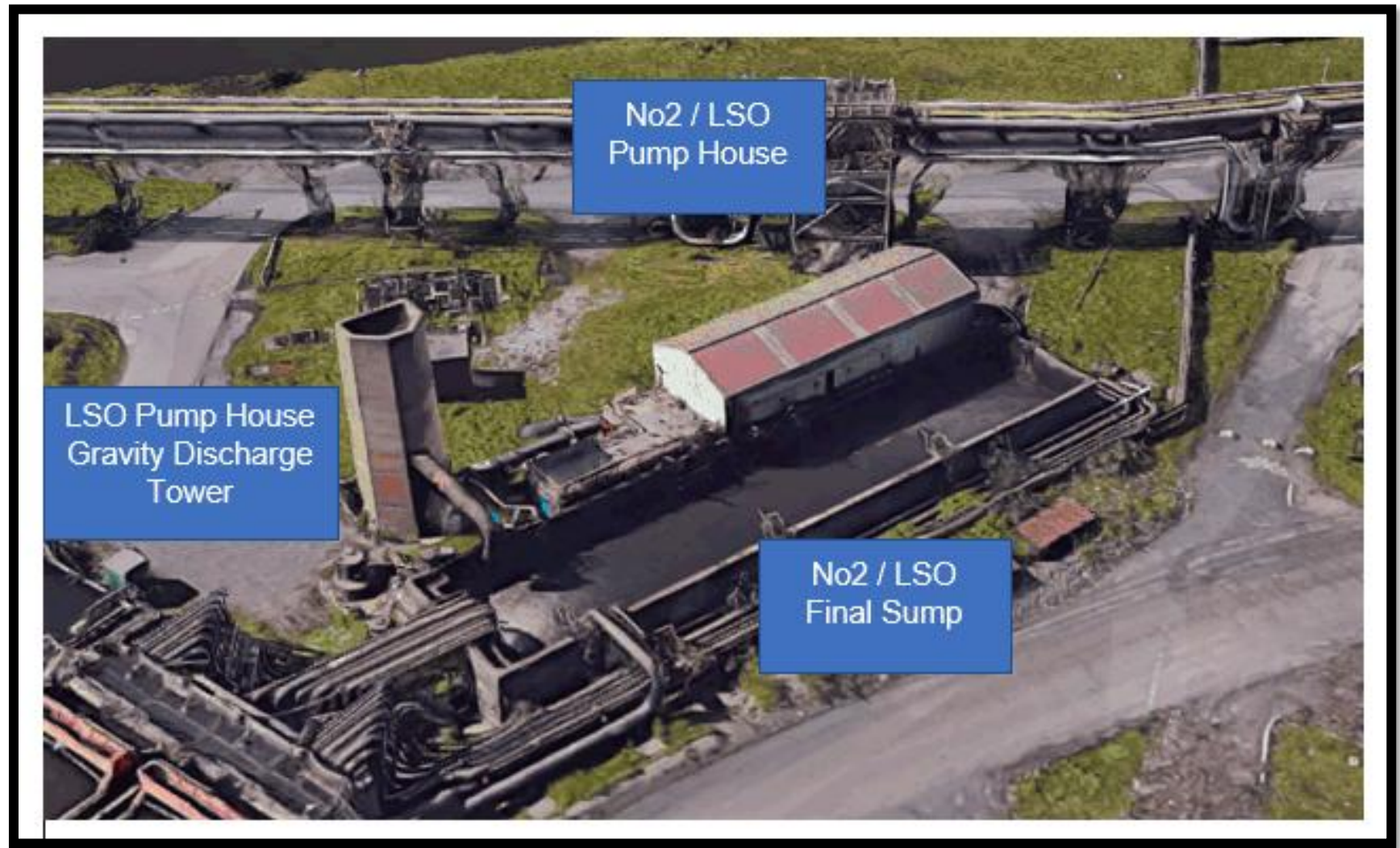


Improving Effluent Management through Automation

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1. Introduction

Managing industrial effluent effectively is critical to maintaining environmental compliance and operational efficiency at Tata Steel No.2 sump. The existing system relies on manual monitoring and basic float switches, resulting in frequent equipment faults, increased labor costs, and inconsistent data reporting. With ongoing staffing reductions and tighter regulatory oversight from natural recourses Wales (NRW), the need for reliable, automated solution became imperative. This project aims to address these challenges by implementing a PLC-based control system integrated with SCADA for remote monitoring, enhancing both operational efficiency and compliance.



