KNOWLEDGE ASSESSMENT SELF REVIEW (FORM KA02)

Name of Applicant: _____

Membership number or date of birth: _____

Section One

Important Instructions and Guidance

Carefully read the following instructions and guidance. They are designed to assist you in providing in providing a portfolio of evidence that best demonstrates the comprehension and application of your engineering knowledge to Washington Accord equivalence.

Section One – Instructions and Guidance

- Familiarise yourself with the definition of 'complex engineering problems' (Appendix One) as you are required to demonstrate you can apply your engineering knowledge to solve complex engineering problems.
- Identify the 'engineering discipline and field' (Appendix Two) you will provide evidence of your comprehension and application of engineering knowledge in.
- The knowledge assessment is based on Washington Accord knowledge profile. This form is designed to capture information to assist the evaluation of your evidence

Section Two – Knowledge Profile

- As you do not have a formal engineering qualification that formally benchmarks to a Washington Accord accredited degree, it is essential that you demonstrate that you have acquired an equivalent level of knowledge.
- The Context and performance indicators provide guidance on the evidence to be provided
- Consider each element of the knowledge profile, including the context statements and performance indicators. Summarise key aspects of your knowledge under each element and how this has been developed through academic study, on-job learning and/or continuing professional development. It is important you use the performance indicators and complexity definitions to enable you to describe your knowledge and how it has been developed.
- When describing how your educational program contributed to your development, focus on the more advanced pieces of work you did, the knowledge you needed in order to perform that work, and the abilities you needed in order to apply your knowledge in an engineering context.
- The word document is formatted to allow you expand a text box if required.
- Write your material in the first-person using 'I' or 'me' instead of 'we' or 'us'. This makes it easy for the assessors to see what your personal contribution was.

Section Three – Evidence of Application of Knowledge

- Describe 3-4 engineering projects or activities (Work/Study Episodes) that you have been involved with, which demonstrate your ability to apply your engineering knowledge to solve complex engineering problems. Think of activities where you have had to apply a high level of engineering knowledge – such as some analysis that you have done, work you have done in scoping a problem and then developing a solution or design. What engineering models did you use? What assumptions were made in the development of the model and how did you test the model was relevant in the way you used it?
- For engineers with limited practical experience post-graduation, project work undertaken during your study is likely to be one of the best ways of illustrating the application of your knowledge. As well as projects conducted within university or college, you may be able to draw on any industry experience required as part of the educational program.
- You are required to include actual samples of your work – calculations, analyses or reports that you have personally undertaken - to substantiate your work/study episodes.
- Write your material in the first-person using 'I' or 'me' instead of 'we' or 'us. This makes it easy for the assessors to see what your personal contribution was.
- The word document is formatted to allow you expand a text box if required.

Section Four – Supplementary Evidence

- You are required to submit a certified copy of your academic transcript(s) (formal record of papers taken and grades received) if you have not submitted to IPENZ already.
- Summarise your work history but include a representative sample of specific engineering projects or activities that evidence the development or application of the knowledge profile.
- Rather than listing all your CPD activities, provide details of those activities that have extended your professional engineering knowledge in your discipline and field and have assisted you to develop the knowledge profile of a professional engineer. A summary of all relevant activities – including those going beyond the most recent 6 years - will assist knowledge assessors in assessing your engineering knowledge. Assessors will be looking for how any gap between your qualification and a Washington Accord qualification has been bridged by your CPD.
- The word document is formatted to allow you expand a text box if required.

Section Five – Payment

- The fee for a knowledge assessment is NZ$1,351.25 GST incl. Please complete your credit card details.
- Send all documentation to address advised

What happens next?

The knowledge assessor will review your portfolio of evidence to determine the need for further challenge tests. This will involve an interactive assessment, that you will need to make yourself available for, either via tele or video conference and may also involve a series of challenge tests that may include one or a combination of:

- an oral and/or written examination
- a work simulation
- a case study

Your knowledge assessor will be in touch with you to discuss the next steps.

SECTION TWO – KNOWLEDGE PROFILE

ELEMENT ONE A systematic, theory-based understanding of the natural sciences applicable to your discipline (e.g. calculus-based physics)
Context All engineering fields are rooted in one or more of the natural sciences. In a broad context, natural science is separated into physical and biological sciences. Physical sciences include chemistry, calculus-based physics, astronomy, geology, geomorphology, and hydrology. Biological sciences involve living systems and include biology, physiology, microbiology, and ecology. Washington Accord graduates are expected to be able to apply this knowledge of the natural sciences to solve complex engineering problems in their discipline.
Performance Indicators • Fundamental quantitative knowledge underpinning nature and its phenomena. • Knowledge of the physical world including physics, chemistry and other areas of physical or biological processes; • Application of knowledge from one or more of the natural sciences to the solution of complex engineering problems relevant to your discipline; science relevant to your discipline Knowledge of key concepts of the scientific method and other inquiry and problem-solving

Summarise your knowledge of the natural sciences relevant to your discipline and how it has been developed through formal study, on-job learning and/or continuing professional development.	Provide annotations to your supplementary evidence (document and page number)
Note: please cross reference to your academic transcript(s) and continuing professional development records, as appropriate.	Episode 1, pages 16, clauses 1.1
I was appointed as lead engineer for design, testing, supply and commissioning support of rotating mechanical equipment	Episode 1, pages 16, clauses 1.2
My role involved identification of scope, preparation of technical requirements and estimation of man hours.	Episode 2, pages 24, clauses 2.3
I supervised during preparation of 2D and 3D modelling.	Episode 2, pages 28, clauses 2.14
My knowledge on rotating equipment helped to resolve issues related to main engine	Episode 3, pages 29, clauses 3.2
I identified cope and initiated engineering activities	Episode 3, pages 33, clauses 3.9
I used my expertise to verify the layout using 3D model & also performed visual inspection	Episode 4, pages 35, clauses 4.2
My role was to develop an automated filling mechanism consisting of conveyor unit	Episode 4, pages 39, clauses 4.14
I played key role in project working & selected right suitable equipment for each mechanism	

ELEMENT TWO

Conceptually-based mathematics, numerical analysis, statistics and formal aspects of computer and information science to support analysis and modelling applicable to your discipline

Context

Branches of mathematics applied in engineering include arithmetic, algebra, geometry, trigonometry, calculus, differential equations, numerical analysis, optimization, probability and statistics, simulation, and matrix theory. Engineers apply mathematics in a wide variety of functions typically carried out in engineering organisations such as planning, design, manufacturing, construction, operations, finance, budgeting, and accounting.

Washington Accord graduates are expected to be able to apply this mathematical knowledge to solve complex engineering problems in their discipline.

Performance Indicators

- Knowledge of mathematics, statistics and numerical methods that supports the development or application of models that replicate ‘real world’ behaviours
- An understanding of the assumptions behind theoretical models and their impacts in the development and use of those models
- Ability to organise and analyse a data set to determine its statistical variability;
- Knowledge of trigonometry, probability and statistics, differential and integral calculus, and multivariate calculus that supports the solving of complex engineering problems
- Ability to apply differential equations to characterize time-dependent physical processes

Summarise your mathematical knowledge relevant to your discipline and how it has been developed through formal study, on-job learning and/or continuing professional development. Note: please cross reference to your academic transcript(s) and continuing professional development records, as appropriate.	Provide annotations to your supplementary evidence (document and page number) Episode 1, page 17, clause 1.4
Based on my experience & knowledge of API 610 I knew that client recommended arrangement of pump flow rate will not work. I did the necessary working and proposed proper flow rate.	
I did calculations for pump related scenarios	Episode 1, page 19, clause 1.5
I calculated electrical load consumption of different equipment and finalized design load for which the engine has to be sized.	Episode 2, page 26, clause 2.5
I analysed the KPI by drafting the graph	Episode 3, page 30, clause 3.4
I calculated pump delivered flow, plunger linear speed etc	Episode 3, page 32, clause 3.5
I calculated acceleration torque and load torque	Episode 4, page 37, clause 4.5

ELEMENT THREE

A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline

Context

Engineering fundamentals provide the knowledge base for engineering specialisations and represent a systematic formulation of engineering concepts and principles based on mathematical and natural sciences to support applications.

The core areas of engineering fundamentals knowledge include fluid mechanics, statics and dynamics, electric circuits, solid mechanics, thermodynamics, heat transfer, mass transfer, and properties of materials.

Washington Accord graduates are expected to be able to apply this knowledge of engineering fundamentals to solve complex engineering problems.

Performance Indicators

- Ability to define key factual information in core areas of fundamental engineering knowledge relevant to your engineering discipline

  Evidence of sufficient depth of knowledge of engineering fundamentals to demonstrate an ability to think rationally and independently within and outside a chosen field of specialisation

- Evidence of sufficient breadth of knowledge of engineering concepts and principles to allow subsequent professional development across a broad spectrum of engineering

- Ability to apply knowledge of engineering fundamentals to solve complex engineering problems relevant to your discipline

Summarise your knowledge of the core engineering fundamentals (as listed above) and how they have been developed through formal study, on-job learning and/or continuing professional development. Note: please cross reference to your academic transcript(s) and continuing professional development records, as appropriate. I did calculations for suitable pump motor. I ensured to select higher efficiency pump so that energy efficient motor can be used. I contacted vendor (of Slop pump) for air freight of some material from their sub-supplier. I did this to keep an eye on the concept of design as per our client need. I used AVEVA Marine 3D, AutoCAD 2D & Microsoft Excel during project completion I prepared mechanical datasheets, material requisitions and technical bid evaluation report I worked as package engineer resolved multiple issues. I ensured that technical comments from inter-disciplines were received without delay I used PDMS 3D modelling software, AutoCAD 2D and NAVIS work. I also aided in developing the necessary logic for automations I used knowledge gained in fluid mechanics to select pump and did the required calculations	Provide annotations to your supplementary evidence (document and page number) Episode 1, page 21 clause 1.10 Episode 1, page 21 clause 1.9 Episode 2, page 26 clause 2.6 Episode 2, page 28 clause 2.13 Episode 3, page 31 clause 3.4 Episode 3, page 33 clause 3.6 Episode 4, page 36 clause 4.4 Episode 4, page 38 clause 4.13

ELEMENT FOUR

Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline

Context

In addition to a broad understanding of fundamental engineering principles, professional engineers are required to develop specialised engineering knowledge to support their practice. This may be aligned with traditionally defined fields of specialisation such as structural, industrial or geotechnical engineering; coherent combinations of such traditional areas; or more recently emerging fields such as software, biomedical or mechatronics engineering.

Advancing technological knowledge and complexity means that technical specialisation is increasingly necessary for an engineer to remain abreast of technological development throughout their career.

Washington Accord graduates are expected to be able to apply this engineering specialist knowledge to solve complex engineering problems.

Performance Indicators

- Evidence of sufficient depth of knowledge to support practice within one or more recognised field of engineering
- Evidence of a systematic understanding of the coherent body of knowledge related to a particular field of engineering; its underlying principles and concepts; its usage and applications; and analytical and problem-solving techniques
- Ability to apply specialist engineering knowledge to solve complex engineering problems

Summarise your specialist engineering knowledge and how it has been developed through formal study, on-job learning and/or continuing professional development. Note: please cross reference to your academic transcript(s) and continuing professional development records, as appropriate. I proposed to supply and install Air Operated Double Diaphragm to resolve multiple issues To achieve minimum pump head due to low level inside the tank, my proposal of providing manual throttling valve at the discharge of decanting pump was found acceptable to the end user I arranged third party consultancy for performing the NOISE testing a per my knowledge & recommendations. I performed material handling study for the entire vessel. I also selected suitable material handling equipment I did load test for crane and ensured that testing was done as per approved load chart of crane I gained extensive knowledge of problem solving activity and effective planning & quality commitment I arranged the fabrication and assembly of the conveyor belt and nozzle movement	Provide annotations to your supplementary evidence (document and page number) Episode 1, pages 18, clauses 1.4 Episode 1, pages 18, clauses 1.4 Episode 2, pages 24, clauses 2.4 Episode 2, pages 27, clauses 2.10 Episode 3, pages 33, clauses 3.7 Episode 3, pages 34, clauses 3.15 Episode 4, pages
I selected slightly bigger pump and used gate valve & smaller diameter piping to meet flow rate	36, clauses 4.4 Episode 4, pages 38, clauses 4.10

ELEMENT FIVE

Knowledge that supports engineering design.

