textbooks, current news articles, organisational documents, and websites. You should consider the *credibility* of your sources; academic journals are normally highly credible sources while websites require careful consideration/selection and should be used sparingly. Any sources you use should be current and up-to-date, mostly published within the last five years or so, though seminal/important works in the field may be older. You must provide *evidence* of your research/own reading throughout your work, using a suitable referencing system, including in-text citations in the main body of your work and a reference list at the end of your work.

Guidance specific to this assessment: You must provide evidence of individual research with respect to the area of study and provide relevant referencing.

2. Knowledge and Understanding Skills

At level 4, you should be able to demonstrate knowledge of the underlying concepts and principles associated with your area(s) of study. *Knowledge* relates to the facts, information and skills you have acquired through your learning. You demonstrate your *understanding* by interpreting the meaning of the facts and information (knowledge). This means that you need to select and include in your work the concepts, techniques, models, theories, etc. appropriate to the task(s) set. You should be able to explain the theories, concepts, etc. to show your understanding. Your mark/grade will also depend upon the *extent* to which you demonstrate your knowledge and understanding.

Guidance specific to this assessment: Your report should show you gained knowledge of the subject area.

3. Cognitive and Intellectual Skills

You should be able to present, evaluate and interpret qualitative and quantitative data, in order to develop lines of argument and make sound judgements in accordance with basic theories and concepts of your subject(s) of study. You should be able to evaluate the appropriateness of different approaches to solving problems related to your area(s) of study and/or work. Your work must contain evidence of logical, analytical thinking. For example, to examine and break information down into parts, make inferences, compile, compare and contrast information. This means not just describing what! But also justifying: Why? How? When? Who? Where? At what cost? You should provide justification for your arguments and judgements using evidence that you have reflected upon the ideas of others within the subject area and that you are able to make sound judgements and arguments using data and concepts. Where relevant, alternative solutions and recommendations may be proposed.

Guidance specific to this assessment: The report should show analysis of the research.

4. Practical Skills

At level 4, you should be able to apply the basic underlying concepts and principles to evaluate and interpret these within the context of your area of study. You should be able to demonstrate how the subject-related concepts and ideas relate to real world situations and/or a particular context. How do they work in practice? You will deploy models, methods, techniques, and/or theories, in that context, to assess current situations, perhaps to formulate plans or solutions to solve problems, or to create artefacts. This is likely to

STUDENT FEEDBACK FORM

This section details the *extent* to which the assessment criteria are demonstrated by you, which in turn determines your mark. The marks available for each category of skill are shown. Lecturers will use the space provided to comment on the achievement of the task(s), including those areas in which you have performed well and areas that would benefit from development/improvement.

Name: Hywel Baker

Generic Assessment Criteria	Marks available	Marks awarded
1. Engagement with Literature Skills		
Good: Engagement with an appropriate range of literature, including sources retrieved independently. Some over-reliance on texts rather than other sources. Referencing may show minor inaccuracies or inconsistencies.	25	14
2. Knowledge and Understanding Skills		
Very good: Competent knowledge of the basic underlying concepts and principles. Exhibits very good understanding.	25	16
3. Cognitive and Intellectual Skills		
Very good: 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	18
4. Practical Application Skills		
Excellent: An advanced application of a range of taught, basic methods, materials, tools and/or techniques. The context of the application is well considered, and insightful. Excellent evidence of different approaches to problem-solving in particular contexts and proposes appropriate solutions.	10	7
5. Transferable Skills for Life and Professional Practice		
Very good: 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. Please see additional comments in assignment text.	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%)

61%

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21/05/17

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61 %

involve, for instance, the use of real world artefacts, examples and cases, the application of a model within an organisation and/or benchmarking one theory or organisation against others based on stated criteria.

Guidance specific to this assessment: The report indicates a level of research with respect to the application and deployment of the equipment, materials or processes that form the basis of the area of study.

5. Transferable Skills for Life and Professional Practice

Your work must provide evidence of the qualities and transferable skills necessary for employment requiring the exercise of some personal responsibility. This includes demonstrating: that you can communicate the results of your study/work accurately and reliably, and with structured and coherent arguments; that you can initiate and complete tasks and procedures, whether individually and/or collaboratively; fluency of expression; clarity and effectiveness in presentation and organisation. Work should be coherent and well-structured in presentation and organisation.

