

# Scott Thomas - 2315244 Project Proposal

*by Scott Thomas*

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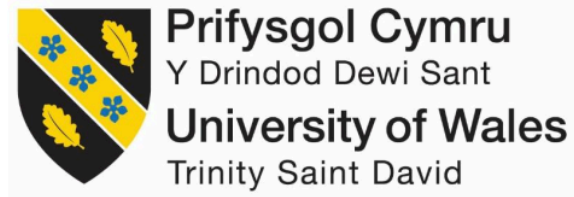
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# **Improving Effluent Management through Automation**

by

Scott Thomas

Supervisor: TBC

Project submitted as part of the requirements for  
the award of

*BEng (Hons) Electrical and Electronics  
Engineering*

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## **1. Introduction**

This project focuses on automating the pumps at the effluent pumping station to improve reliability and efficiency, particularly in the No. 2 sump, as part of the company's ongoing restructuring. The current manual system has resulted in inefficiencies, including equipment damage and limited remote control capabilities. By switching to an automated system, the goal is to reduce the need for on-site operators while maintaining service levels from the No. 2 sump, ensuring smooth operations and regulatory compliance despite reduced staffing levels.

### **1.1 Background**

The effluent management system at Tata Steel plays a critical role in treating water before it is discharged into the Long Sea Outfall (see Appendix 1). The setup consists of twelve pumping sumps, with No. 2 sump being especially important for meeting environmental standards overseen by Natural Resources Wales. Monitoring of key factors like temperature, pH, and flow rate is done via SCADA and IFIX systems. However, the basic on/off monitoring method currently in place is inefficient. Operators often have to manually check the sump's status due to insufficient data, leading to wasted resources. Issues with the float switch frequently cause malfunctions that require manual intervention, adding to the operational complexity. With staff reductions, addressing these inefficiencies has become even more essential.

A budget of around £20,000 has been set for this project, but all spending must align with the company's cost-saving focus. Additionally, upcoming changes to the organisational structure in mid-2025 emphasise the need to finish the project on time. Improving the No. 2 sump's monitoring and control systems through automation is critical to enhancing operational efficiency, safety, and compliance with environmental regulations. Appendix 2 includes the current layout of the main control panels.

### **1.2 Main Aims and Objectives**

The following are the aims and objectives for the project, structured using the SMART criteria. [1]

### **1.3 Main Aims**

The aim of this project is to enhance the efficiency, safety, and reliability of the No. 2 sump pump system by automating operations using level transmitters, PLCs, and HMI controls. It will reduce manual intervention, modernise outdated systems, implement safety measures, and enable remote operation, aligning with organisational goals and improving overall performance.

### **1.4 Objectives**

1. Integrate level transmitters for remote sump level indication and maintain sump levels within specified error bands using a PLC by the end of Q2 2025. The engineering team will accomplish this by integrating the level transmitters into the control system, automating sump control, and incorporating a stop float switch for reliability. Accomplishing this goal will enhance sump monitoring and improve safety at the site.
2. Add a Man/Auto toggle for each pump on the HMI and implement a voting system for level transmitters by Q2 2025. The automation team will accomplish this by developing the HMI interface and enabling manual pump control when necessary. This will provide flexibility for operators, ensuring more accurate control and improved system performance.
3. Reduce operator time spent at the No. 2 sump by 50% within six months of automation implementation. The operations team will accomplish this by equipping pumps with a stop float switch and establishing automatic activation bands. This reduction in operator intervention will lead to better resource allocation and increased operational efficiency.
4. Replace outdated relay systems with a PLC for automatic pump control by Q2 2025. The maintenance team will accomplish this by installing the PLC and programming automatic start/stop based on predetermined levels. This will ensure continuous service without requiring on-site staffing, resulting in operational continuity and cost savings.
5. Enable remote mode switching and implement pump halt safety measures by Q1 2025. The control systems team will accomplish this by installing a switch in the MCC cabinet for HMI control and ensuring that all pumps halt safely if

both level transmitters fail. This will enhance system safety and allow seamless operations in line with organisational restructuring.

## **2. Literature Review**

A literature review reveals both the advantages and challenges of automating systems for managing effluent and wastewater. Research indicates that automating pumping systems can enhance efficiency, reduce labour costs, and help meet regulatory standards. In industries such as steel production, where there is a constant push to improve efficiency and cut expenses, companies are exploring new strategies. However, these initiatives are often limited by tight budgets and a lack of understanding among key stakeholders [3]. The management practices at Tata Steel's Port Talbot site serve as a useful example in this context.