Context

The design process – the root of engineering – is the process of devising a system, component or process to meet desired needs. Engineering design is a systematic process that involves problem definition and scoping, research, analysis, option development and selection, modelling to predict future performance, detailed design and testing. Importantly, it also involves communication of the outcome in a way that enables the design solution to be realised.

Washington Accord graduates are expected to be able to apply this knowledge of the design process to solve complex engineering problems.

Performance Indicators

- Ability to undertake research and analysis to support the design process
- Ability to investigate a situation or the behaviour of a system and identify relevant causes and effects
- Ability to develop from first principles and construct mathematical, physical and conceptual models of situations, systems and devices, with a clear understanding of the assumptions made in development of such models
- Application of technical knowledge, design methods and appropriate tools and resources to design components, systems or processes to meet specified criteria
- Ability to analyse the pros and cons of alternative design options to support the development of an optimised design alternative
- Ability to analyse the constructability or manufacturing feasibility of a project or product
- Experience of personally conducting a significant design exercise, providing evidence of the consideration of various realistic constraints, such as safety, reliability, ethics, economic factors, aesthetics and social impact.
- Ability to apply appropriate design methods in solving complex engineering problems

Summarise your knowledge that supports engineering design relevant to your discipline and how it has been developed and applied through formal study, onjob learning and/or continuing professional development. Note: please cross reference to your academic transcript(s) and continuing professional development records, as appropriate.	Provide annotations to your supplementary evidence (document and page number)
I lead all mechanical related design review meetings and also provided necessary engineering support during commissioning and troubleshooting. I calculated suction specific speed which was needed for design purpose. Upon extensive research & discussion I finalized flex plate coupling for single bearing generator	Episode 1, page 17, clause 1.3 Episode 1, page 19, clause 1.6 Episode 2, page 25,

I used AVEVA marine 3D model software and proposed piping layout for resolving the clashing issue of pre-filter and after filter. The operations of thee isolation valves and the drain lines of PSV were resolved by me by rerouting the piping I designed the DC motor driven conveyor belt I designed liquid feeding and nozzle moving mechanism I used CNC machine knowledge to use ball screw nut mechanism for filling	clause 2.4 Episode 2, page 27, clause 2.9 Episode 3, page 31, clause 3.4 Episode 4, page 36, clause 4.3 Episode 4, page 36, clause 4.4 Episode 4, page 37, clause 4.9

ELEMENT SIX

Knowledge of engineering practice in the engineering discipline

Context

Engineers require knowledge of a broad range of tools and techniques relating to technical (measurement, modelling, drawing, design), business (financial management, project management) and interpersonal (communications, teamwork) aspects of modern engineering practice.

Washington Accord graduates are expected to be able to:

- Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations.
- Apply knowledge of management principles and economic decision making as part of the management of engineering projects
- Function effectively as an individual and as a member or leader in diverse teams
- Communicate effectively with both technical and non-technical audiences

Performance Indicators

Tools and technologies:

- Awareness of critical issues affecting current technical and professional practice
- Awareness of current tools of analysis, simulation, visualisation, synthesis and design, particularly computer-based models and packages, and competence in the use of a representative selection of these
- Appreciation of the accuracy and limitations of such tools and the assumptions inherent in their use
- Knowledge of materials and resources relevant to the discipline and their main properties and ability to select appropriate materials and techniques for particular objectives
- Knowledge of a wide range of laboratory procedures relevant to the discipline and a clear understanding of the principles and practices of laboratory safety
- knowledge of current types of systems, equipment, information technology, and specifications that accomplish specific design objectives Communication:
- write correspondence that clearly and concisely communicates facts and circumstances related to a project, product or process
- plan, prepare and deliver an oral presentation, with appropriate visual aids and other supporting materials
- communicate effectively with both technical and non-technical individuals and audiences Engineering management principles and economic decision making:
- apply appropriate tools and techniques to monitor project schedules and costs Team work:
- Operate as an effective team member or leader of a multidisciplinary team

ELEMENT SIX

Knowledge of engineering practice in the engineering discipline

Summarise your knowledge in each of these core areas underpinning engineering practice and how it was developed through formal study, on-job learning and/or continuing professional development. Note: please cross reference to your academic transcript(s) and continuing professional development records, as appropriate.	Provide annotations to your supplementary evidence (document and page number)
I was involved in meeting with Project manager every fortnight to discuss the progress & material delivery status	Episode 1, page 22, clause 1.13
The architectural engineer provided significant guidance while performing feasibility study of elevators	Episode 2, page 26, clause 2.8
I prepared mechanical datasheet, material requisition & technical bid evaluation report for the mechanical equipment	
I to overcome delay I recommended having technical negotiations across the table and insisted vendors to come fully prepared for tech talk. This resulted in 90% resolution of issues and lead to quick closure of tech bid evaluations.	Episode 2, page 27, clause 2.13
I prepared all the technical requirements & coordination strategy with production team & expedited the fabrication process.	Episode 3, page 30, clause 3.4
I gave presentation for displaying the working of the miniature bottling plant	Episode 3, page 34, clause 3.13 Episode 4, page 38, clause 4.12

ELEMENT SEVEN

Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the professional responsibility of an engineer to public safety; the impacts of engineering activity: economic, social, cultural, environmental and sustainability

Context

Engineers design artefacts (facilities, structures, systems, products and processes) that are intended to meet a societal need, but which typically impact on individuals or groups in different ways. As a result, design and decision-making processes must take account of often conflicting stakeholder needs. An understanding of this societal context and the ethical obligations that the engineer has in service of society are critical components of engineering practice.

Washington Accord graduates are expected to be able to:

- Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice
- Understand and evaluate the sustainability and impact of professional engineering work in the solution of complex engineering problems in societal and environmental contexts.

Performance Indicators

- Demonstration of ethical behaviour in accordance with ethical codes of conduct and established norms of professional conduct
- Evidence of making ethical decisions and regulating one's own professional conduct in accordance with a relevant code of ethical conduct
- Implementation of appropriate health and safety practices
- Application of safe practices in laboratory, test and experimental procedures
- Awareness of the social and environmental effects of their engineering activities
- Awareness of sustainable technologies and sustainable development methodologies
- Ability to identify risks as a consequence of engineering compromises made as a result of project or business constraints, and understanding of techniques to mitigate, eliminate or minimise risk
- Knowledge of appropriate risk management techniques used to assess the accuracy, reliability and authenticity of information
- Understanding of the role of quality management systems tools and processes

Summarise your knowledge of the role of engineering in society and how it has been developed through formal study, on-job learning and/or continuing professional development. Note: please cross reference to your academic transcript(s) and continuing professional development records, as appropriate.	Provide annotations to your supplementary evidence (document and page number)
I ensured that the pumps involved in this project were subjected to Factory Acceptance Test as per International Standards	Episode 1, page 20, clause 1.7
I noticed that man hours consumption was high as compared to output; so, I personally allotted the man hours to my subordinates and provided target dates so that we are ahead of the planned dates	Episode 1, page 20, clause 1.9
The allowable noise limit was given high emphasis; so I ensured that the selected equipment had noise level below 85 db.	Episode 1, page 21, clause 1.12 Episode 2, page 26, clause 2.7
I was involved in performing the Torsional Vibration Analysis on diesel engine generator	Episode 3, page 33, clause 3.7
I performed the Factory Acceptance Test of Positive Displacement Pumps as per API 674 & 675 I tested the nozzle moving, belt moving and liquid filling mechanism	Episode 4, page 37, clause 4.7

ELEMENT EIGHT

Engagement with selected knowledge in the research literature of the discipline

Context

Research and broader lifelong learning capabilities are essential if the engineer is to remain up-to-date with rapidly evolving scientific knowledge, technology and engineering tools critical to engineering practice

Washington Accord graduates are expected to be able to use research-based knowledge and research methods as part of the investigation of complex problems in their discipline

Performance Indicators

- Advanced knowledge in at least one area within your discipline, to a level that engages with current developments in that area
- Understanding of how new developments relate to established theory and practice and to other disciplines with which they interact
- Describe advancements in engineering research and technology and science in a particular area of engineering practice;
- Review research articles pertaining to a project component typically encountered in a specific area of engineering design;
- Choose topics most appropriate for continuing education to increase depth of technical knowledge pertinent to the specific area of engineering practice Commitment to lifelong learning.

Summarise your research knowledge and how it has been developed through formal study, on-job learning and/or continuing professional development. Note: please cross reference to your academic transcript(s) and continuing professional development records, as appropriate.	Provide annotations to your supplementary evidence (document and page number)
I did extensive research to recommend installation of an air eliminator on the unloading pipeline which later vented off the trapped air within the jet fuel	Episode 1, page 20, clause 1.8
My knowledge in centrifugal pump helped in resolving issues while performing commissioning & troubleshooting.	Episode 1, page 22, clause 1.14
I reviewed & commented on inter-discipline engineering document and engineering design.	
I made an extensive research for resolving issues related to the sizing of the coupling.	Episode 2, page 24, clause 2.3
I was guided extensively by HVAC & Architectural team to understand the	Episode 2, page 26, clause 2.8
My knowledge over maintenance aspects of the equipment helped significantly to develop a robust material handling plan.	Episode 3, page 33, clause 3.8
I learnt technical presentation skills while demonstrating the working of the bottling plant of building material and HVAC control philosophy.	Episode 3, page 34, clause 3.14
	Episode 4, page 39, clause 4.14

Section Three - Evidence of Application of Knowledge

In this section you are required to provide evidence of the application of your engineering knowledge using 3-4 engineering projects or activities (Work/Study Episodes) that you have been involved with.

Provide a general overview of the scope or parameters of each project or activity, your role in it and the particular challenges or complexities involved. Then describe, in narrative form, how it provides evidence of the application of different aspects of your engineering knowledge. Cross reference to the relevant elements of the knowledge profile in the right hand column.

You are also required to complete the Knowledge Matrix to summarise the contribution to knowledge demonstration made by each project. The work/study episodes are expected to provide at least 2 examples of the application of each knowledge element.

Work Episode 1	Element
Overview of the project Project Title: Falcon D of Punch List Works within the refinery terminal (Engineering, Procurement & Construction) Dates of Project: February 2016 to January 2017 Name of Organization: Lamprell Energy Ltd / Lamprell Engineering & Construction (E & C) Location: Lamprell Shipyard, Hamriyah Free zone Sharjah, UAE My Role: Senior Mechanical Engineer Background 1.1 Lamprell Engineering & Construction ("E&C") delivers fully integrated engineering solutions to the onshore and offshore oil & gas and renewable energy sectors. Lamprell E&C offers a full scope of services from early production to delivery and beyond, extending to all areas of onshore and offshore design and construction. The division is organized to deliver through the full project life cycle in the UAE, GCC, North Africa and beyond. Horizon Emirates Jebel Ali Petroleum Terminal (HEJP) operates a Petroleum Products Storage Terminal inside JAFZA, UAE. The Terminal contains Jet Fuel Storage Tanks, Pumping and Filtration facilities, Truck Loading facilities, connection to Berths, Utilities, etc. The facilities were commissioned in 2014 and to augment the operating efficiency and safety, some Punch-List works were required to be carried out in the operating facilities. The proposed work scope involved Civil, Mechanical, Electrical and Instrumentation disciplines. The Works Location was spread inside the terminal and Oil Tanker Berth areas. Proposed project schedule by Lamprell was 17 months; however, client (HJATL) requested for 12month project schedule in order to minimize the plant shutdown works. I was responsible to execute the mechanical scope of the task and the short time frame was intimidating. I was appointed as Lead Engineer for engineering, design, testing, supply and commissioning support of rotating mechanical equipment.	One
Objective of the Project 1.2 ENOC/HJATL awarded this job with project completion duration of 12 months. This project required involvement from all disciplines and strong coordination. Since the budgeted man-hours was minimal most of the engineers involved were shared resources i.e., it was expected to work simultaneously in other projects as well. All the engineering work was expected to be accomplished to the satisfaction of third party inspection agency which was Bureau Veritas. My role mainly included identification of scope, preparation of all the technical requirements, estimate man-hours and co-ordination with site and purchase team. Apart from the above I was also responsible to resolve any engineering, production, installation and commissioning and troubleshooting issues. I was the single point contact for all concerns related to mechanical equipment. Junior engineer and	One
Roles & Responsibilities 1.3 - Perform site survey. - Identify the scope of work based on client furnished tender documents and survey - Prepare list of engineering deliverables. - Break down each engineering deliverable into various tasks and provide weightage to each task.	