Guidance specific to this assessment: Your work should be well organised and presented in a professional manner.

GENERIC ASSESSMENT CRITERIA

Level 4

In accordance with the Framework for Higher Education Qualifications, at the end of Level 4 students will be expected to have demonstrated knowledge of the basic underlying concepts and principles of a subject, and an ability to evaluate and interpret these within the context of that area of study. They should be able to present, evaluate and interpret qualitative and quantitative data in order to develop lines of argument and make sound judgements in accordance with basic theories and concepts of their subject(s) of study. They will have learned how to evaluate different approaches to solving problems, and will be able to communicate the results of their study/work accurately and reliably, and with structured and coherent arguments. They will be able to undertake further training and develop new skills within a structured and managed environment and will have the qualities and transferable skills necessary for employment requiring the exercise of some personal responsibility.

Level 4 Category	FAIL 0-29%	MARGINAL FAIL 30-39%	SATISFACTORY (3 rd / Pass) 40-49%	GOOD (2.2 / Pass) 50-59%	VERY GOOD (2.1 / Merit) 60-69%	EXCELLENT (1 st / Distinction) 70-84%	EXCEPTIONAL (1 st / Distinction) 85-100%
Engagement with literature (including reading, referencing, academic conventions and academic honesty)	Little or no evidence of reading and/or reliance on inappropriate sources. Views and findings mostly unsupported and non-authoritative. Referencing conventions used incoherently or largely absent.	Poor engagement with essential reading. No evidence of wider reading. Reliance on inappropriate sources, and/or indiscriminate use of sources. Heavily reliant on information gained through class contact. Inconsistent and weak use of referencing.	Engagement with a limited range of mostly relevant and credible sources but with some reliance on information gained through class contact. Some omissions and minor errors. Referencing conventions evident though not always applied accurately or consistently.	Engagement with an appropriate range of literature, including sources retrieved independently. Some over-reliance on texts rather than other sources. Referencing may show minor inaccuracies or inconsistencies.	Engagement with a wide range of literature, including sources retrieved independently. Selection of relevant and credible sources. Generally sound referencing, with no/very few inaccuracies or inconsistencies.	Engagement with an extensive range of relevant and credible literature. Consistently accurate application of referencing.	Exceptional engagement with an extensive range of relevant and credible literature. High-level referencing skills consistently applied.

Level 4	FAIL	MARGINAL FAIL	SATISFACTORY (3 rd / Pass) 40-49%	GOOD (2.2 / Pass) 50-59%	VERY GOOD (2.1 / Merit) 60-69%	EXCELLENT (1 st / Distinction) 70-84%	EXCEPTIONAL (1 st / Distinction) 85-100%
Knowledge and understanding (Knowledge of the basic underlying concepts and principles of a subject)	Major gaps in understanding of the basic underlying concepts and principles of the subject matter. Inclusion of irrelevant material. Substantial inaccuracies.	Gaps in knowledge of the basic underlying concepts and principles, with flawed or superficial understanding. Some significant inaccuracies and/or irrelevant material.	Limited knowledge and understanding of the basic underlying concepts and principles within the subject area. Some elements may be missing.	Knowledge of the basic underlying concepts and principles is accurate with a good understanding of the field of study but lacks depth and/or breadth.	Competent knowledge of the basic underlying concepts and principles. Exhibits very good understanding.	Excellent knowledge and understanding of the basic underlying concepts and principles of the subject.	Exceptional, detailed knowledge and understanding of the basic underlying concepts and principles
Cognitive and intellectual skills (Evaluate underlying concepts and principles of a subject and interpret qualitative and quantitative data in order to develop lines of argument and make sound judgements)	Wholly or almost wholly descriptive work. Little or no evaluation of the underlying concepts and principles. Failure to develop arguments, leading to illogical or invalid judgements. Minimal or no use of evidence to back up views.	Largely descriptive work, with superficial evaluation of the underlying concepts and principles. Weak interpretation of data, flawed development of arguments and judgements. Information accepted uncritically, uses generalised statements made with scant evidence and unsubstantiated opinions. Ideas sometimes illogical and contradictory.	Limited attempt at evaluation of the underlying concepts and principles, tending towards description. Can interpret qualitative and quantitative data but with some errors. Some evidence to support emerging arguments and judgements but these may be underdeveloped or with a little inconsistency / mis-interpretation.	Good evaluation of the underlying concepts and principles. Can interpret qualitative and quantitative data, with minor errors. An emerging ability to use evidence to support the argument. Mostly valid arguments and logical judgements.	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.	Excellent evaluation of the underlying concepts and principles. Can interpret qualitative and quantitative data accurately and with some insight. Excellent ability to devise arguments using evidence and make appropriate and valid judgements.	Exceptional evaluation of the underlying concepts and principles based evidence. Outstanding interpretation of qualitative and quantitative data. Exceptional ability to devise arguments using evidence and make wholly appropriate and valid judgements.