Automation can significantly boost efficiency and reliability in operations. By minimising human error and enabling real-time monitoring of key parameters, automation is particularly advantageous in effluent management. Automating routine tasks not only improves reliability but also optimises resource utilisation. [4] [5]

In the manufacturing sector, automation is crucial for increasing productivity, lowering costs, and maintaining competitiveness. By delegating repetitive tasks to machines, employees can concentrate on more complex, cognitive work [6]. Technologies such as Programmable Logic Controllers (PLCs), Supervisory Control and Data Acquisition (SCADA) systems, and artificial intelligence (AI) have been instrumental in enhancing efficiency and facilitating better decision-making through remote monitoring and data analysis. [7]

For Tata Steel, adopting automation offers a chance for significant change, something previously limited by scarce resources and resistance to innovation. Traditionally, the steel industry has been slow to embrace new technologies due to its dependence on a large workforce. However, recent challenges have compelled Tata Steel to adapt, prompting changes that are now driven more by necessity than by a long-standing culture of continuous improvement. This transition paves the way for modernising operations and fully embracing innovation. [8]

## **2.1 Legislation and Standards**

The project will need to comply with relevant legislation and standards, including:

- Water Resources Act 1990
- The Electricity at Work Regulations 1989
- Health and Safety at Work Act 1974
- COSHH
- Site Standards – ESI 7 (Low Voltage Rules)

## **3. Project Design**

I have been appointed to manage the project, overseeing design and installation with a dedicated team. Bi-weekly meetings will track progress. I proposed a cost-effective solution utilising existing infrastructure and internal personnel, significantly reducing costs. We will upgrade one pump at a time to minimise disruptions.

### **3.1. Data Collection Requirements**

Data collection before and after the upgrades will focus on productivity and efficiency, with key metrics including:

- Downtime
- Operator time at No. 2 sump
- Engineering time (faults)
- Engineering costs
- Operation time of pumps
- Input and output from No. 2 sump

This data will be logged and analysed through SAP for work planning. Lean Six Sigma methodologies will enhance performance by improving workflows and identifying root causes. A quantitative analysis will support decisions on operational changes and upgrades. [9] [10] Quantitative analysis is a mathematical approach to data collection. From this, the data can be measured, verified and evaluated.

### 3.2 Upgrade Options

Several upgrade options are available, differing by approximately £1,900 per pump, totalling around £9,500 for the project:

#### 3.2.1 Option 1:

- **Overview:** Utilises overload protection and auxiliaries with normally open/closed contacts for the PLC.
- **Cost:** Affordable, resulting in lower initial investment.
- **Data Collection:** Limited capabilities may hinder monitoring.
- **Control Interface:** Retains current HMI layout, simplifying upgrades but lacking advanced features.
- **Integration:** Uses existing level transmitters and float switches.

#### Risks:

- Limited data collection could lead to undetected issues.
- Outdated components may hinder future upgrades.
- Increased reliance on manual checks could lead to higher costs.

#### 3.2.2 Option 2:

- **Overview:** Employs overload protection and contactor with Ethernet connectivity.
- **Cost:** Higher initial cost but offers extensive data collection.
- **Data Collection:** Enables monitoring of line voltages and current.
- **Control Interface:** Upgrades front panel and HMI screen.
- **Integration:** Installs accurate level transmitters for improved reliability.

#### Risks:

- Higher costs may face budget resistance.
- Installation complexity may extend timelines.
- Staff may require training on new features.

### 3.2.1 Conclusion on Options

Both options have distinct advantages. Option 1 is cost-effective but may limit data collection capabilities. In contrast, Option 2, while more expensive, offers significant benefits in operational insight and reliability. The final decision will balance these factors to ensure the best outcome for the project.

### Risks Management

- **Project Timeline:** Delays could extend beyond the mid-2025 deadline.
- **Regulatory Compliance:** Non-compliance during upgrades may result in fines.
- **Operational Disruption:** Incremental upgrades could impact productivity.

### Mitigation Strategies

- Conduct thorough risk assessments during planning.
- Establish contingency budgets for unforeseen costs.
- Develop training programs for staff on new systems.