- Estimate the man-hour and the man power required based on deliverables.
- Ensure the deliverables meet the contractual schedule requirements.
- Delegate work to my sub-ordinates.
- Review material requisition, mechanical data sheet, noise datasheet and technical bid valuation.
- Supervision during preparation of 2D drawing (Auto CAD) and 3D modeling (Auto CAD)
- Coordination with client, vendors, inter-discipline and other department (projects, operations, procurement and commissioning).
- Review and comment on inter-discipline engineering documents and engineering drawings.
- Review and comment on vendor drawing, datasheets, Inspection & Test Plan, Performance Curves, test Procedures, Operational Procedures.
- Responsible for the overall execution and control on project.
- Responsible for reporting, controlling and monitoring the job execution.
- Lead all mechanical engineering related design review meetings.
- Review the progress of the project deliverables based on weightage provided and further takes required action to maintain the planned schedule.
- Provide necessary engineering support during commissioning and troubleshooting.
- Preparation of lubrication and maintenance schedule.
- Resolve all the site queries.
- Ensure all the task

Five

Complexities (using the complexity definitions) and challenges of the project

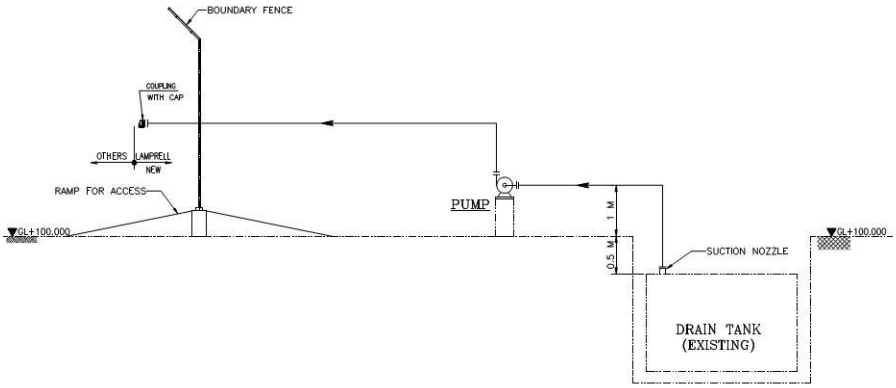
1.4

Problem 1

During process of preparation of datasheet, I noticed that flow rate of the pump was very low, Slop Pump had a flow rate of 5 m3/hour and Uplift Pump had a flow rate of 2 m3/hr. I did detailed study with respect to API 610, layout drawings & PIDs.

Two

As per tender documents vertical or horizontal API 610 was required for Slop pumping application of draining slop oil from an underground drain collection tank of 700 mm depth. Based on my experience and the knowledge of API 610; I was convinced that client recommended arrangement will not work. The tank depth was only 700 mm and this does not provide sufficient space for the column, the volute and the minimum required settling clearances. Beside this being horizontal API 610 OH2 centrifugal pump would face two difficulties in the recommendation of configuration due to suction lift (refer the drawing below). Firstly, the loss of prime may lead to dry run resulting in bearing and mechanical seal failure.



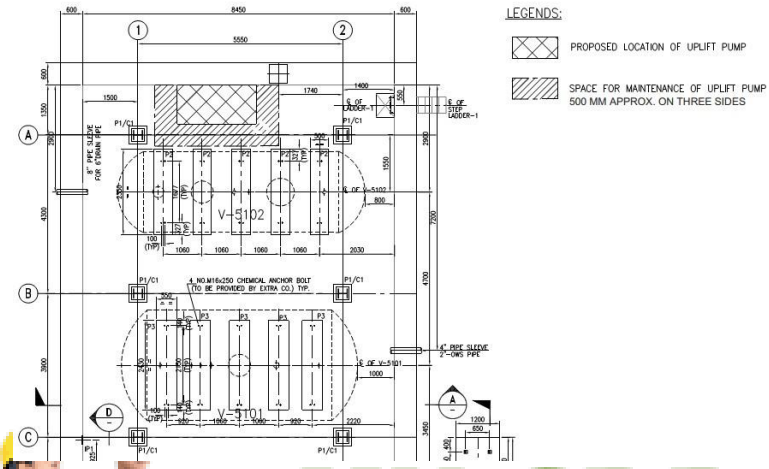
Secondly the pump operating point will not be in the API recommended operating region on the pump performance curve, since in our case the flow rate was very low and there may be a tendency for pump to vibrate which is not acceptable as per API 610.

To overcome the above difficulties for our application I suggested to install a Non- API, Self-Priming horizontal centrifugal pump (typical picture. The pump which I selected had no utility requirements, the casing design was such that the pressure differential amongst the aerated liquid at the impeller and nonaerated liquid in the priming chamber creates vacuum pulled the liquid up in the pipe.

A technical query was raised to the client explaining the situation along with proposed solution with necessary backup from the suppliers. My proposal was successfully approved by the end user. My preemptive study at the initial stage prevented us from all the needless annoyances at commissioning stage.

Problem 2

I was also studying on the Uplift pump as well; this pump was for uplifting the drained water from both the underground tanks through a common manifold and further discharging it to the Holding tank. Owing to the low flow rate of 2 m3/hour an API 610 pump was out of question like Slop Pump. Beside this, maintenance space was not available on all four sides further to the bottom of the pit would require excavation by approx. 1 (one) meter to cast the foundation to meet the required suction condition (prevent dry running). Moreover, due to rain the pit would be filled with rain water and the proposed pump models were not suitable to operate in submerged condition.



Four

To overcome all the above concerns, I proposed to supply and install Air Operated Double Diaphragm Pump (AODD). The said pump operated without any operational issues as it was aligned very well with our operations requirements. This was informed to end user vide a technical query which was further approved based on the detailed explanation provided. Successful approval of my proposal was highly respected and an email was issued appreciating huge saving to our company.

Problem 3

The progress on decanting pump was smooth; however, client advised change in process parameters.
The pump was expected to operate for below conditions Capacity: 25 m3/hour, Head: 20m (max) & 6 m (min). Unfortunately, the requested wide range in head cannot be met with the same pump. The pump performance curve was provided below wherein required operating range was marked. Lower liquid level inside tank requires lower pump discharge head. Required pump discharge head less than 16.5meter causes pump operating point to shift outside of Pump performance curve which will ultimately lead to pump tripping.

However, to comply with client's requirement I proposed below possible solution:

- Decanting operation is a manual intervention, hence install manual operated throttle valve in the pump Discharge line.
- API centrifugal pump with VFD option.
- Proposed type of pump shall be API standard PD Pump.

Solution 2 and 3 were not found feasible at this stage of the project. Hence to achieve minimum pump head due to low level inside tank, my proposal of providing manual throttling valve at the discharge of Decanting pump was found adequate by the end user. The throttle valve shall be adjusted manually to keep pump discharge pressure at 22.5 psi (20-meter Head) throughout jet fuel transfer operation which was further made official through obligatory documentation.

Four

<u>How does this project demonstrate application of your engineering knowledge?</u>

1.5

Two

Engineering Calculations

I started working on calculations, preparation of datasheet and obtaining inter discipline comment on our documents and other activities related to order placement of equipment. Some of the calculations were also performed during this activity, Formula used is provided below. Pump:

□ □ Q□H

P_{kW} □ _____

368 □ □

Where; P_{kW} □ Power in kW

□ □ Specific gravity of liquid

Q □ Flow rate in m^3/hr

H □ Head in meters

□ □ Efficiency (%)

$NPSH_A$ □ P_S □ H_S □ P_V - H_F

Where; $NPSH_A$ □ Net Positive Suction Head Available in meters

P_S □ Pressure acting on liquid in meters

H_S □ Static Head in meters

P_V □ Vapour pressure of liquid in meters

H_F □ Friction Head in meters

A

Q □ A □ V

Where; Q □ Flow rate in m^3/sec

A □ Cross section area of pipe in m^2

V □ Average liquid Velocity in m/sec

Where; V □ Velocity of flow in m/sec

C_d □ Co-efficient of discharge

g □ Acceleration due to gravity in m^2/sec

H □ Head of liquid in meters

Five

1.6

Software Used

I used

□ Auto CAD (2D & 3D)

- Excel Software for performing calculation

Below is sample calculating Suction Specific Speed. It was needed for design purpose.

Data Entry for Calculation

Flow is in m3/hr	8	
NPSHR (m)	1.4	← D/Head for SS (at BEP & Max Dia)
RPM	2950	

Note: SS is Specific Speed

Below is Auto-calculated

Suction Specific Speed (NSS)

N (RPM)	Q (Flow) m3/s	NPSHR m	API Defined SI Unit Nss (Suction Specific Speed) in SI UNIT (m3/s, m, rpm)	Equivalent US Unit
2950	0.002222	1.4	108.0487464	5579.64

1.7

Engineering Testing

- The pumps involved for this project were subjected to Factory Acceptance Test as per API 610. I ensured that testing was performed as per international standards. Moreover, I verified all the readings to ensure that the pump performance was as per the Performance Curve.
- I was also involved in Start Up and commissioning of the centrifugal pumps. My role was to ensure that the commissioning activities were carried out as per international standards and pump supplier recommendation. Moreover, I was also accountable to perform trouble shooting if there were challenges during the commissioning.

Seven

1.8

Resources Usage

Eight

During execution of this project, I took guidance from my Head of the Department and the Project Manager to resolve challenges which came across.

Secondly, during detail engineering; client requested to resolve the concern related incorrect metering (measurement) of the Jet fuel while unloading from the truck.

During unloading from truck due to negative pressure there was a possibility of vortex formation due to which air may be mixed with Jet Fuel which may result in incorrect reading while metering.

I performed extensive research over the internet; moreover, I also discussed with my colleagues and recommended installation of an Air Eliminator on the unloading pipeline which will vent of the trapped air within the jet fuel. This prevented incorrect metering of the Jet Fuel.

1.9

Implementation of special technique

A) I noticed that, man hour consumption was high in comparison to our output.

To resolve this concern, I called for a meeting with my sub-ordinates and found out that the booking was not happening as per the work accomplished. To counter this concern, I personally allotted the manhours to my subordinates and provided specific target dates so that we are ahead of the planned dates. I also recommended to demobilize junior engineer from the project and persuaded others to take additional responsibility.

Seven

Further I ensured that employees working additional hours are duly compensated in the form of additional paid leaves and ensured their support was recognized as well.
In lieu of my above approach I managed to prevent overspending of the man-hours.

B) Slop pump was under production in Flowserve's plant located in Spain. This plant was a new set up and they were overloaded with many orders owing to which the response time was very poor despite regular expediting.

I requested vendor to furnish the production schedule and I noticed that there was drastic slip between

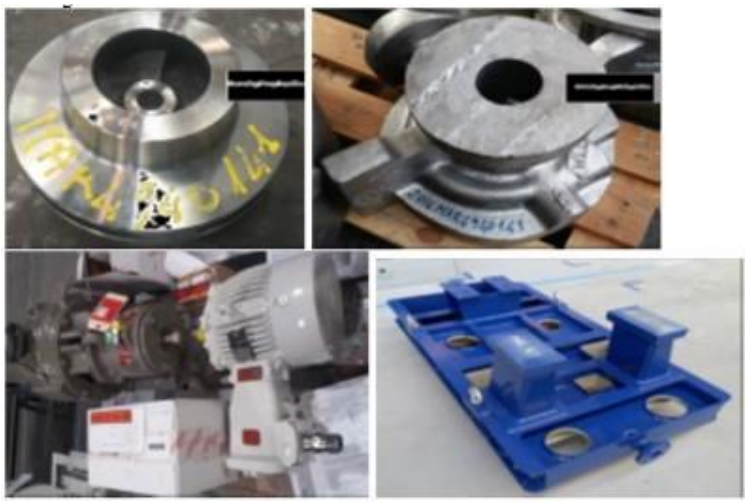
forecast dates and actual dates. This was certainly alarming situation.

