

Pen y Bont WwTW

SCADA and Control Systems Migration

A full replacement of the existing control system whilst maintaining existing plant operations was required as the raw product flows into the works 24/7. To achieve this our teams reviewed the existing control system and a method and order of changeover was devised and carried out.



Pen y Bont WTW is a sewage treatment plant next to Candlestone Castle and is located in Bridgend County borough, Wales, United Kingdom. At this project, our teams carried out the following:

- Management, organisation, administration, and supervision in connection with the delivery of the programme;
- Full CDM project with OSS as Principal Contractors;
- Migration of existing control system including SCADA and PLC to a new Mitsubishi Q series solution (10 PLC nodes);
- Bespoke software (PLC and SCADA);
- Automation of wastewater treatment process including mechanical screens and grit plant;
- Electrical installation of control panels and retrofitting of ICA backplanes and PLC hardware;
- Installation of plant wide fibre optic network;
- Fibre optics networks including setup of Ring Masters for standard Ethernet;
- Use of fibre optic networks with Mitsubishi CC-Link for ring management and data exchange between PLCs;
- Fault finding on existing plant to make devices available to the new control system;
- Decommissioning of old control system, removal of obsolete equipment and retained for spares by customer where possible;
- Full project lifecycle including survey, design (FDS, schedules, drawings etc), software development, internal and customer Factory Acceptance Testing (FAT), site installation and commissioning, Site Acceptance Testing (SAT), Training, Provision of O&Ms and formal handover.

CDM Regulations 2015: This was a notifiable project and an F10 was raised with the HSE. OSS were nominated as Principal Contractors and subcontracted the services to our installation arm OSS Electrical to undertake the supply of the electrical design and installation subcontract. We provided project management working to an NEC3 contract with the client.

As part of our CDM duties, we prepared and issued a Construction Phase Plan outlining the Health & Safety arrangements for the

project and management of sub-contractors. Minor temporary works were carried out at this scheme. The project was executed to the highest specifications within OSS's Integrated Management System - certified to:

- ISO 45001 for leadership in Health, Safety & Wellbeing,
- ISO 9001 for Quality Assurance,
- ISO 14001 for the Environment,
- TickIT Plus for Software Quality Assurance, and
- ISO 27001 for Information Security.

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Case Study

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All aspects of the detailed design and installation were carried out in compliance with the most recent revisions of DCWW Standard Specifications and Drawings, Water Industry Mechanical Electrical Specifications (WIMES); Civil Engineering Specification for the Water Industry (CESWI); and appropriate current British/EN Standards.

Pre-Construction Stage: Initially our engineers reviewed all available information and ensured that this correlated to the existing installation on site. Each area of plant was given due consideration to operating plant in manual where possible. It was decided that the electrical ICA panels were going to need to be updated and prepared for the new control system.

Cabling in the form of fibre optics was installed across site, between buildings for communications, all performed by our in-house fibre optics engineers and electrical install personnel. Cable duct surveys were performed to assess the runs and options available and challenges were identified regarding access to plant, testing of devices and IO as the majority of equipment was in constant use.

A detailed commissioning plan was prepared to cover the site aspects of the project including installation and commissioning activities. It was then used as the basis for the HAZOP and HAZCOM reviews and was reviewed and updated each week during commissioning.

Live Operational Site: We effectively and openly managed interfaces with the client and also third-party operators. At Pen y Bont, our team of engineers worked closely with the customer's in-house capital department to deliver the SCADA and Control System Migration project.

The design of the SCADA and PLC was based on the existing site configurations; however, it was then going to require some modifications to meet the customers standardised approach. The changeover of equipment and plant operations was

carefully planned, considering the potential impact on the process and equipment and taking sufficient steps to ensure that this was mitigated to acceptable risk levels.

The UV plant was fully operational and testing the Profibus interface with the new control system presented a rare opportunity. To overcome the issue a simulation device was provided by the UV manufacturer, this was firstly proved on the site's existing control system. One of the offline units was unserviceable, so it was temporarily disconnected, and the simulation test device used in its place to prove compatibility with existing Profibus interface before removing off-site for testing with the new control system.

During site commissioning one of the operational UV interfaces was found to be providing erroneous information and indications which was providing incorrect data to the operations personnel. The issues were resolved by working with the UV supplier and thorough field point to SCADA point testing. It also provided opportunity to improve the graphic view presented to operator.

The SCADA to PLC communications utilises OPC servers. These had been configured by OSS and any further additions were made by appending the new additions to the existing database. This method was provided as training to other SI Framework suppliers so that they could continue with their site activities alongside ours.

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Internal/External Stakeholders: As the Contractor, we communicated regularly with DCWW and other stakeholders over the duration of the project through emails and phone calls. We also attended and provided meetings, such as the design peer review, design HAZOP, weekly progress meetings and the pre-commencement meeting. NEC contract management was smooth with regular programme updates and the use of the early warning notification system to ensure a high level of stake holder involvement and that all issues were notified, agreed and resolved in a timely manner.

In addition, our teams co-operated with DCWW Operations and regulatory authorities requiring safe access to area's under our control. Co-ordination of the works were carried out through the DCWW Project Co-ordinator /Project Manager and unobstructed access was provided to DCWW operational staff at all times during the works.

How Did We Stand Out? Our engineering team has a strong presence in the water industry, from delivering innovative solutions on large capital investment projects to small modifications on existing systems. Our process knowledge has been of enormous benefit to our end users. At Pen y Bont, we were able to add value and provide their experience with Servelec (Ovarro) SCADA systems and fibre optics and by using a hot and cold splicing technique for terminating fibres within fibre patch boxes. We also carried out quality tested using calibrated test equipment to ensure specifications for signal loss are within acceptable limits.

Our in-house engineers are Profibus certified and have experience in interfacing a variety of Profibus devices. Whilst the Profibus standard aims to simplify the interfacing process, manufacturers devices can and do throw up technical challenges which require some consideration.

A set of existing variable speed drives, already on Profibus connected to the existing system when tested on the new system were found to be incompatible. The standard telegram option required was not available in the existing VSDs firmware and required drive specialists to visit site to update each device.

Firmware updates can in certain circumstances 'brick' the device and make it unusable. To mitigate this risk a new drive was purchased to provide assurances to operations that plant operability would be maintained.

Customer Services Challenges: We recognised that our teams had the responsibility to act on behalf of and represent DCWW to its general public customers. It was vital that we identified measures to ensure that customers were considered prior to mobilising.

These included proper planning to mitigate issues to reduce adverse impact to customers whilst on site, through assessment & quantification and understanding of local sensitivities or sites with historic operational issues. Through this approach of close collaboration with our client from the outset, we did not experience any customer services challenges.

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