### 3.2.2 Visual Representation

Figure 1 is a single line diagram (SLD) providing an overview of the proposed plan, helping to understand the system layout.

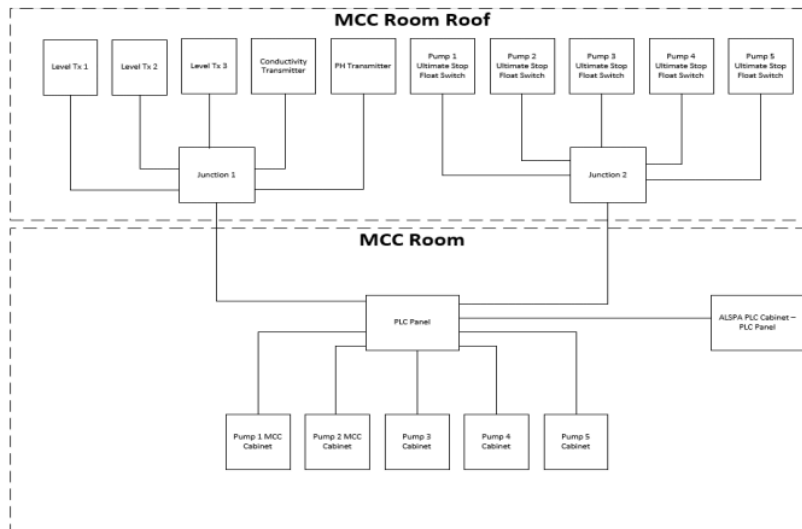


Figure 1

#### **4. Resources**

The project requires substantial resources, but to align with cost-saving efforts, a proposed budget for initial parts totals £10,147.80. Many components are packaged, allowing shared use across the project. The total budget aligns with the £20,000 allocated.

The hardware includes components necessary for the two pumps, such as sensors, valves, and the PLC. Materials will be sourced from two contractors to ensure quality while minimising environmental impact.

For the software aspect, Studio 5000 will be used to program the PLC, streamlining the design process.

The list of proposed items to order is shown below in Figure 2:

| Equipment / Item                                                                                                     | Qty | Price    | Cost     |
|----------------------------------------------------------------------------------------------------------------------|-----|----------|----------|
| 10 pair type 143 + Consumables                                                                                       | 1   | 1,026.21 | 1,026.21 |
| 19 Core cable 1.5mm 50m                                                                                              | 1   | 412      | 412      |
| 3M GPT -020F Clear Double Sided Plastic Tape, 0.202mm Thick, 11.3 N/cm, PP Backing, 100mm x 50m                      | 1   | 55.69    | 55.69    |
| 3M Scotchfil Black Synthetic Rubber Electrical Tape, 38mm x 1.5m                                                     | 5   | 12.38    | 61.9     |
| 3M VALUE DUCT 1900 Scotch 1900 Duct Tape, 50m x 50mm, Black                                                          | 1   | 4.91     | 4.91     |
| A4 316 Stainless Steel Mudguard Washers, M5                                                                          | 5   | 7.42     | 37.1     |
| Advance Tapes AT7 Assorted PVC Electrical Tape, 19mm x 33m                                                           | 4   | 10.9     | 43.6     |
| Allen Bradley Blue Pilot Light Head, 22mm Cutout 800F Series                                                         | 4   | 3.26     | 13.04    |
| Allen Bradley for Use with 800FM Series, 1NO                                                                         | 10  | 3.71     | 37.1     |
| Bahco 150 mm Carbon Steel Hacksaw Blade, 32 TPI                                                                      | 6   | 3.38     | 20.28    |
| Dymo Black on White Label Printer Tape, 5.5 m Length, 12 mm Width                                                    | 2   | 26.4     | 52.8     |
| Entelec CPV Series Clear Cover for Use with DIN Rail Terminal Blocks                                                 | 3   | 19.69    | 59.08    |
| Entelec SCFV Series End Cover for Use with DIN Rail Terminal Blocks                                                  | 10  | 2.68     | 26.8     |
| Finder 48 Series Interface Relay, DIN Rail Mount, 24V do Coil, DPDT, 2-Pole                                          | 6   | 15.23    | 91.38    |
| Finder 58 Series Interface Relay, DIN Rail Mount, 24V do Coil, 4PDT, 4-Pole                                          | 3   | 20.49    | 61.47    |
| HellermannTyton Cable Tie, 200mm x 3.4 mm, Black Polyamide 6.6 (PA66), Pk-100                                        | 2   | 5.51     | 11.02    |
| HellermannTyton Cable Tie, 200mm x 4.6 mm, Black Polyamide 6.6 (PA66), Pk-100                                        | 5   | 3.97     | 19.85    |
| HellermannTyton Cable Tie, 300mm x 4.6 mm, Black Polyamide 6.6 (PA66), Pk-100                                        | 10  | 10.4     | 104      |
| HellermannTyton Cable Tie, 390mm x 4.6 mm, Black Polyamide 6.6 (PA66), Pk-100                                        | 5   | 10.88    | 54.4     |
| HellermannTyton Spiral Wrap, I.D 9mm, 100mm Polyethylene SBPE Series                                                 | 1   | 24.67    | 24.67    |
| Klaue Uninsulated Ring Terminal, M8 Stud Size, 70mm² to 70mm² Wire Size                                              | 50  | 2.18     | 109      |
| Knipex 70 06 160 VDE/1000V Insulated Side Cutters                                                                    | 1   | 23.97    | 23.97    |
| MCC Panel Plates                                                                                                     | 1   | 197      | 197      |
| MECATRACTION, N Insulated Ring Terminal, M6 Stud Size to 2.5mm² Wire Size, Blue                                      | 100 | 0.13     | 13       |
| MODULE-DIS IO:FIELD POTENTIAL, 1734-FPD,P                                                                            | 1   | 211.02   | 211.02   |
| NewLink NLMS-224W 3 Button Wireless Ergonomic Optical Mouse Black                                                    | 3   | 7.18     | 21.54    |
| Rexel Quote - 0092014249                                                                                             | 1   | 416      | 416      |
| Rexel Quote - 009201614                                                                                              | 1   | 1,810    | 1,810    |
| Rexel Quote 0091678961 ( Welding cable)                                                                              | 1   | 565.25   | 565.25   |