In order keep the production on track, I arranged weekly progress review meeting teleconference during which I proposed few solutions to reduce the time frame. I also requested for the photographs of the pump components during various stage of fabrication (some of the pictures are shown below).

Three

I advised the vendor to air freight some of the material from their sub-suppliers. I also informed vendor to perform factory testing in within a day.

The above resolutions ensured that the delay was reduced; however, there was 1 week delay in the delivery which was



My Creative innovation

For this project I had to select appropriate pump matching the site conditions. For instance, one pump did not have enough NPSH, during which conventional horizontal centrifugal pump would not work. Hence, I proposed selection of Self-Priming Pump.
manageable.

Three

1.10

Seven

Secondly, I performed calculations for selecting suitable pump motor. I ensured to select with higher efficiency pump so that energy efficient motor will can be used. This prevented overall operating expenditure of the end user.

1.11

Engineering Standards Followed

I followed following codes

- API 610
- API 682

1.12

Safety

The allowable noise limit was given high emphasis. I ensured that the selected equipment had noise level below 85 dBa, this was very important from HSES point of view, since the operators were mostly subjected to harsh environment and my small effort added to their comfort to some extent.

Secondly, during commissioning activity I ensured that all the people involved in the task were well equipped with Personnel Protection Equipment (PPE). Moreover, middle east climatic conditions are hot and humid. Therefore, I insisted everyone to carry water bottles along with them so they can remain hydrated. This also prevented heat stress related concerns.

1.13

Project management

I was involved in meetings with Project Manager fortnightly to discuss the progress and material delivery status. Moreover, any changes or modification required to optimize the task was also discussed.

I used to have everyday meeting with my Subordinates to discuss technical concerns and issues related to progress, man-hours and necessary man power requirement.

I also had weekly meetings with other discipline engineer like electrical, instrumentation, piping, civil so that we can find solutions to any concerns during execution.

As per designation I was a Senior Engineer in my company. However, for this project I was nominated as a Lead Engineer. Moreover, I was single point contact for Mechanical discipline.

Six

My leadership skills were clear as I was proactive and noticed problems in advance. This approach helped project to complete within schedule. Moreover, I ensured that there was no overrun in terms of schedule and the budget. Secondly, I also provided solution to suppliers so that they can meet the necessary delivery dates.

I was involved in preparation of Mechanical Datasheet, Material Requisition and Technical Bid Evaluation report for the mechanical equipment. Besides this, site survey report was also prepared so that missing information from tender documents were duly incorporated.

Furthermore, I prepared necessary Technical Queries and Engineering Change Notes so that any changes or modifications are documented officially.

Presentations

Presentation was provided related to the proposed solution which is described under Problem 3 (mentioned above). During this phase, I was responsible to explain the end user regarding the best solution. I had to collect all the necessary back up to prove that providing throttle valve would be most feasible solution so that the pump can operate at different rated conditions.

1.14

Application of Engineering Knowledge

I was competent in handling API 610 centrifugal pumps and their impact on the equipment while handling hydrocarbons. This helped me to identify the possible complications involved in this project. Moreover, I managed to propose a suitable solution due the problem

Eight

I also managed to redevelop a plan to meet the target dates in terms of submission of engineering deliverable.

I was also instrumental in mobilizing and demobilizing the man power based on the workload which ultimately saved considerable money.

- Co-ordinate with procurement engineer and supplier to ensure that material is delivered on time. Moreover, I also proposed suitable solutions to counter any concerns during production of pumps.

- I also provided all the necessary information required during Site Testing and commissioning.

- My knowledge in centrifugal pumps helped resolving issues while performing commissioning and troubleshooting activities.

1.15

Knowledge gained & my personal contributions

This project was successfully completed as per schedule. The end user was impressed with the quality of work and innovative resolution to counter challenges. All the client requirements were compiled without any compromise on safety and quality.

I had enormously constructive experience with this project. I ensured to contribute towards on track project schedule, commercial, safety and quality aspect of the project, while enhancing my technical, management and interpersonal skills. Some of the competencies like efficient coordination, problem solving approach and effective communication improved commendably.

I could save cost due to preplanning of material requisitions & monitoring & controlling man-hours without any compromise on quality, health and safety. One of the major aspects which I realized while handling this job was the right selection of the equipment based on the actual conditions at site. This positive attitude has however increased my efficiency and ability to do the same amount of work in lesser time. It has imparted more knowledge on suitable substitutes that can be used.

Learnings from the project were as below

- Ensuring timely submission of engineering documents.
- Understanding the limitations involved in Horizontal Centrifugal Pumps in more detail.
- Knowledge about the Factory Testing of the Pumps as per API 610.
- Selection of pumps according to the requirements. Commissioning and troubleshooting of pumps
- Coordinating with clients for obtaining approvals.

Element

Overview of the project

Project Title: Conversion of an Existing Three-Legged Offshore Jack-Up Drilling
Dates of Project: September 2013 to July 2014
Name of Organization: Lamprell Energy Ltd
Location: Lamprell Shipyard, Khalid Port Sharjah, UAE
My Role: Mechanical Engineer

Work Episode 2

Background
2.1

Lamprell, based in United Arab Emirates is a leading provider of fabrication, engineering and contracting services to the offshore and onshore oil & gas and renewable energy industries. Lamprell holds market position in the fabrication of shallow water drilling jack up rigs, accommodation vessels, multi-purpose life boats, land rigs and rig refurbishment projects.

Brief about the Accommodation Support Vessel (ASV):
The ASV is a MLT 116C self-elevating accommodation unit, of modern and field-proven design with a year-round 91.5 m (300 feet) water depth capability in a harsh environment.
The ASV has three sets of rack and pinion type jacking systems. The main hull consisted of a tank bottom, machinery deck, main deck, level 1-5 accommodation and helicopter-deck. Enclosed in the hull structure will be the machinery rooms, auxiliary machinery rooms, workshops, stores and control room. All liquid storage will be within the hull structure. The ASV, including its machinery and equipment,
was to be upgraded and built under the special survey and inspection of the Classification Society American Bureau of Shipping (ABS).

Objective of the Project

2.2 Client, Millennium Offshore Services (MOS) awarded a fast track contract to upgrade the Accommodation Support Vessel. As per the contract schedule the duration to complete the project was 290 days which was a challenging task to accomplish.	

A construction specification was issued which described the scope of construction, outfitting, equipment, machinery and electrical installation of the conversion of an existing three-legged offshore jack-up drilling unit to an offshore Jack-Up Accommodation Support Vessel.
The ASV including its machinery and equipment was required to be built under the special survey and inspection of the Classification Society.

Roles & Responsibilities
2.3

- Perform site survey.
- Identify the scope of work based on client furnished tender documents and survey.
- Prepare list of engineering deliverables and estimate man-hour and the man power required.
- Break down each engineering deliverable into various tasks and provide weightage to each task.
- Ensure that the deliverables meet the contractual schedule requirements.
- Prepare/review material requisition, data sheet and technical bid valuation.
- Supervision during preparation of 2D drawing (Auto CAD) and 3D modeling (Aveva Marine)
- Coordination with client, vendors, sub-contractors, interdisciplinary and other department (projects, operations, procurement and commissioning).
- Review and comment on inter-discipline engineering documents and engineering drawings.
- Review and comment on vendor drawing, datasheets, Inspection & Test Plan, Performance Curves, Test Procedures, Operational Procedures.
- Responsible for the overall execution and control on project.
- Responsible for reporting, controlling and monitoring the job execution.
- Lead all mechanical engineering related design review meetings.
- Review the progress of the project deliverables based on weightage provided and further planning required action to maintain the planned schedule.
- Witness equipment Inspection and testing.
- Preparation of lubrication and maintenance schedule and develop spare parts data package as per client requirements.
- Provide necessary engineering support during commissioning and troubleshooting. Resolve all the site queries.

One

Eight

Complexities (using the complexity definitions) and challenges of the project

2.4
Problem 1
At various stages of project execution, I encountered plentiful challenges pertaining to detail engineering. I used some innovation in work (briefly tabulated below) to ensure these obstacles did not impact the planned completion schedule.

- Excessive Time Consumed for Inter-disciplinary comments/inputs (IDC)
  Company procedure permitted 7-day turnaround time for IDC. While reviewing the schedule, I noticed time was not feasible for completing the project on time. I proposed a meeting with project team, across which I explained the scenario. Further I negotiated a 2-day turnaround time instead of 7 days.
  To ensure the agreement is met I liaised with engineers frequently vide email, phone calls and meetings
- Resolving Client queries
  Company's contract with client permitted them 5 days' time to return comments on engineering documents. I took a proactive approach to compress this time and personally met the client with an advance copy of critical documents further to which possible comments and resolutions were mutually discussed. Post discussion agreed changes were captured and officially transmitted for client review. I managed to get approval on most of the documents in first revision and lowered the number of revisions for document with comments before they were accepted.
- Meeting the tight schedule of engineering deliverables
  I prepared plan of action by identifying manpower requirement and prioritized with planned dates. I requested management to allocate additional manpower to improve efficiency while maintaining the tight schedule.
- Performance of Noise and Vibration study for the complete vessel
  Class has fixed allowable noise limit in the accommodation. Since we lacked in-house

Four

expertise, I arranged for third-party consultant to provide their services. I further expedited the process by assisting the consultant to perform noise testing at each room as per class requirement. A noise report was issued which was approved by ABS.

Problem 2

As the project was approaching towards major payment milestone which is Diesel Engine start up; a bottle neck was identified by our subcontractor, they were unable to couple the new diesel engine with existing alternator due to the bearing design.

I began my investigation in this regard. As per the construction specification provided by the client, the existing generator bearing arrangement was two bearing arrangement, therefore ABS type approved flexible couplings were ordered and supplied. However, based on whistle blown by the sub-contractor, I decided to perform visual inspection of the existing Caterpillar engine and GE generator. To my surprise I found that the generator was a single bearing arrangement and it was not possible to install the supplied flexible coupling. A report was issued to management updating the concerns.

My next challenge was to identify coupling suppliers who can manufacture a coupling suitable for single bearing type alternator within short time span. In order to select the coupling, details of the alternator like weight of the alternator, weight of the rotor, length of the rotor and dimensional details of the alternator along with center of gravity was required. The alternator being very old had no technical information available with manufacturer or client. Moreover, the manufacturer (GE) confirmed that the model was obsolete. In lieu of the above the alternator had to be stripped to obtain the details (stripping activities pictures shown below).

Under my supervision a drawing was prepared with necessary details and issued to suppliers. I provided the required specifications, calculations and design for purchase and approached 15 potential coupling suppliers.

Problem 3

Being a contractor, we had to stick to our plan and any kind of delay was not acceptable. Hence, I looked for alternate solution since most of the suppliers declined to quote for a engineered coupling due to short delivery.

Upon extensive research and discussion with multiple experts I finalized the most suitable coupling for single bearing which was flex plate coupling. These couplings will be suitable to absorb the radial loads of the alternator. However, the availability of the same was next to impossible.

Five

I approached some of the local shipyard and fortunately I managed to arrange a flex plate coupling which was suitable for our requirement and it was available in stock. The flex plate coupling was a simple arrangement; it mainly consisted of multiple shim plates and coupling hub. The shim plate side was connected to the flywheel of the engine and the hub side was connected to the alternator.

<u>How does this project demonstrate application of your engineering knowledge?</u>

2.5

Engineering Calculations

I calculated (sample calculation as shown below) electrical load consumption of different equipment and finalized design load for which the engine must be sized. For quick calculations in-house excel spreadsheet with formulas was developed.

Pump:

$$P = \frac{\Upsilon * Q * H}{368 * \eta}$$

Two

Where; P → Power in kW

ϒ → Specific Gravity of liquid

Q → Flow rate in Cu. m/hr. H → Head in meters. η → Efficiency (%)

Crane:

$$P = \frac{2 * \pi * N * T}{60 * 1000 * \eta}$$

Where; P → Power in kW

N → Speed, rpm

T → Torque , N-m

η → Product of all Efficiency (%)

I successfully finalized diesel engine datasheet and specification on the above to meet the class requirements. I further issued material requisition for enquires to purchase.