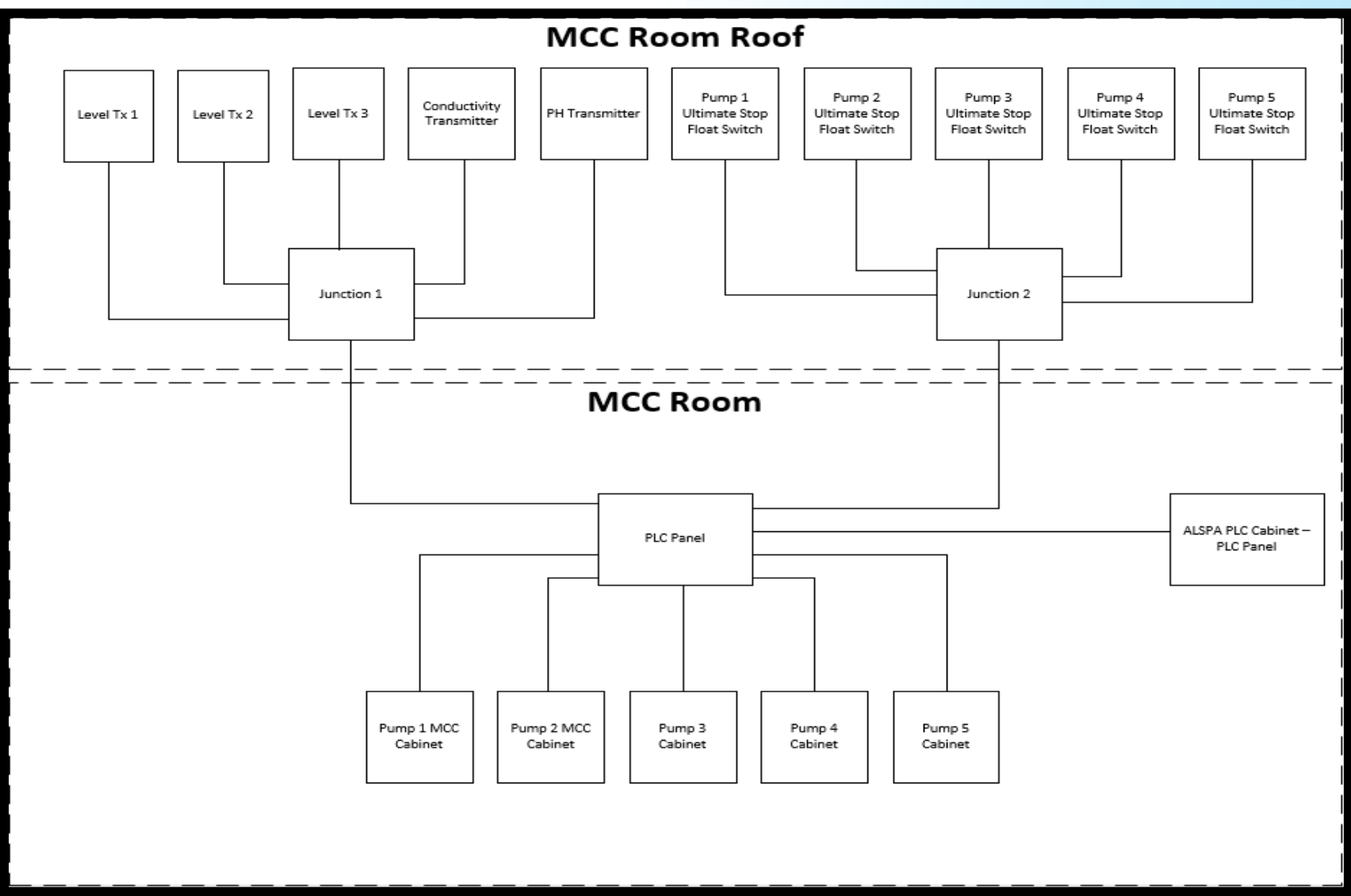
2. Aims and Objectives

Aim: To automate the control of the effluent pumping system to reduce manual intervention, improve monitoring accuracy, and ensure compliance with regulatory standards.

Objectives

- Implement a PLC system for automated pump control, reducing operator workload by 90%.
- Develop a remote monitoring interface using SCADA, enabling off-site access and fault alerts.
- Integrate dual level transmitters for accurate sump level measurement and voting alerts.

- Establish fault detection protocols to minimise equipment damage and reduce maintenance callouts.



3. Methodology

The project followed a structured approach involving systems analysis, design, implementation, and testing. The initial phase included a feasibility study to access system requirements and component compatibility. Studio 5000 was used for PLC programming, employing both ladder logic and structured text to handle pump sequencing, fault detection, and level monitoring. Add-on instructions (AOI) were developed for key functions, including pump control, level transmitter selector, and fault handling. Testing was conducted using simulation tools within studio 5000, following by on-site validation using the HMI and SCADA system.

4. Results and testing

The implementation of the PLC system significantly improved operational efficiency.

- Operator time was reduced from 168 hours to 18 hours per week. Allowing staff to focus on higher-priority tasks.
- Pump faults decreased by 80%, reducing unplanned maintenance and equipment downtime.
- SCADA integration enabled remote monitoring and control, providing real-time status updates and fault notifications.

- Testing confirmed that the system maintained accurate sump levels and effectively handled fault conditions, such as transmitter discrepancies and pump overloads.

Metric	Before Automation	After Automation	Improvement %
Operator Time (hrs/week)	168	18	89%
Pump Faults Reported (per week)	6	1	83%
Manual Interventions Required	24	3	87%
Contractor Callouts (per month)	4	1	75%
Average Work Order Backlog	12	4	66%
Unplanned Downtime (hrs/month)	10	2	80%

5. Conclusion and Recommendations

The project successfully delivered a cost-effective automation solution within the allocated £20,000 budget. Automated control and remote monitoring reduced manual oversight and improved system reliability, supporting Tata Steel's broader strategy for operational efficiency. It is recommended to extend similar automation to other sumps across the site and consider implementing predictive maintenance using SCADA data to further optimise pump performance and minimise future faults.

6. Reflection and learning

This project provided valuable practical experience in industrial automation, including PLC programming, HMI design, and fault logic development. Key challenges included scaling HMI inputs correctly, managing component lead times, and conducting effective operator training. Overcoming these obstacles not only enhanced technical skills but also reinforced the importance of through planning, communication, and structured testing in engineering projects.