Level 4	FAIL 0-29%	MARGINAL FAIL 30-39%	SATISFACTORY (3 rd / Pass) 40-49%	GOOD (2.2 / Pass) 50-59%	VERY GOOD (2.1 / Merit) 60-69%	EXCELLENT (1 st / Distinction) 70-84%	EXCEPTIONAL (1 st / Distinction) 85-100%
Category Practical skills (Different approaches to solving problems in particular contexts)	Limited or no use of taught, basic methods, tools and/or techniques. Little or no appreciation of the context of the application. Very weak evidence of different approaches to problem-solving in particular contexts.	Rudimentary application of taught, basic methods, tools and/or techniques but without consideration and competence. Flawed appreciation of the context of the application. Weak evidence of different approaches to problem-solving in particular contexts.	An adequate awareness and mostly appropriate application of basic methods, tools and/or techniques. Basic appreciation of the context of the application. Can identify problems in particular contexts and propose basic alternative approaches or solutions though there may be errors.	A good and appropriate application of basic methods, tools and/or techniques. Clear appreciation of the context of the application. Good evidence of different approaches to problem-solving in particular contexts and proposes mostly appropriate solutions.	A very good application of a range of basic methods, materials, tools and/or techniques. Very good consideration of the context of the application. Very good evidence of different approaches to problem-solving in particular contexts and proposes appropriate solutions.	An advanced application of a range of taught, basic methods, materials, tools and/or techniques. The context of the application is well considered, and insightful. Excellent evidence of different approaches to problem-solving in particular contexts and proposes appropriate solutions.	Exceptional levels of application and deployment skills in particular practical contexts. Outstanding identification of problems in particular contexts and formulation of wholly appropriate, thoughtful solutions / different approaches.

Level 4		FAIL	MARGINAL FAIL	SATISFACTORY (3 rd / Pass)	GOOD (2.2 / Pass)	VERY GOOD (2.1 / Merit)	EXCELLENT (1 st / Distinction)	EXCEPTIONAL (1 st / Distinction)
Category	0-29%	30-39%	40-49%	50-59%	60-69%	70-84%	85-100%	
Transferable skills for life and professional practice (Communicate the results of their study/work accurately and reliably, and with structured and coherent arguments, the qualities needed for employment requiring the exercise of some personal responsibility within a structured and managed environment.)	Work is poorly structured, disorganised, inaccurate and/or confusingly expressed. Very weak use of language and/or very inappropriate style. Failure to work effectively individual or as part of a group. Little or no evidence of the skills for employment requiring the exercise of some personal responsibility.	Work is poorly presented in a disjointed manner. It is loosely, and at times incoherently, structured, with information and ideas often poorly expressed. Weak use of language and/or inappropriate style. Flawed approach to individual or group work, meeting only partial obligations to others. Limited evidence of the skills for employment requiring the exercise of some personal responsibility.	Mostly ordered presentation and structure in which relevant ideas / concepts are reasonably expressed. Work may lack coherence and/or accuracy in places. Can work as part of a group, meeting most obligations to others but perhaps with limited involvement in group activities. Demonstrates the basic skills for employment requiring the exercise of some personal responsibility, with some areas of minor weakness.	Mostly coherent, organised and accurate work, in a suitable structure and is for the most part clearly expressed. Can work effectively independently and/or as part of a team, with contribution to group activities. Demonstrates the skills for employment requiring the exercise of some personal responsibility, with some areas of strength and some of minor weakness.	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.	Work is coherent, very fluent and is presented professionally. Can work effectively independently and/or as part of a team, with an excellent contribution to group activities. Demonstrates excellent skills for employment requiring the exercise of some personal responsibility with an appetite for further development.	Work is accurate, exceptionally coherent, very fluent and presented well. Can work effectively independently and/or as part of a team, with an exceptional contribution to group activities. Demonstrates exceptional skills for employment requiring the exercise of some personal responsibility with an appetite for further development.	