Software Used

I used following software

- AVEVA Marine 3D Model
- AutoCAD 2D
- Microsoft Excel

Three

2.6

2.7

Seven

Engineering Testing

I was involved in performing the Torsional Vibration Analysis on diesel engine generator. The test was carried out under full load from 95% to 105% of the rated speed and under no-load from the low idle speed to 105% of the rated speed. This analysis was critical to conclude that the system will be free of serious levels of torsional vibration for the conditions described. This test was critical to verify the suitability of flex plate coupling

I was also involved in the sea trial activities. This was 2-day activity where every system in the vessel was verified to ensure that all the systems were working as per the design requirements.

2.8

Six

Resources Usage

Eight

My colleagues provided good support while working on the layout. Specially the architectural engineer provided significant guidance while performing feasibility study of Elevator. While working on the layouts, I realized the challenge which came across even with slight modification. I also understood the impact on operating condition which sometimes resulted in equipment sizing.

I made extensive research over the internet and requested some of the specialist to advise over the problems I was facing in this project particularly to the problem related to sizing of the coupling. During this I realized the importance of bearings on alternator and the absence of same lead to look out for unconventional coupling design.

2.9

Implementation of special technique

During the installation of Air Dyer package, it was noted that the pre-filter and after filter were clashing	

with hatch opening due to which, the operator was unable to have clear opening.

Five

To resolve this concern, I reviewed the actual condition at the location and compared the same with the Aveva marine 3D model software. The location had absolutely no space to move the skid.

Hence, I suggested to move both the filters above the dryer. A mezzanine deck was fabricated under my supervision. Further I ensured that the pipe routing between the desiccant dryer and the filters have minimum elbows to avoid any kind of pressure drop across the system. This proposed piping layout was accepted by the air dryer supplier and I managed to resolve the concern.

Here I utilized my intellectual skills and the knowledge I had related to pipe routing.

2.10
My Creative innovation

For this project we were installing, procuring and supplying an Elevator. This was first experience for our company. My role was to size an Elevator which was suitable for 12 persons. This was a huge elevator for accommodating jack Up Platform. With the existing space constraints, I performed a study to check the feasibility and space availability. I change our layout to include the Elevator. Changing layout was a challenging task since I had to ensure all the material handling, maintenance requirements and process conditions were up to the satisfaction of the end user.

I performed material handling study for the entire vessel. My role was to develop material handling plan for equipment requiring frequent maintenance. Moreover, I also had to select a suitable material handling equipment which will be suitable for the purpose. One of the significant constraint was lack of headroom clearance and travel plan. Due to this constraint I made changes in the layout and lifting plan as well.

Four

Engineering Standards Followed

I followed following codes

- ABS MODU

2.11

- SOLAS
- LSA
- API 2C
- MARPOL MEPC.159 (55)
- CAPS 437

2.12
Safety

During engineering phase my selection of equipment and ensuring proper installation such as installing vibration isolators for engine became the main reason for the noise to be under allowable limit while performing noise and vibration study.

Secondly, I also emphasized on no jewelry policy for yard workers. Whenever I noticed laborers following unsafe practices I exercised my right to stop the work. Moreover, I made them understand the importance of abiding the safe working practices.

2.13
Project management

I was appointed as Mechanical Lead Engineer for engineering, design, testing, supply and commissioning support of mechanical equipment for this project. My role included, identifying the scope, preparation of all the technical requirements, man-hour/man power estimation and scrutinizing, reviewing and resolving all concerns related to supplier, production, installation, trouble shooting and commissioning issues.

Six

Meetings with Project Manager were held fortnightly where technical issues, man power issues and client comments were discussed. I had weekly meeting with my colleagues to discuss over various	

concerns which had an impact over the progress of the project. During the same time technical concerns were also discussed and brain storming sessions were arranged to resolve the same specially issues related to clashing. Weekly teleconference was conducted to verify the progress of production with suppliers.

I was involved in preparation of Mechanical Datasheet, Material Requisition and Technical Bid Evaluation report for the mechanical equipment. Besides this I was responsible to record the minutes while handling concerns with the suppliers and clients.

I also prepared Inspection Survey report based on my findings during stripping activities.

The project involved repair and overhauling work as well, so I had to inspect the working conditions of existing equipment and generate suitable documentation to inform the findings.

Presentations

Presentation was provided to the management regarding the problem and solution related to the coupling of Main engine. This issue was a major concern to the higher management since the delivery of the vessel was likely to get affected; moreover, payment milestone was approaching as well.

Three

2.14

Application of Engineering Knowledge

- My knowledge on rotating equipment helped to resolve issues specially related to Main Engine. My experience with pumps helped in resolving snags during commissioning activities.
- My planning and delegating skills were also used which eventually helped to deliver the documents on schedule.
- Forecast over man power requirement was also quite accurate during which I managed to arrange necessary people during peak stage. This also helped to complete activities as per the schedule.
- Continuous expediting with supplier and sub-contractor with respect to the production schedule helped in timely delivery of the material.

One

2.15

Knowledge gained & my personal contribution

Project was successfully completed and testing and commissioning was done without any lost time incidents. However, there were some minor punch points which were resolved with proper solution and necessary documentation. Currently the vessel is in the Australian waters performing its routine activities.

Working in this project helped in improving task management skills as well as technical skills. As I was leading the project, I ensured the tasks assigned to me were completed as per plan. Moreover, I ensured to find innovative solutions where the task seemed impossible and my experience with rotating equipment helped to approach effective solutions. My approach also helped to save significant liquidated damage in case of delay in delivery of vessel.

Learnings from the project are as below

- Ensuring timely submission of engineering documents.
- Understood the limitations involved in Single bearing alternator.
- Witnessed the stripping activities of alternator which gave me an insight over electrical equipment as well.
- Selection of material handling equipment.
- Commissioning and troubleshooting of pumps
- Importance of checking and verifying documents. I also gained more knowledge on the dynamics of TVA analysis.
- Coordinating with clients for obtaining required approvals.

Work Episode 3

Element

Overview of the project

Project Title: Upgrade of Crude Gathering Facilities Safaniya- Phase 1
Dates of Project: August 2010 to March 2012
Name of Organization: McDermott International, Inc
Location: McDermott Jebel Ali free Trade Zone, UAE
My Role: Mechanical Engineer

Background
3.1

McDermott International Inc, based in United Arab Emirates is a tier-one leader in project engineering, design, procurement, fabrication and delivery for the offshore and subsea markets. McDermott is recognized globally for its excellence in providing overall project solution for FrontEnd Engineering Design, offshore, subsea, Greenfield or brownfield projects.

Brief about Safaniya Upgrade Project – Phase 1
Saudi Aramco intended to upgrade oil production facilities and associated infrastructure to maintain maximum sustainable capacity (MSC) of 1300 MBCD.

The Safaniya upgrade crude gathering and power supply facilities project scope was modification of some of the existing wellhead platforms to accommodate control and power supply facilities for Electrical Submersible Pump, fabricating new tie-in platform, intra-field subsea pipelines, trunk lines and onshore modification.

McDermott Middle East Inc., was awarded engineering, procurement, construction and installation phase of the project which included new Tie-In Platform (Jacket, Deck and Piling), new auxiliary platform and Platform modification for nine Wellhead platforms and three Tie-in platforms

Objective of the Project
3.2

Client awarded a contract of engineering, design, procurement, fabrication and installation of offshore jacket and topsides for an oil field which was in the sea approximately 200 km away from the mainland. Client issued all the tender documents and I had to identify our scope and initiate the engineering activities accordingly. Some of the major equipment's are listed below:

Equipment Name	Capacity	Pressure
24" Scraper Receiver	NA	450-650
20" Scraper Receiver	NA	450-650
Neutralization Tank	1.8 m^3 (475 USG)	ATM
Slops Tank	29 m^3 (7500 USG)	ATM
Corrosion Inhibitor Tank	58.3 m^3 (15420 USG)	ATM
Corrosion Inhibitor Injection Pump (API 675)	0.0833 - 0.25 USGPM	700
Slops Pump (API 674)	25 USGPM	700
Submersible Sea Water Pump (API 610)	150 USGPM	135.3
Pedestal Crane	60 tones @ 10m	-
Overhead Crane	32 tones	-
Electric Trolley Hoist Block	32 tones	-
Electric Trolley Hoist Block	15 tones	-

One

Roles & Responsibilities

3.3

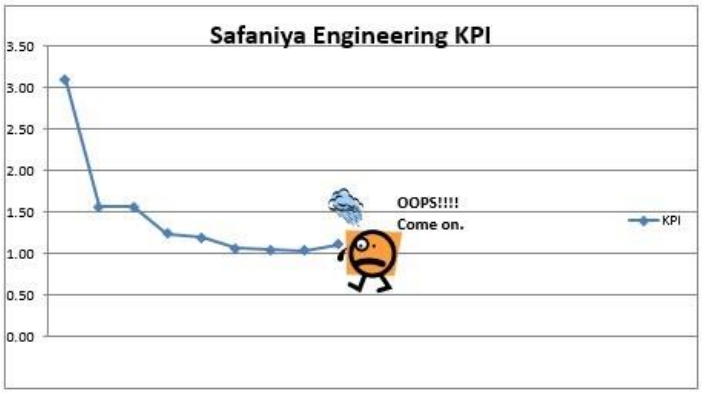
- Achieve full understanding of the awarded mechanical scope.
- Prepare list of engineering deliverables and estimate the man-hours required for the task.
- Ensure that the deliverables meet the contractual requirements.
- Prepare material requisition, data sheet and technical bid valuation.
- Preparation of Noise Datasheet & Safety Instruction Sheet.
- Coordination with clients, vendors, inter-discipline and other department (projects, operations, procurement and commissioning).
- Perform material handling study.
- Supervision during preparation of 2D drawing (Auto CAD/Navisworks) and 3D modeling (PDS/PDMS)
- Participate in HAZOP meetings and 3D model review.
- Review and comment on inter-discipline engineering documents and engineering drawings. Responsible for the overall execution and control on projects.
- Responsible for reporting, controlling and monitoring the job execution.
- Lead all mechanical engineering related design review meetings.
- Attend Factory acceptance testing and inspecting various equipment at vendor works.
- Evaluation of test reports and test certificates.
- Preparation of lubrication and maintenance schedule.
- Develop spare parts data package as per client requirements.
- Resolve all the site queries.
- Preparation of As-Built documents.
- Ensure compliance towards quality and HSES requirements.
- Attend site safety walk and provide tool box talk on safety.

Complexities (using the complexity definitions) and challenges of the project

3.4

Problem 1

One of the significant challenge was to evaluate the technical quotes and verify the calculation provided by various suppliers to ensure the suitability of the quoted equipment. During this stage, I had very limited time to complete the task owing to handling numerous deliverables, reviewing multiple quotes and issuance of many technical queries. This lead to significant drop in KPI (Key performance Indicator), which was an alarming situation.



Two

This negative figure called for improvements. I observed excessive time spent over technical negotiation with suppliers.

Six

To overcome the delay, I recommended having technical negotiation across the table and insisted

vendors to come fully prepared for the technical discussion. This initiative started bearing rich dividends, as almost 90% of the issues were resolved in the meeting leading to quick closure of the technical bid evaluation.

Owing to my effective resolution, rather than solely depending on conventional methods such as working on emails, I managed to achieve an exceptional progress of an additional 12%. While this had drastic improvements on the KPI it also gave additional lead time to counter unforeseen engineering obstacles which otherwise would affect timely project completion

Problem 2
The project faced another hurdle due to resignation of the package engineers for rotating equipment and material handling equipment assigned for this project. The project manager identified me as a potential package engineer instead of recruiting a new employee. I didn't had similar experience; however I took up the challenge to absorb all the package engineer responsibilities.