| Rexel Quote - 0091752954                                                                                             | 1   | 2,493.80 | 2,493.80 |
| Rittal PK Series Plastic Enclosure, IP66, 111 x 254 x 180mm                                                          | 1   | 30.46    | 30.46    |
| RS PRO 100mA F Glass Cartridge Fuse, 5 x 20mm                                                                        | 20  | 0.58     | 11.6     |
| RS PRO 1A F Glass Cartridge Fuse, 5 x 20mm                                                                           | 4   | 2.43     | 9.72     |
| RS PRO 2.5A T Ceramic Cartridge Fuse, 5 x 20mm                                                                       | 1   | 2.47     | 2.47     |
| RS PRO 2kW Fan Fan Heater, Floor Mounted, Type G - British 3-pin                                                     | 2   | 32.58    | 65.16    |
| RS PRO 3A F Glass Cartridge Fuse, 5 x 20mm                                                                           | 4   | 2.59     | 10.36    |
| RS PRO 4 Port USB 3.1 USB C Hub, USB Powered                                                                         | 1   | 12.98    | 12.98    |
| RS PRO 500mA T Glass Cartridge Fuse, 5 x 20mm                                                                        | 4   | 2.49     | 9.96     |
| RS PRO 5A T Glass Cartridge Fuse, 5 x 20mm                                                                           | 4   | 2.43     | 9.72     |
| RS PRO ABS Wall Box, IP65, 400 mm x 300 mm x 165mm                                                                   | 3   | 70.68    | 212.04   |
| RS PRO Alkaline 9V Batteries PP3                                                                                     | 30  | 1.87     | 56.1     |
| RS PRO Alkaline AA Battery 1.5V                                                                                      | 5   | 6.39     | 31.95    |
| RS PRO Bright Zinc Plated Steel Self Drilling Screw M4.8 x 16mm Long                                                 | 6   | 6.71     | 40.26    |
| RS PRO Grey ABS General Purpose Enclosure, IP66, IK07, Grey Lid, 120 x 160 x 75mm                                    | 1   | 15.82    | 15.82    |
| RS PRO Grey Slotted Panel Trunking - Open Slot, W50 mm x D50mm, L2m, PVC                                             | 8   | 11.08    | 88.64    |
| RS PRO HSS Twist Drill Bit, 6mm Diameter, 93 mm Overall                                                              | 1   | 23.13    | 23.13    |
| RS PRO Insulated Crimp Bootlace Ferrule, 8mm Pin Length, 2mm Pin Diameter, 1.5mm² Wire Size, Black                   | 1   | 9.65     | 9.65     |
| RS PRO Insulated Ring Terminal, M6 Stud Size, 0.5mm² to 1.5mm² Wire Size, Red                                        | 1   | 11.56    | 11.56    |
| RS PRO Plain Rivet Set, 200 pieces                                                                                   | 1   | 58.69    | 58.69    |
| RS PRO Red 1.5mm² Hook Up Wire, 16AWG, 27/0.25 mm, 100m, PVC Insulation                                              | 1   | 48.11    | 48.11    |
| RS PRO Self Adhesive Black Cable Tie Mount 19.5 mm x 19.5mm, 4.6mm Max. Cable Tie Width                              | 2   | 7.99     | 15.98    |
| RS PRO Self Adhesive Black Cable Tie Mount 28.6 mm x 28.6mm, 5.5mm Max. Cable Tie Width                              | 1   | 13.34    | 13.34    |
| RS PRO Steel Wall Box, IP66, 400 mm x 300 mm x 150mm                                                                 | 1   | 48.06    | 48.06    |
| RS PRO Tungsten Carbide Tipped 22mm Core Drill Bit                                                                   | 2   | 11.2     | 22.4     |
| RS PRO Twist Release Emergency Stop Push Button, Panel Mount, 22mm Cutout, 1 NO + 1 NC, IP65                         | 3   | 28.66    | 85.98    |
| RS PRO Uninsulated Tubular Ring Terminal, M10 Stud Size to 70mm² Wire Size                                           | 50  | 2.19     | 109.5    |
| RS PRO Water Pump Pliers, 250 mm Overall, VDE/1000V                                                                  | 1   | 24.45    | 24.45    |
| RS PRO Wedge Indicator Light, Clear, 28 V, 40 mA, 10000h                                                             | 40  | 0.47     | 18.8     |
| RS PRO White 1.5 mm² Hook Up Wire, 15 AWG, 30/0.25 mm, 100m, PVC Insulation                                          | 1   | 57.34    | 57.34    |
| RS PRO White 1.5 mm² Hook Up Wire, 30/0.25 mm, 100m                                                                  | 4   | 41.9     | 167.6    |