THIS DOCUMENT IS ALSO AVAILABLE IN WELSH

HNC Process Operations Engineering

Environmental Protection and Sustainable Manufacturing Systems.



PCPO4003
Assignment 1 of 1
Hywel Baker

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Introduction

This assignment will be analysing a chosen industrial process at Puma Energy, Milford, with respect to environmental protection and sustainable manufacturing systems.

It will include:

- Research on the industrial plant, equipment and manufacturing process design and operation
- Identification of specific aspects associated with meeting environmental protection, legal requirements and best practice
- Identification of aspects associated with ensuring sustainable manufacture can be achieved through efficient equipment, plant and process operation
- Conclusions and recommendations on how the process could be improved with respect to environmental protection and manufacturing sustainability.



Report Topic

This report will be on the Rail loading system at Puma Energy, Milford Haven. The Rail loading system is a system that is designed to load Rail cars with clean fuel products consisting of, Kerosene's, Gasolines and Diesels. This system is a top loading system, using loading arms that are controlled by meter logics. There are numerous safety systems within the loading system that monitor the loading of the rail cars, trying to increase safety and decrease any protentional risks.



Figure 1. Illustrating the Rail loading stand.



Figure 2. Illustrating a loading arm

Aim & Objectives of the Report

The aim of this report will be to discuss the Rail loading system at Puma Energy, Milford and to highlight what the system does and how it works, also to highlight any strengths or weaknesses within the system in terms of the Environmental affect it has. Objectives are to outline any problems the system has, ways to improve the system and if the system is reaching the right environmental needs. As this topic is a site related topic, some information will not be available due to it being exclusive and confidential to Puma Energy, Milford.

How the Rail loading system works

The Rail system at Puma, Milford is a top loading system that uses a metered system to load rail cars. Before any rail cars are loaded, details must be entered into the PRJ computer system at Milford. Information that is required is the nomination number, date, destination, flow number, product and number of cars. Different products have different flow numbers and it is vital that all the information is inputted correctly into PRJ before any Rail car is loaded. This information is inputted manually by a competent Rail operator. Once this information is in PRJ, Rail loading can commence.

Once rail cars are lined up to the correct loading arm the safety system must be tested before loading can commence from any arm. This safety system is a SIS system, which is a safety instrumented system installed to IEC 61511 standards. This SIS system is monitored by a high-level probe in the loading arms, if this probe is activated it will then activate the SIS system shutting down all loading arms. This system can be operated from a panel screen in the control room. The panel operator will reset the SIS system, which trips the SIS valves for each loading arm, the Rail Operator will then manually open individual SIS valves dependant on what loading arms are being used.



Figure 3. This shows one of the SIS valves that must be in the open position before any loading can commence on the Rail. This also illustrates the SOV which can be used to manually open or close the valve, this SOV is connected to a safety PLC. These valves are controlled by a pneumatic system, supplied from compressors, if the air fails, it will fail shut to prevent any loss of containment.

Once the SIS valves are re-set and opened, loading can commence. This is done by inputting the correct index number into the batch controller, index numbers are determined when inputting information into the PRJ system. Each product being loaded will have a separate index number. Once the index number is entered, the

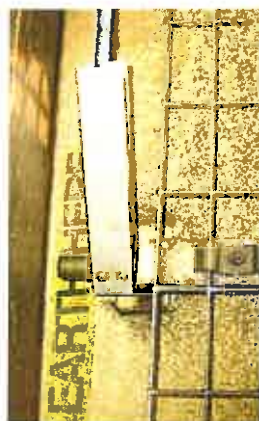
Rail Car number can then be inputted into the meter, ensuring that it is the correct Rail Car number, the meter will then display a volume that will be loaded into the Rail car, every car has its own separate volume and this can vary depending on the size of the Rail car. This volume will then be recorded by a Rail Operator for Oil accounts.