As part of responsibility of a package engineer, I thoroughly expedited the production progress and resolved several technical issues raised by client through meetings and teleconferences with suppliers. I regularly visited vendor's workshops for witnessing the actual production progress of the equipment to avoid delays. Following sample pictures were taken during my visits.
Another task of the package engineer was to witness the factory acceptance test like performance test,

Three

Simultaneously, review of vendor documents like PIDs, general arrangement drawings, sectional drawings, datasheets, inspection and test plan and procedures were carried out to ensure that technical comments from inter-disciplines were received without any delay.

test, noise test, leak test and functional test along with the end user. I ensured that tests were performed in compliance international standards. I was also responsible to verify the workmanship of the equipment and ensured that all kinds operational safety issues were eliminated before the equipment delivery.

Factory acceptance test of all my equipment went smoothly apart from a few minor issues which were resolved as per client requirements. Photographs of various tests shown below.

NPSH Test:

Performance Test

Problem 3
I continued to verify the workmanship of the complete unit which was found satisfactory however I had a concern on the operability and the safety of the operator. I noticed that isolation valves were not placed at the accessible height, moreover the drain line of the PSV was placed above the disconnect switch, further the routing of the cable tray and the earthing lug in the pump skid was a potential trip hazard to the operator. A punch list was prepared to officialise the minor errors in design and safety

Five

hazards.
To save time, I proactively offered solution to the above-mentioned safety concerns. I advised an alternate cable routing in the skid to prevent trip hazard and the earthing lug was trimmed to acceptable depth. The operability of the isolation valves and the drain lines of PSV were also resolved by rerouting the piping along with necessary supports under my supervision. However, rerouting was not a minor task since there was no space available in the skid and there were many other technical issues as well which needed to be addressed. I was involved in brainstorming session with the vendor in order to reach to a productive solution. I used 2D (Auto-Cad) and 3D (PDMS) software to develop a solution.

How does this project demonstrate application of your engineering knowledge?

3.5
Engineering Calculations

I had to check and perform various calculations to finalize the operating parameters. Some of the formula's used for calculation are provided below:

Positive Displacement Pumps:

Two

a) Delivered Flow (Q) = $\frac{\pi * D^2 * L * N * \eta_v * 60}{4}$

Where; D → Plunger Diameter in meter
L → Length of Stroke in meter N → Plunder Speed.
η_v → Volumetric Efficiency (%)

Load on Plunger = $\frac{\pi * D^2 * P}{4}$

Where; D → Plunger Diameter in meter
P → Relief Valve Set Pressure

b) Plunger Linear Speed = 2 * L * N

Where; L → Length of Stroke in meter.
N → Plunder Speed.

Acceleration Head = $\frac{D * L_P * N * \Upsilon}{D_P^2 * 10^7 \times K_1}$

Where; Υ → Specific Gravity
L → Length of Stroke in millimeter
D → Plunger Diameter in millimeter
N → Plunder Speed.
L_P → Length of Suction Pipe in meter
D_P → Diameter of Suction Pipe in millimeter
K_1 → 1.5 for Simplex pump & 4 for Triplex pump

Pressure Vessel / Atmospheric Circular Tank:

a) Ellipsoidal head vessel

Full Volume (m^3) = $(\pi * D^3)/12 + (\pi * D^2 * L)/4$

Where; D → Inside Diameter of the Vessel
L → Length tan to tan

b) Cylinder Thickness due to circumferential stress (based on para UG-27 of ASME Section VIII Division 1):

$$t = P * R / (2 * S * E - 0.6 * P)$$

Where; t = Cylinder thickness in corroded condition
P = Design pressure
R = Cylinder Inside radius in corroded condition
S = Max Allowable Stress at design temperature
E= Joint Efficiency

3.6
Software Used
I used

- PDMS 3D MODELLING SOFTWARE
- AUTOCAD 2D
- EXCEL SOFTWARE
- MICROSTATION SOFTWARE
- NAVISWORKS

Three

3.7
Engineering Testing
I was involved in Factory Acceptance Test of Positive Displacement Pumps. The tests were performed as per API 674 & API 675. Performance Test, Hydrostatic Test, Functional Test, NPSH test, Mechanical Run tests and Noise Test was performed.

Four
Seven

I was also involved in testing of Cranes which was performed as per API 2C. The critical test was load test at are various radius. I had to ensure that the testing was as per the data mentioned in the approved
Load Chart of the crane.

Resources Usage
I took help from my colleagues specially from the QA/QC engineers to understand the parameters which needed to be verified while performing tests like PMI, Paint thickness test.

3.8

Eight

Moreover, I requested for guidance from my department manager while developing Material Handling Plan. I also partially worked along with HVAC & Architectural team related engineering and construction activities which helped me to understand the aspects involving duct layout, engineering of building materials, AHU & ACCU and HVAC control philosophy.

One

3.9
Implementation of special technique
I was vigilant while checking the workman ship of the various equipment. I was predominantly concentrating over operating and safety issues. I used my experience to verify the layout using 3D model and also performed visual inspection in order to develop a workable solution in case any concern was encountered.

3.10
My Creative innovation
I introduced innovative techniques to reduce time and improve overall progress of the project

3.11
Engineering Standards Followed

I followed following codes

- API 610
- API 675
- API 674

- API 2C
- Underwriters Laboratories
- NFPA

3.12

Safety

During the project I volunteered for Zero Hand Injury Safety Campaign (ZHIC) which was a noble cause initiated by our company. Primary motive of this campaign was to educate the workers on the importance of hand safety, since the workplace was surrounded by hazards. I visited the yard frequently and informed workers the importance of working with adequate personnel protection equipment. I personally presented few toolboxes talks and addressed the importance of being vigilant during carrying out any task. I further ensured to translate tool box talks in the mother tongue of workers since many were not well versed with English language. To make this campaign more interesting, I suggested few fun activities related to utilization of hand. As a token of appreciation company issued a certificate for participating in the campaign.

3.13

Project management

My role in this project was to support the lead engineer and package engineer. However, some of the package engineer (Rotating Equipment Engineer and Material Handling Engineer) resigned and the responsibility to handle their package was provided to me.

The position of a package engineer followed a cradle to grave concept wherein the assigned engineer was entirely responsible for designing, engineering, coordinating, expediting, delivery, installation, trouble shooting and commissioning activities. My role also included preparation of all the technical requirements and co-ordination with production team and expediting the fabrication status of the equipment and estimating the man power required. As a part of expediting I frequently had to visit vendor works which was based in Europe.

Six

I was involved in preparation of technical documents such as Mechanical datasheet, Job Specification, Design Basis, Material Requisition, Technical Bid Evaluation report. I also initiated issuance to NCR due to inferior material supplied by supplier. I also prepared punch list report to capture the noncompliance form various suppliers.

In this project weekly meeting was arranged with Project Manager where the progress status was verified. Also, the critical technical issues were discussed so that common and acceptable solutions could be developed. Presentations

Presentation was mainly provided during 3D model review with respect to rotating and material handling equipment. The presentation was developed to provide an overview to client over material handling philosophies.

3.14

Application of Engineering Knowledge

My knowledge over the maintenance aspects of the equipment helped significantly to develop a robust material handling plan.

Moreover, my knowledge and experience of rotating equipment and helped to close many of the punch points. Furthermore, I also managed to identify the problem due to which the pump failed during testing and I further extended a suitable solution as well.

My scheduling and planning skills were innovative which ensured that there was no further delay in the delivery of the platform.

Eight

3.15

Knowledge gained & my personal contribution

Project was successfully completed and testing and commissioning was accomplished without any hurdles. Moreover, I was awarded with Quality Spot award for my Pro-activeness, Effective Planning, Quality commitment, Positive Attitude and Diligent efforts in successful close out of Pump Packages for SAFANIYA project and handle additional work scope related to Mechanical Handling Packages

Four

which was recommended by the project engineering manager.

As a mechanical engineer, my primary area of expertise was related to rotating equipment and material handling equipment. While executing this project I overcame many hurdles such as delay in progress and sudden hand over unexpected responsibilities.

The experience of handling this project individually was extremely enriching. As I was the package engineer it helped me gain knowledge of overall management. It was extremely challenging to manage specially the vendors and further ensure the completion of the task as per our requirement. I learnt the skill of assertive communication while being the point of contact for the management as well as the suppliers. I also learnt the art of expediting which played a major role in timely execution of the projects.

In terms of technical knowledge, I realised the importance of a component which was as small as an O-ring of gear reducer. The improper selection of O-ring led to the failure of test and loss of precious time. In today's competitive world timely completion of the project is of high priority since the reputation of the company as well as millions of dollars are on stake. This project also introduced me to the area of routing of pipes, fitting, valves and cable trays and further identifying the supports required for the new layout. During the course of project execution there were multiple technical challenges which were handled professionally in order to meet the client requirements without any compromise on the quality.

Work Episode 4

Element

Overview of the project

Project Title: Development of a Miniature ''Automated Filling Unit''
Dates of Project: April 2006 to June 2006
Name of Organization: Department of Mechanical Engineering-NMAMIT
Location: NITTE, INDIA
My Role: Student Mechanical Engineer

Background
4.1

Nitte Mahalinga Adyanthaya Memorial Institute of Technology (NMAMIT) is an engineering college which is affiliated to Visveshvariah Technological University (VTU), in Belgaum, India. I was pursuing my final semester in the stream of Mechanical Engineering. For being awarded the degree of Bachelor of Engineering, I had to complete a project work prescribed as one of the academic requirements by the university. The project work was titled as "Automated Filling Unit".

Brief about the Project Work

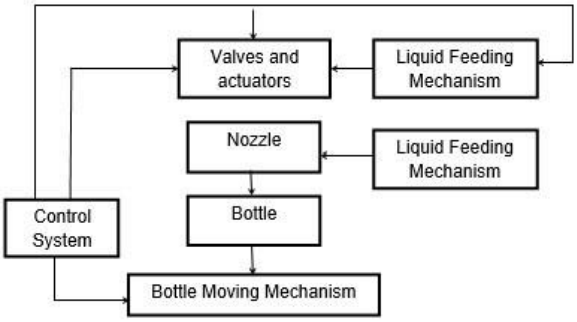
The automated filling mechanism project entailed designing of motor operated conveyor unit, bidirectional motor driven recirculating ball screw and nut assembly which carried the filling nozzle. This nozzle was connected to a motor driven gear pump. All these units were controlled by a timer and multiple limit switches.

Objective of the Project
4.2

The objective was to develop an automated filling mechanism consisting of the conveyor unit which operates with the help of a DC motor. The bottles were lined over this unit. As a bottle takes position below the nozzle the motor is stopped using the driver circuit and microcontroller. The next instant nozzle moves down with the help of certain mechanism attached to stepper motor. When the tip of the nozzle reaches the bottom of the bottle, the stepper motor is stopped and starts running in opposite direction with a set speed based on the feed rate. Coeval to this, pump motor is switched on for a particular period and then switched off. This shall be done using a timer. Once the filling is complete the stepper motor starts running at a higher speed to move the nozzle to the higher end. Once the higher end is reached the stepper motor is stopped and the conveyor motor starts and the next bottle is

One

brought in line. This cycle repeats, the basic block diagram of the bottle filling machine is shown below:



Roles & Responsibilities

4.3

- Designing the DC motor driven conveyor belt (bottle moving mechanism).
- Selecting a pump to meet the required capacity, pressure and type of liquid handled (liquid feeding mechanism).
- Selecting the suitable nozzle moving mechanism
- Purchasing of the Ball screw nut assembly, stepper motor, DC Motor, Timer, steel plate, ball bearings
- Assembly of all the units.
- Coordination with assembly workshops
- Preparation of project report

Five

Complexities (using the complexity definitions) and challenges of the project

4.4

Problem 1

The task involved design of liquid feeding mechanism. Here the liquid was supplied to the nozzle by force feed mechanism using a pump. Selection of type of pump was a major challenge. My intention was to select a pump which can handle any liquid irrespective of viscosity and specific gravity. Furthermore, it should be able to generate a constant flow rate and variable discharge pressure. Considering the above requirement, I selected a positive displacement pump (gear pump). The gear pump was perfectly meeting all my requirements. Based on the above, I calculated the required flow rate and sized the pump and motor required for the application.