| RS PRO Zinc Alloy 5-way Control Cabinet Key                                                                          | 4   | 13.81    | 55.24    |
| Schmersal IFL Series Inductive Barrel-Style Proximity Sensor, M30 x 1.5, 10 mm Detection, 15 # 250 V ac, IP67        | 1   | 102.92   | 102.92   |
| Schneider Electric Adapter, Conduit Fitting, 20mm Nominal Size, uPVC, Black                                          | 5   | 3.5      | 17.5     |
| Schneider Electric Auxiliary Contact Block, 4 Contact, 4NO, Front Mount, TeSys                                       | 5   | 13.85    | 69.25    |
| Schneider Electric Harmony XALK Series Twist Release Emergency Stop Push Button, Surface Mount, 40mm Cutout, 2NC,    | 3   | 30.58    | 91.74    |
| Schneider Electric Harmony XB4 Series Push Button, Panel Mount, 22mm Cutout, SPST, IP66, IP67, IP69(IP69K)           | 3   | 8.67     | 26.01    |
| Schneider Electric Harmony XB4 Series Push Button, Panel Mount, 22mm Cutout, SPST, IP66, IP67, IP69(IP69K)           | 3   | 8.67     | 26.01    |
| Schneider Electric Harmony XB4 Series Twist Release Emergency Stop Push Button, Panel Mount, 22mm Cutout, 2NC, IP66  | 4   | 24.56    | 98.24    |
| Schneider Electric Knob Selector Switch - (SPDT) 22mm Cutout Diameter 2 Positions                                    | 3   | 15.38    | 46.14    |
| Schneider Electric Rigid Conduit, 20mm Nominal Diameter, PVC, Black                                                  | 10  | 2.28     | 22.8     |
| Schneider Electric TeSys Protective Cover for use with Giga Electronic Overload Relay LR9G500                        | 8   | 7.06     | 56.48    |
| Schneider Electric, AZ5DE Insulated Crimp Bootlace Ferrule, 8mm Pin Length, 2.5mm Pin Diameter, 2 x 1.5mm² Wire Size | 2   | 7.46     | 14.92    |
| Schneider Electric, AZ5DE Insulated Crimp Bootlace Ferrule, 8mm Pin Length, 2.5mm Pin Diameter, 2 x 1.5mm² Wire Size | 4   | 7.46     | 29.84    |
| Schneider Electric, DZ5CE Insulated Crimp Bootlace Ferrule, 8.2mm Pin Length, 1.8mm Pin Diameter, 1.5mm² Wire Size,  | 4   | 10.38    | 41.52    |
| SCJ Professional Universal Wipes Wet Hand Wipes, Tub of 150                                                          | 3   | 23.87    | 71.61    |
| Siemens Blank label for Use with Emergency Stop Mushroom Push Button                                                 | 20  | 3.76     | 75.2     |
| Starrett HSS 20mm Hole Saw                                                                                           | 2   | 14.35    | 28.7     |
| Starrett Tungsten Carbide 50mm Hole Saw                                                                              | 2   | 38.82    | 77.64    |
| SWITCH-E-NET-LIGHTLY MANAGED, 1783-LMS8.8                                                                            | 1   | 164.5    | 164.5    |
| Tivoli 19-Piece for Stainless Steel, 10mm Max, 1mm Min, HSS-Co Bits                                                  | 1   | 53.74    | 53.74    |
| Tivoli 25-Piece for Steel, 13mm Max, 1mm Min, HSS Bits                                                               | 2   | 32.67    | 65.34    |
| Unistrut Channel Nut, M10, Nut Base Dimensions 35 x 19 x 8mm, Steel, 0.04kg                                          | 5   | 12.67    | 63.35    |
| Unistrut P 1047 U & Z Shape Fitting, U Shape 41 x 41mm 137mm 41mm 3 14mm Steel                                       | 1   | 45.08    | 45.08    |
| Unistrut Steel                                                                                                       | 2   | 45.59    | 91.18    |
| Weidmuller EW Series End Stop for Use with DIN Rail Terminal Blocks, ATEX                                            | 5   | 6.46     | 32.2     |
| Weidmuller W Series End Cover for Use with DIN Rail Terminal Blocks, ATEX                                            | 50  | 0.31     | 15.5     |
| Weidmuller WDU Series Beige Feed Through Terminal Block, 4mm², Single-Level, Screw Termination, ATEX                 | 5   | 6.21     | 31.05    |
| Weidmuller, DEK Terminal Marker for use with for use with Terminal Blocks                                            | 5   | 4.02     | 20.1     |
| Weidmuller, DEK Terminal Marker for use with for use with Terminal Blocks                                            | 10  | 4.02     | 40.2     |
| Wera Joker 6000 Series 4-Piece Spanner Set, 10 # 19 mm, Chrome Molybdenum Steel                                      | 1   | 73.74    | 73.74    |
| Wera Phillips, Plusminus Phillips, Pozidriv, Pozidriv, Slotted Interchangeable Insulated Screwdriver Set,            | 2   | 72.38    | 144.76   |