Figure 4. This shows one of the batch controllers on the Rail stand. This is where an Operator must manually input an index number, Rail car number and can input number pins to display flow rates, dye ratios and dye totalizers.

*I removed ref
of capitals*

Figure 5. This shows a loading arm in place. All arms are controlled by a pneumatic system and the control pad circled in red is used to manoeuvre the arms up and down.



Figures 6 & 7. These illustrate the earthing cable & clamp. The clamp must be placed on a designated earthing point on a Rail car. When following procedure, this earthing clamp must be attached to a Rail car before any arm is inserted. This earthing dissipates any potential static energy.

I needed images.



Figure 8. This illustrates a $\frac{1}{4}$ turn ball valve, with a limit pack. This must be in the open position before loading can commence, if this valve is left closed the meter head will display a message highlighting this.

Figure 9. This shows the probe that drops the footplate of the arm to the bottom of a rail car, this prevents turbulence of the arm whilst it is loading and also earths the arm to the rail car. This must be switched down via a button on the control pad. This probe must also be down before any loading can take place.



Figure 10. Shows the lighting system that is used by operators, this is a permissive system to prevent filling cars if the right sequence hasn't been followed. This lighting system also lets operators know whether they have a correct earthing on a Rail car, again without a green light no loading can take place.

Figure 11. This is the SIS high level probe on a loading arm, if this probe is activated it will activate the SIS system on the Rail stand. It will sound an alarm and shut the SIS valve.





Figure 12. This illustrates a loading arm ready to go, with the correct earthing, high level probe down and solenoid valve open. Once these 3 steps are done, the meter head will display a start permissive, enabling Operators to commence loading.

Potential Hazards Associated with the System

- Fire & Explosion – This can be caused by sparks, static and significant heat.
- Loss of Containment – Caused by over fill, equipment failure or integrity failure.
- Contamination – Caused by in correct line up to the rail or contamination from water and other products.
- Exposure to Vapours – Caused by vapour extraction system not working correctly.
- Movement of Rail arms whilst loading – Caused by break failure on Rail cars or Locomotive failure.

All of the hazards above can affect the environment and it is important to monitor these hazards frequently during the operation of Rail loading at Puma, Milford.

Existing Environmental Protection within the system

- SIS system – To prevent over fill and loss of containment.
- Vapour recovery – Which removes unwanted vapours to the atmosphere via flame arrestors, to a veductor and a stack away from the loading stand.
- Earthing – Prevents static energy becoming an ignition source and allows Rail car to be loaded via a permissive.

- Traffic Light system – Prevents unwanted movement of Rail cars when being loaded.
- Heat Sensors – Used to detect any heat source within the loading stand, activates alarms in control room.
- Cameras – Used to monitor the stand and its conditions.
- Bunded areas – Designed to hold a volume of product, if loss of containment occurred.

All of these systems above are used to protect the loading system. Most of the systems are in place to prevent loss of containment which can deeply affect the environment. Loss of containment is one of the biggest issues within the Oil & Gas industry and continues to be. Some of these systems could be further developed to help protect the environment which will be found in the improvement section. ✓

Recent problem within the system

During the process of the loading system, recently at Puma Energy there has been a number of high-level activations on Loading arm RA2. This is a Gasoline loading arm which is frequently used on the rail loading system. These activations have been caused by high level activations on the SIS system that is currently installed on the Rail stand. Numerous investigations have taken place by Puma's specialist instrumentation team to establish why these activations are becoming more frequent on RA2, this was priority to investigate due to the implication of over filling a rail car in terms of environmental issues. ✓

Troubleshooting

One issue that was found, was a bent probe inside the loading arm. This was highlighted by operations and investigated. However, it was established that this bent probe was not the reason for the recent frequent activations on loading arm RA2. A plan was put in place to deduct volumes into the rail cars that are being loaded by RA2, the first initial volume to deduct was 100 decalitres. This is done by manually inputting a lower figure into the meter head, for example Rail car 89007 would have a pre-set volume of 9580 Decalitres, this would be reduced to 9480 decalitres by a Rail Operator on the meter before commencing a load. ✓