Five

Problem 2

The next challenge was to design the nozzle moving mechanism. There are different methods of nozzle positioning. In my case, the nozzle had to move to one position to fill the bottle and then move upwards. While filling, both the nozzle and bottle shall remain stationary and only after the bottles were filled, the nozzle and bottle move. To achieve the nozzle moving mechanism, I selected a recirculating ball screw and nut assembly (typical picture is available below). The principal feature of this assembly consisted of many balls rolling in a helical path of thread form and returning through a returning channel, thus forming a closed loop of operation.

Problem 3

Following the completion of design and purchase of all components, I arranged the fabrication and assembly of conveyor belt assembly and nozzle movement assembly. I explained the design to a local fabricator and they managed to fabricate the necessary components and supports. Finally, along with help of local fabricator, managed to assemble all the items and built the final product.

Four

Another bottleneck was the synchronization of all the three mechanisms by developing the necessary logic for automation purpose. The operation logic was explained to a local third-party consultant. They supplied the necessary limit switches, sensors and timers. Switching logic sequence was developed for the complete operation to my satisfaction. I was involved in the co-ordination and testing of system along with the third-party consultant.

How does this project demonstrate application of your engineering knowledge?

Three

4.5

Engineering Calculations

Selection of Motor for Ball Screw Nut & Conveyor Unit

$J = J1 + J2$

$J1 = m1 \times r^2/2g$

$J2 = m2 (h/2000\pi)$

Where; J → Total Load

J1 → Motor Inertia

J2 → Load Inertia

h → Pitch

m1 → Mass carried by nut m2 → Mass of motor

r → Radius

Two

Acceleration Torque : $Ta = (\pi/30) \times J \times (An/ta)$

Where; Ta → Acceleration Torque

An → Speed (RPM)

ta→ acceleration time in seconds Load Torque : T2 $= (F \times D) / (2 \times \eta \times I)$

Where; F → Axial Load Acting on the belt

D → Pulley Diameter η → Efficiency

I → reduction gear ratio

Total Torque (kg-cm) = Load Torque (Ta) + Acceleration Torque (T2)

a) Load on Plunger $= \frac{\pi * D^2 * P}{4}$

Where; D → Plunger Diameter in meter

P → Relief Valve Set Pressure

b) Plunger Linear Speed = 2 * L * N

Where; L → Length of Stroke in meter.

N → Plunder Speed.

4.6

Software Used

I used

- Auto CAD (2D & 3D)

Seven

4.7

Engineering Testing

After completion of assembly, the operational and functional test was carried out. This was to verify whether our designs and calculations were meeting the desired requirements. The nozzle moving mechanism, belt moving mechanism and liquid filling mechanism was tested and moreover the synchronization of this mechanism with respect to electrical module was tested.

There were significant issues which were encountered while performing testing since it involved atomization. However, these issues were ultimately resolved with the help of some experts.

4.8

Resources Usage

Project Guide was instrumental while selecting the nozzle mechanism. His knowledge and industrial experience gave confidence to build the miniature bottling plant.

Five

4.9

Implementation of special technique

Research over internet and basic knowledge over the operation of CNC machines gave us an idea to use ball screw nut mechanism for filling. Moreover, the Fluid Dynamics concept studied during graduation helped in selection of pump. 4.10	

My Creative innovation

This project mainly involved selection of appropriate motor for nozzle movement and bottle moving mechanism. Certain calculations were performed to select the right motor.
Secondly, the filling mechanism involved selection of pump and calculations were performed to select appropriate pump. However, the flow rate required was small and such pump was not available in the market. So, I selected slightly bigger pump and used gate valve and smaller diameter piping to meet the flow rate.

Four

4.11
Safety

There was no impact to environment due to this project. However, I ensured that activities performed in the workshop such as welding, plate cutting and drilling was carried using all the safety precaution and suitable personnel protection equipment.

4.12
Project management

Every week project status was discussed with our project guide. In case of some technical issues he readily helped us to resolve them as and when it was required.

We used to meet frequently in the college campus to discuss over the progress and developments related to projects. New ideas were discussed to resolve any concerns developed. Moreover, every week we assembled in the workshop which we utilized to build this miniature plant.

A project report was developed upon completion of the project. This report consisted of details related to mechatronics module, electrical module, calculations performed, drawings developed, cost estimation and photographs of the plant.

Moreover, the report also highlighted the advantages and recommended possible improvements to make it more sophisticated.

Presentations

Six

A presentation was provided to college faculty and fellow students over the operation. A demo was provided to show the working of this miniature bottling plant. Moreover, detailed explanation was provided over the working principle of all the three-mechanism involved in the project.

4.13

Application of Engineering Knowledge

I was competent in handling API 610
I used the knowledge gained in Fluid Mechanics to select pump suitable for the purpose and perform necessary calculations.
I used the skill gained while studying Engineering drawing to prepare necessary details of the components using Auto Cad.
I also utilized the knowledge garnered while studying Mechatronics in university. This helped to provide the automation touch to the project.
Basic Electrical engineering knowledge was used to select appropriate motor.

4.14
Knowledge gained & my personal contribution

Three

Project was successfully completed and tested as per the planned schedule. However, there were some challenges related particularly to the synchronization of the mechanism. To make it more effective, sensitive sensors were required which were not available and budget was also a concern. Nevertheless,

the project was still executed and managed to garner appreciation from the college management. I had made a significant contribution in the project. I took keen interest in selection of right equipment suitable for each mechanism. Moreover, extensive research was carried out to locate the suppliers who could source the necessary components. Prepared hand sketch and was also involved in developing drawings so that assembly of all components could be carried out. Learnings from the project were as below - Knowledge about Operating philosophy of a bottling plant. - Knowledge of the ball screw nut mechanism utilized in automated CNC machines. - Basic knowledge of fluid machinery and electric motor. - Generating necessary document required for the project. - Presentation skills while demonstrating the working of the bottling plant. - Liaising with the workers from workshop and motivating them to complete the necessary task within given time frame.	One Eight

Knowledge Matrix

Knowledge Element	W/S Episode 1	W/S Episode 2	W/S Episode 3	W/S Episode 4
1. Application of knowledge from one or more of the natural sciences	1.2, 1.3	2.2, 2.3	3.2, 3.3	4.2, 4.3
2. Application of knowledge of mathematics	1.5	2.5	3.5	4.5
3. Application of knowledge of engineering fundamentals		2.4, 2.6, 2.7	3.4, 3.6, 3.7	4.4, 4.6, 4.7
4. Application of specialist engineering knowledge to solve complex problems	1.4	2.4	3.4	4.4
5. Application of knowledge of design methods to solve complex problems	1.4, 1.9, 1.10	2.4, 2.9, 2.10	3.4, 3.9, 3.10	4.4, 4.9, 4.10
6. Application of knowledge of key elements of engineering practice	1.14, 1.15	2.14, 2.15	3.14, 3.15	4.13, 4.14
7. Role of Engineering in Society	1.12	2.12	3.12	4.11
8. Application of advanced knowledge in an area of your discipline	1.4, 1.6, 1.7	2.4, 2.6, 2.7	3.4, 3.6, 3.7	4.4, 4.6, 4.7

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SECTION FOUR – SUPPLEMENTARY EVDENCE

Academic Transcript(s)

Please attach a certified copy of your academic transcript(s) if you have not already supplied one to IPENZ

WORK HISTORY SUMMARY

List your employment history starting from your most recent employment and then chronologically back to the start of your first job.

Ref No	Name of Employing Organisation	Position Title	End mm/yy Start mm/yy	Key responsibilities, activities undertaken, major achievements and/or projects. These should relate to your practice area description.
1.	Doosan Heavy Industries & Construction (EPC Business Group), Seoul, South Korea	Assistant Manager,	Present Start at 05/11	specifications for water t, waste water treatment wners ITB (Invitation of ical requirements for the IELP sessment To prepare the key technical specification for the Basic design of water treatment Plant ,waste water treatment plant, sewage treatment Plant • Preparing the Material purchase specifications for taking the technical and price quotations from the vendors of specialized equipment like chemical dosing pumps, UF and RO membrane. • Taking part in the Cost review meetings before the cost is finalized for the water treatment Plant ,waste water treatment plant, sewage treatment Plant packages • After the award of the contract carrying out detailed design and submitting documents to owner PID, Process Flow Diagram, Mass Balance, GA drawing, System description, etc. for Pretreatment Plant (PT

				Plant), Demineralization Plant (DM), Waste water Treatment Plant (WWTP).

Ref No	Name of Employing Organisation	Position Title	End mm/yy Start mm/yy	Key responsibilities, activities undertaken, major achievements and/or projects. These should relate to your practice area description.

				• Selection of sub vendor for specialized process equipment like chemical dosing pumps, UF and RO membrane which included the technical review of the items, Project Kick-off meetings (KOM), Design review meetings with vendors • Submitting the documents to the project owner for review and incorporating the owner technical comments in the design documents • Attending design review meetings with owner Regular Basis. • Planning and carrying out meetings for the interface check with Architecture, Electrical, Piping, Plumbing, Utility departments for smooth interface and efficient design at the terminal points. • Keeping the project deadline and reporting to the head of water treatment section on weekly basis about the status of technical document submittals for Pretreatment Plant (PT Plant), Demineralization Plant (DM), Waste water Treatment Plant (WWTP), Sewage Treatment Packages (STP)etc. • Preparation of AS Built drawings and documents after the approval and installation of water treatment Packages on project site. • Preparation of the operation and Maintenance O&M) Manuals for the smooth operation of the Pretreatment Plant (PT Plant), Demineralization Plant (DM), Waste water Treatment Plant (WWTP), Sewage Treatment Packages (STP) etc. • Preparation of "AS BUILT" drawings and documents after the approval and installation of water treatment Packages on project site. • Investing at least 4 man hours every week in the library of the office to keep my knowledge updated about the recent trends in the water and waste water treatment industry by reviewing professional publications

Ref No	Name of Employing Organisation	Position Title	End mm/yy Start mm/yy	Key responsibilities, activities undertaken, major achievements and/or projects. These should relate to your practice area description.

				related to water treatment industry. Achievements in this organization • Rated as Best Foreign Engineer working in the Doosan EPC BG for consecutive two years • Played a key role in winning many projects in water treatment section of Doosan Heavy Industries & Construction Co. Ltd. • Trained Fresh recruited engineers of Doosan Heavy Industries & Construction about doing business in India and Indian work culture.
2.				CDR HELP aranteed Skill Assessment
3.				

Ref No	Name of Employing Organisation	Position Title	End mm/yy Start mm/yy	Key responsibilities, activities undertaken, major achievements and/or projects. These should relate to your practice area description.
4.				

5.				
6.			End date: Start date:	CDR HELP aranteed Skill Assessment
7.			End date: Start date:	

CONTINUED PROFESSIONAL DEVELOPMENT (CPD) ACTIVITIES SUMMARY

DESCRIPTION OF ACTIVITY AND LEARNING. Please record all relevant CPD activities (eg. short course, conference, reading, technical lectures, formal study towards qualification, research, discussion groups, workshops, symposia, voluntary service roles) that have extended your professional engineering knowledge and have assisted you to develop the knowledge profile of a professional engineer. Describe the learning outcomes and how these have contributed to your acquiring a Washington Accord level of knowledge..					Was Formal Assessment involved? What was the outcome?

Date(s)	Actual Hours	Form of Activity	Title of activity	What was the knowledge you acquired? How have you applied this knowledge in your engineering practice?	
10/Feb/2006	6	Program	Education Program on Suez's Technologies water and waste water treatment ,by Director Technical, Suez, Gurgaon India	• Basic and design details of Pulsator (sludge Blanket clarifier) • Basic and design details of Aquazur V filters Benefits to my work • Developed an understanding of the advanced clarification and filtration technologies used by Suez for various water treatment facilities • Developed understanding of standing of Suez technology in the Indian water Market.	
29/Aug/2007	8	Program	Training program on "Ultrafiltration and MBR membrane systems" by "Mr. Satish Chilekar" New Delhi ,India	• Fundamentals of UF membrane ,MBR systems • Membrane Construction features • Membrane Performance • Membrane design parameters • Scaling and Fouling in membrane systems • Membrane cleaning processes Benefits to my work • Developed an in-depth understanding about the design and working of Membrane systems used in	No.