Figure 2

4.1 Project Plan

To ensure smooth project execution, a Gantt chart will track progress and provide a visual timeline of tasks, helping to manage resources effectively. Key stages include:

- Panel construction
- Installation of power, control, and Ethernet cables
- Completion of any prefabrication work

This strategy aims to minimise downtime, as at least four pumps need to remain operational. Key milestones include:

- Completion of preparation work
- Key stakeholder meetings
- Pump outages
- PLC installation
- HMI modifications
- Final connections

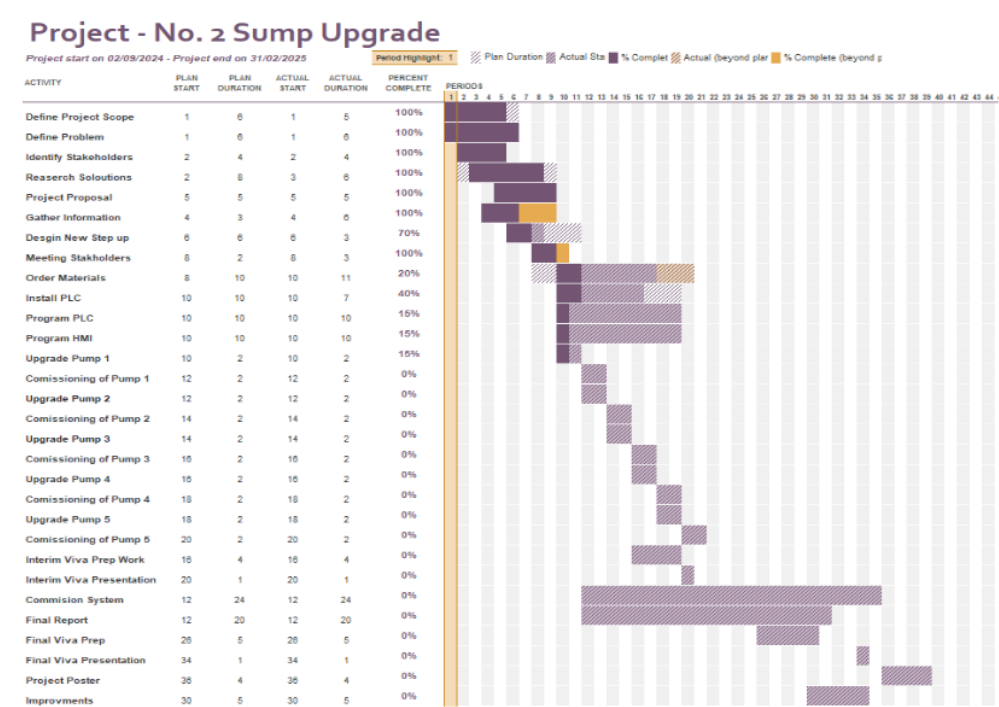


Figure 3

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## 6. Appendix 1

The images below depict the Abbey No. 2 sump pumphouse and the Long Sea Outfall (LSO).

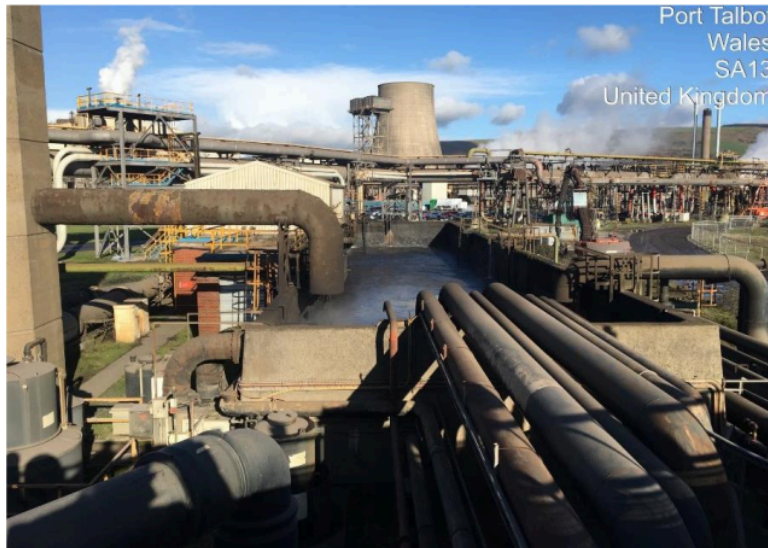


Figure 4



Figure 5



Figure 7

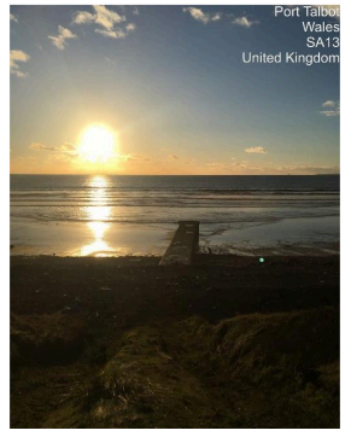


Figure 6

## 6.1 Appendix 2

Below are images of the control panel at No.2 sump.