This method was implemented to operations and worked for a few weeks, but again RA2 high level was activated, forcing the SIS system to close the SIS Valve. More investigating was needed. It was established that due to the density of the gasoline in storage at the moment being very low, this was the cause of the high-level activations. The PRJ system previously spoken about loads rail cars on weight, as Gasoline has a low density it means more product gets loaded into the car. As the current Gasoline being stored and exported at Puma is at the very low end of Gasoline density, it is causing a small ullage to be left in the rail cars, and this is why it RA2 high level is being activated on a frequent basis. Due to the Rail loading system frequently being checked via meter proving, regular ullage dip exercises and regular maintenance, it was hard to establish why these regular trips were happening. It was also a concern that if the reasons behind the trips were not found and solved, it could eventually cause a major over-fill on the Rail, meaning loss of containment and a very high environmental impact to the surrounding area. ✓

Solving

As the density issue was identified as the source of the recent problem, The FIC committee on site are now tasked on producing something to prevent any further high-level activations on RA2. After discussions with Specialists, they have decided to review the ullages on every Rail car in the PRJ system. This means gathering all the ullages from PRJ and increasing them on each Rail car in the system. Ullage is the space between the top of the Rail car and the top of the product. By increasing this space, it should prevent the probes be being touched by product, effectively stopping any future high-level activations. Another issue that has been identified by specialists is that the SIS high level and the ESD high level probes are at the same height inside every arm, in best practice after speaking to specialists both probes should be at different heights, with the SIS probe being at a higher level. This issue has been known for a while but to change these probes the system would have to be re-built to a SIL level 1, which is the highest SIL level, meaning it is the best level of protection. In the future the Company would like to install a SIL 1 system however, the biggest concern currently is making sure all the ullages are increased on each Rail car to prevent the chance of an overfill and loss of containment. ✓

Conclusion

Improvements to the system

The biggest improvement could be on the vapour recovery system, at the moment the system is just vented to atmosphere via a stack away from the loading stand. A VRU unit could be installed next to the road stand which would send all the unwanted/un-used vapours back to tankage instead of the atmosphere. These vapours could then be re used as product, which would be cost effective for Puma Energy, Milford. This method would also reduce pollution to the atmosphere.



This would be a great addition in the process.

Figure 14. Illustrating the vapour recovery system on the Rail stand. It shows the vapour tubes from each arm piped into hardlines that go through flame arrestors, before being vented to atmosphere via a stack.

Figure 15. Illustrating the vapour recovery stack. This stack is monitored by the NRW every 3 months to ensure it is not breaching any pollution limits, most of the vapours displacing out from the stack will be light ends, meaning they will dissipate into the atmosphere without causing any harm to the surrounding environment. This stack area is constantly monitored, and gas tested by Operations twice a day.



Energy Saving Improvements/Ideas for the system

As the Rail loading system is a 24/7 Operation, there is a lot of energy consumed via the lighting on the Rail stand. This energy could be saved in various ways like: Solar panels, Wind Turbines or more windows. These three ideas are all beneficial, however the most cost-effective idea would be to add more windows to the Rail Stand to let more Natural light in during the Day time operation of the Rail.



Figure 16. This shows the Western side of the rail stand and the 9 windows it has. These windows could be replaced with a clearer material to enable natural lighting into the Stand, or they could have sections cut out to again allow light in. This would reduce the energy consumption on the Rail stand drastically. Boyle G states *"Natural lighting is more powerful than artificial lighting."*

During the operation of the Rail, it was also noted that some of the Control pads for the loading arms were leaking compressed air. As previously stated, the arms are



controlled via compressed air which is supplied via compressor packages. By fixing the leaking air on the control pads, it would prevent the wastage of air, therefore saving energy due to the compressors being run by mains electricity. *True*

Figure 17. Illustrating a control pad for the loading arms.

As the Rail Area is classed as a Zone 1 area on site, there are not many ideas that can implemented due to the danger of the Rail stand.

In conclusion, the Rail system at Puma Energy is meeting all of its environmental needs, however, could have some slight improvements regarding environmental sustainability. As stated on numerous occasions the main concern with the Rail system is the potential to over fill a Rail car, causing a loss of containment. This is always highlighted and is always trying to be improved via Safe systems, procedures and good operational practice.

*More improvements could have
been included in your assessment.*

References

All information gathered was established from Puma Energy, Milford. With help from specialists and experts in the field.

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