DESCRIPTION OF ACTIVITY AND LEARNING.

Please record all relevant CPD activities (eg. short course, conference, reading, technical lectures, formal study towards qualification, research, discussion groups, workshops, symposia, voluntary service roles) that have extended your professional engineering knowledge and have assisted you to develop the knowledge profile of a professional engineer. Describe the learning outcomes and how these have contributed to your acquiring a Washington Accord level of knowledge..

Date(s)	Actual Hours	Form of Activity	Title of activity	What was the knowledge you acquired? How have you applied this knowledge in your engineering practice?	Was Formal Assessment involved? What was the outcome?

				the water Treatment Industry. Had good interactions with other water professionals in the same field from various companies at the training programme and expanded my network	
					No.
					No
					No
					No

DESCRIPTION OF ACTIVITY AND LEARNING.

Please record all relevant CPD activities (eg. short course, conference, reading, technical lectures, formal study towards qualification, research, discussion groups, workshops, symposia, voluntary service roles) that have extended your professional engineering knowledge and have assisted you to develop the knowledge profile of a professional engineer. Describe the learning outcomes and how these have contributed to your acquiring a Washington Accord level of knowledge..

Date(s)	Actual Hours	Form of Activity	Title of activity	What was the knowledge you acquired? How have you applied this knowledge in your engineering practice?	Was Formal Assessment involved? What was the outcome?
					No
					No

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SECTION FIVE - PAYMENT

KNOWLEDGE ASSESSMENT (LEVEL 2) FEE PAYMENT

ASSESSMENT FEE (INCL GST) IN NZD NZ$1,351.25

Please send a receipt ☐

CREDIT CARD DETAILS:

Visa ☐ Bankcard / Mastercard ☐ American Express ☐ Diners Card ☐

Credit Card Number

Name on card _____ Expiry Date _____ CVV _____

Cardholders Signature _____

WHERE TO SEND COMPLETED DOCUMENTS

Send the completed form and associated documents to theIPENZ Membership Manager at one of the addresses below:

Courier Address:
IPENZ National Office,
Level Three
50 Customhouse Quay
Wellington 6011
New Zealand

Postal Address:
IPENZ National Office
PO Box 12-241
Wellington 6144
New Zealand

Appendix One

COMPLEXITY DEFINITIONS

COMPLEX ENGINEERING PROBLEMS

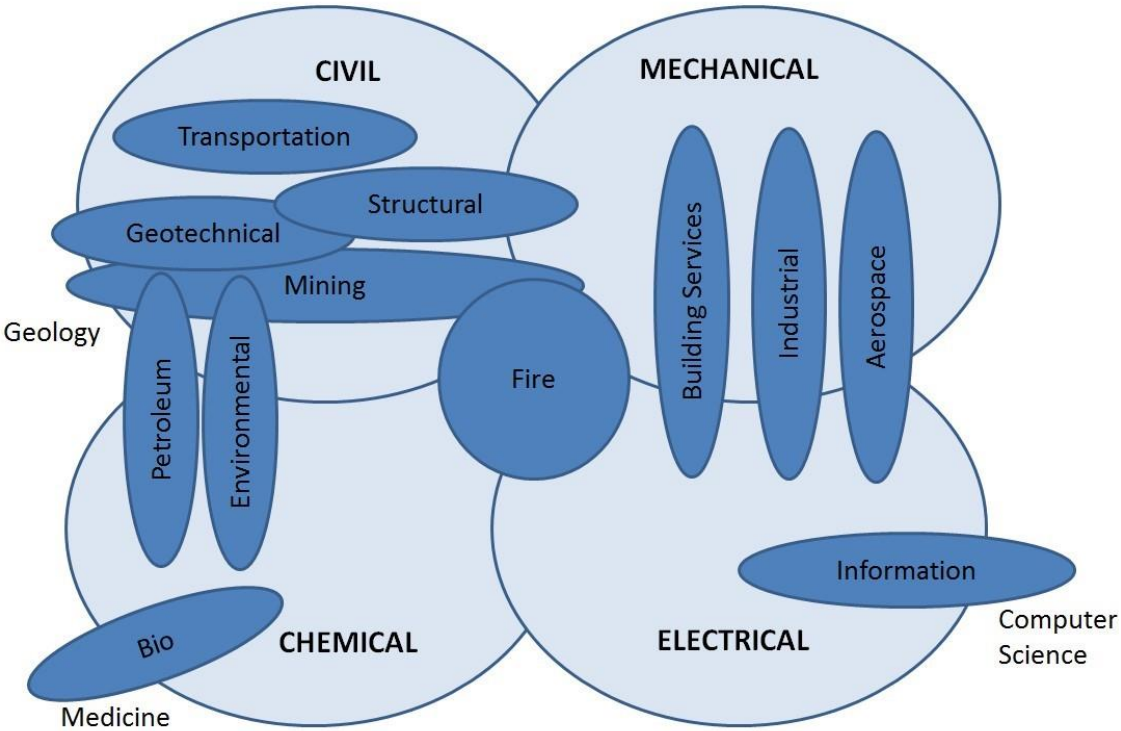
Complex engineering problems have some or all of the following characteristics:

- Involve wide-ranging or conflicting technical, engineering, and other issues;
- Have no obvious solution and require originality in analysis;
- Involve infrequently encountered issues;
- Are outside problems encompassed by standards and codes of practice for professional engineering;
- Involve diverse groups of stakeholders with widely varying needs;
- Have significant consequences in a range of contexts;
- Cannot be resolved without in-depth engineering knowledge

APPENDIX TWO

DISCIPLINES AND FIELDS OF ENGINEERING

Engineering practice fields are loosely defined terms and are used as an indication of the nature of engineering work carried out by engineers practising in an engineering field of practice. The following diagram is a graphical display of the relationships between the various fields and the four core disciplines. Some fields may extend into other fields of scientific endeavour.



AEROSPACE ENGINEERING

Aerospace engineering is the design, development, and production of aircraft (aeronautical engineering), spacecraft (astronautical engineering) and related systems. Aerospace engineers may specialise in aerodynamics, avionics, structures, control systems or propulsion systems. It may involve planning maintenance programmes, designing repairs and modifications and exercising strict safety and quality controls to ensure airworthy operations.

BIO ENGINEERING

Bioengineering draws heavily on the Chemical Engineering discipline and involves the engineered development of raw materials to produce higher value products, using biological systems (biological catalysts). The description also encompasses the general application of engineering to biological systems to develop new products or solve problems in existing production processes. As examples, bioengineers are found in medical research, genetic science, fermentation industries and industries treating biological wastes.

BUILDING SERVICES

Building Services engineering is the application of mechanical or electrical engineering principles, and an understanding of building structure, to enhance all aspects of the built environment from air conditioning and mechanical ventilation, electrical light and power, fire services, fire safety engineering, water and waste services, data and communications, security and access control, vertical transportation, acoustics and energy management.

CHEMICAL ENGINEERING

Chemical engineering is concerned with the ways in which raw materials are changed into useful and commercial end products such as food, petrol, plastics, paints, paper, ceramics, minerals and metals. Often these processes

are carried out at large scale plants. Research of raw materials and their properties, design and development of equipment and the evaluation of operating processes are all part of chemical engineering.

CIVIL ENGINEERING

Civil engineering is a broad field of engineering concerned with the, design, construction, operation and maintenance of structures (buildings, bridges, dams, ports) and infrastructure assets (road, rail, water, sewerage). The Civil engineering discipline underpins several engineering fields such as Structural, Mining, Geotechnical and Transportation engineering, in which civil engineers often specialise. General Civil engineers are likely to be competent to undertake work that relates to one or more of these areas.

ELECTRICAL ENGINEERING

Electrical engineering is the field of engineering which deals with the practical application of electricity. It deals with the aspects of planning, design, operation and maintenance of electricity generation and distribution, and use of electricity as a source of energy within major buildings, industrial processing complexes, facilities and transport systems. It includes the associated networks and the equipment involved such as switchboards, cabling, overhead lines/catenaries, earthing, control and instrumentation systems.

Areas of specialisation within the wider electrical engineering discipline, such as electronics and telecommunications are usually concerned with using electricity to transmit information rather than energy. For this reason electronics and radiocommunications/telecommunications are captured under the field of Information Engineering.

ENGINEERING MANAGEMENT

The Engineering Management practice field is used by engineers who manage multi-disciplinary engineering activities that are so multi-disciplined that it is difficult to readily link their engineering practice with any other specific practice field. Project managers, asset managers and engineers working in policy development are likely to use the 'Engineering Management' field.

ENVIRONMENTAL ENGINEERING

Environmental engineering draws on the Civil and Chemical engineering disciplines to provide healthy water, air and land to enhance human habitation. Environmental engineers devise, implement and manage solutions to protect and restore the environment, within an overall framework of sustainable development. The role of the environmental engineer embraces all of the air, water and soil environments, and the interactions between them.

FIRE ENGINEERING

Fire engineering draws on knowledge from the range of engineering disciplines to minimise the risk from fire to health and safety and damage to property through careful design and construction. It requires an understanding of the behaviour of fires and smoke, the behaviour of people exposed to fires and the performance of burning materials and structures, as well as the impact of fire protection systems including detection, alarm and extinguishing systems.

GEOTECHNICAL ENGINEERING

Geotechnical engineering involves application of knowledge of earth materials in the design of structures, such as foundations, retaining walls, tunnels, dams and embankments. Geotechnical engineers assess the properties and performance of earth materials such as their stability and strength, and the impact of groundwater.

INDUSTRIAL ENGINEERING

Industrial engineering is the application of mechanical and electrical engineering principles to the design and operation of production equipment, production lines and production processes for the efficient production of industrial goods. Industrial engineers understand plant and procedural design, the management of materials and

energy, and human factors associated with worker integration with systems. Industrial engineers increasingly draw on specialised knowledge of robotics, mechatronics, and artificial intelligence.

INFORMATION ENGINEERING

The field of Information engineering is based on the Electrical engineering discipline but also draws heavily from Computer Science. Three areas of further specialisation can be identified:

Software engineering - The development and operation of software-intensive systems that capture, store and process data.

Telecommunications engineering - The development and operation of systems that encode, transmit and decode data via cable systems (including fibre optics) and wireless systems (radiocommunications).

Electronics engineering - The design, development and testing of electronic circuits and networks that use the electrical and electromagnetic properties of electronic components integrated circuits and microprocessors to sense, measure and control processes and systems.

MECHANICAL ENGINEERING

Mechanical Engineering involves the design, manufacture and maintenance of mechanical systems. Mechanical engineers work across a range of industries and are involved with the design and manufacture of a range of machines or mechanical systems, typically applying principles of hydraulics (fluid control), pneumatics (air pressure control) or thermodynamics (heat energy transfer). Mechanical engineers may specialise in the Building Services or Industrial engineering field.

MINING ENGINEERING

Mining engineering involves extracting and processing minerals from the earth. This may involve investigations, design, construction and operation of mining, extraction and processing facilities.

PETROLEUM ENGINEERING

Petroleum engineering is a field of engineering relating to oil and gas exploration and production. Petroleum engineers typically combine knowledge of geology and earth sciences with specialised Chemical engineering skills, but may also draw on Mechanical engineering expertise to design extraction and production methods and equipment. Petroleum engineering activities are divided into two broad categories:

Upstream - locating oil and gas beneath the earth's surface and then developing methods to bring them out of the ground.

Downstream - the design and development of plant and infrastructure for the refinement and distribution of the mixture of oil, gas and water components that are extracted.

STRUCTURAL ENGINEERING

Structural Engineering is a specialised field within the broader Civil engineering discipline that is concerned with the design and construction of structures. Structures might include buildings, bridges, in-ground structures, footings, frameworks and space frames, including those for motor vehicles, space vehicles, ships, aeroplanes and cranes, composed of any structural material including composites and novel materials.

TRANSPORTATION

Transportation engineering is a specialised field of practice in the civil engineering discipline relating to the movement of goods and people by road, water, rail and air.

A Transportation engineer might specialise in one or more of: pavement design, asset maintenance/management, construction/project management, traffic operations and control, transportation planning and systems analysis, freight transportation and logistics, road safety, railways or public transport systems.