Figure 9

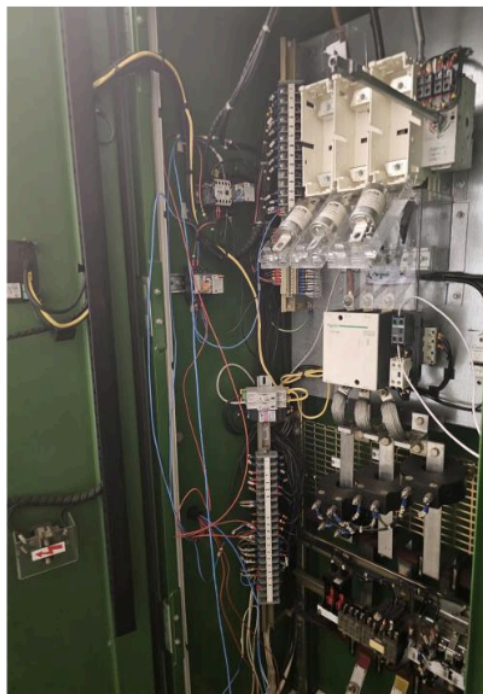


Figure 8



Figure 10



Figure 11

# Scott Thomas - 2315244 Project Proposal

## GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

78/100

|                                                                                                                                                                                                                                                                                                                                                      |                                |                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------|
| Module Code/ Module Name                                                                                                                                                                                                                                                                                                                             | ACCA6020 / INDEPENDENT PROJECT |                       |
| Student Name                                                                                                                                                                                                                                                                                                                                         | Scott Thomas                   |                       |
| Student Number                                                                                                                                                                                                                                                                                                                                       | 2315244                        |                       |
| PROJECT PROPOSAL FEEDBACK                                                                                                                                                                                                                                                                                                                            |                                |                       |
| <b>Introduction / A&amp;O:</b><br><br>Project title; Identification of a specific problem to be investigated; Well-defined aims and SMART objectives; Explaining why this project is worth doing; Discussion of what the project needs to do in order to be a success; Description any deliverables that will be produced at the end of the project. | <b>Max. Marks</b>              | <b>Marks Obtained</b> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|
| <p>The project title is clear and aligns with the objective. The problem identification is good. The aims of the project is well-defined with a SMART objective and the rationale is clear and provides a valid justification for the work. The deliverables are mentioned indirectly. However, a dedicated list summarising key outputs would improve clarity</p>                                                                                                                       | 20 | 17 |
| <p><b>Background to the Project / Literature Review:</b></p> <p>Description of how the work to be done by in the project relates to the work identified in the literature review; Discussion of any ethical issues raised by the project Identifying what has already been done within the field; Topic familiarity; Brief literature review using appropriate sources – 6-8 journal papers and book chapters rather than just websites; Selection of relevant models &amp; concepts</p> | 20 | 15 |
| <p>The background demonstrates a strong understanding of the problem. Ethical considerations are mentioned, particularly compliance with regulations. The review identifies general</p>                                                                                                                                                                                                                                                                                                  |    |    |

|                                                                                                                                                                                                                                                                                |    |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|
| <p>advances in automation and the benefits in industrial processes. Use of more peer reviewed research article would have strengthened the document. The report could include a brief comparison of alternative models or methods to provide a broader perspective.</p>        |    |    |
| <p><b>Project Design:</b></p> <p>Clear statement of which development methods are to be used and why they are appropriate;<br/> Clear statement of which tools are to be used and why they are appropriate;<br/> Clear description of how data collected will be analysed.</p> | 30 | 23 |
| <p>The development methods and tools are described well. However, the reasoning for selecting these tools over others could be better. How data will be collected and analysed is mentioned</p>                                                                                |    |    |
| <p><b>Resources / Planning:</b></p> <p>List of any deliverables;<br/> Clear diagram showing both timing and resource use;<br/> Completed ethics form;<br/> Limited and relevant appendices.</p>                                                                                | 15 | 12 |
| <p>Good clear Gantt chart</p>                                                                                                                                                                                                                                                  |    |    |

|                                                                                                                                                                                                                                                                                                       |            |    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----|
| showing each task to be completed. Ethics form completed. It would have been better with clear listing of deliverables.                                                                                                                                                                               |            |    |
| <b>Document Presentation:</b><br><br>Correct spelling, grammar and punctuation; Flow of narrative/fluency; Coherence; Word processed ; Correct use of referencing with bibliography; Strict word limit                                                                                                | <b>15</b>  | 11 |
| The document is well structured and well-presented with good spelling, grammar, and flow. Greater inclusion of peer-reviewed journals or authoritative books would enhance the quality of the references. Additionally, providing captions for each figure would improve the quality of the document. |            |    |
| <b>TOTAL</b>                                                                                                                                                                                                                                                                                          | <b>100</b> | 78 |

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