Maerdy WTW
Process Improvements

Oasis Software Solutions

case study

Located north of Cardiff, supplies 16Ml/d potable water to Ferndale and the surrounding area. Water is gravity fed from Castell Nos and Lluest-Wen Reservoirs, but with varied quality, resulting in a challenge to WTW performance. In addition, raw water quality varies between the two sources supplying the WTW. Planned maintenance on the impounding reservoirs feeding the WTW necessitated a process review to ensure works performance remained robust during planned reservoir safety works.

Objectives: The objective was to improve the hypochlorite plant system that was in poor condition. The aim was to introduce a replacement system of dosing dilute delivered hypochlorite. It was proposed that the existing 0.8% hypochlorite storage tanks would be re-used for storage of delivered 14% bulk hypochlorite. The scheme would renew the hypochlorite dosing pumps, equipment and controls; instrumentation and actuated valves. To facilitate the changeover, the OSEC units were to be removed, in order to install the new chlorination system.

A secondary objective was undertaken to introduce a run-to-waste system enabling the redirection of flow preventing non-compliant water progressing through the treatment process, protecting final water quality. In addition, additional process resilience objectives were identified to improve the process, combining the separate source water inlets into a common manifold at WTW inlet upstream of existing flash mixer. There was provision of dosing points for pH correction and coagulation and improvements to the operation of the DAF plant.

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.

CDM Regulations 2015: OSS were engaged as a specialist systems integrator on this

scheme. We worked in close collaboration with the Principal Contractor and the project was executed to the highest specifications within OSS's Integrated Management System, that is 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, ISO 27001 for Information Security and Cyber Essentials Plus.

The project was interrupted due to the Covid-19 pandemic and when site activity was able to re-commence, OSS worked closely with MMB and DCWW to ensure that a safe system of work was deployed in the areas involving multiple contractors. This included a one-way route through the control room, a relocation of the engineering workstation and a physical barrier put in place to ensure separation between site operators and OSS personnel.

OSS developed a Covid-19 risk assessment which dovetailed into the existing RAMS documentation. Control measures included

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At this project, our team was engaged as a specialist contractor to perform the following:

- Work as a contractor liaising with Principal Contractor Mott MacDonald Bentley (MMB);
- System integration associated with the conversion of chlorine plant, integration of new run-to-waste system and implementation of new flow control regime;
- Repurpose existing cubicles and control system channels for new plant items;
- ICA modifications associated with the conversion of old signals to new signals;
- Fault finding on existing plant to make devices available to the new control system;
- Phased changeover of the chlorine plant whilst maintaining fully compliant water;
- Decommissioning of old chlorine removal of obsolete equipment (retained for spares);
- Assistance with telemetry commissioning;
- Support to the MMB commissioning team and DCWW Automation, Telemetry and Control (ATC) Team;
- 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.

wiping down the keyboard and mouse on the engineering working station after every session. All RAMS followed OSS's IMS review process to ensure risk assessments and associated controlled measures were scrutinised, challenged and approved before issuing to the Client for approval two weeks before commencing work. We also developed a Covid specific mobile app to ensure staff were fully informed of all measures in place and kept up to date with the ongoing actions being taken by the Company throughout the pandemic. Software development and meetings was able to take place through remote working and through the use of Microsoft Teams, and the app allowed supervision to be undertaken whilst remote working.

Site working was monitored through use of the company's in-house InfoApp to ensure safe access and egress from site and that site work and tasks had been undertaken satisfactorily.

All issues communicated and fed back on the effectiveness of RAMS were provided back to the management team. Details of Points of Work Risk Assessments ahead of starting all site activity was also fed back to the management team.

Pre-Construction Stage:

Our teams worked directly with the client from pre-construction stage and during various phases of the project to provide them with knowledge of how the existing system functioned and how the proposed modifications would interact with it and could therefore be implemented. In line with our usual way of working, this was key to the getting it right first time.

We also worked closely with ATC whilst modifying the existing telemetry mapping to add new signals. The existing telemetry signals needed to be live at all times. Due to Covid restrictions some telemetry testing needed to be executed with ATC off-site and OSS drove this testing due to their site attendance. In addition, our teams collaborated with MMB, the Principal Contractor, by maintaining regular dialogue and combining progress meetings addressing all projects, in one meeting, rather than engaging in multiple progress meetings.

Further information on this project can be found at
https://waterprojectsonline.com/custom_case_study/maerdy-wtw-2021

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Live Operational Site: Throughout the duration of the project, our team worked closely DCWW/MMB. Multiple commissioning meetings and project rehearsals were held to plan the implementation of the projects with minimal impact on the site or site operations. These allowed the tasks requiring shutdown to be reduced to a minimum so they became achievable with the works remaining in an operational state and with minimal risk.

Proven efficiencies were carried forward from a scheme we had previously designed with DCWW, in order to assist with this MMB project. A D22 controller had been selected to control the Cla-Val at Maerdy and we were heavily involved in identifying the requirements of this controller and how it needed to interact with the works PLC. We set up a test-bed system in-house, which in conjunction with a physical valve motor, allowed Cla-Val/OSS to demonstrate to MMB how the Cla-Val would be controlled from the Works PLC via its D22 controller.

Enabling Works: There were no major enabling works to be carried out by OSS. By scheduling-in the work shutdowns and planning-in the key personnel for the tasks to be completed that day, all tasks were achieved to satisfaction. However, there were temporary works required to carry out the PLC I/O modification as well as PLC/SCADA mods, to enable one of the new hypo tanks to be displayed on SCADA alongside the old OSEC tanks. This was in order to provide temporary storage of hypochlorite whilst old equipment was stripped out and new equipment installed.

WES manufactured the hypo dosing skid and batch make up equipment. Our team modified the control philosophy and generated the FDS and PLC/SCADA code, and then tested the system with WES within two days.

Multiple Work Disciplines: OSS worked closely with other disciplines to ensure the was clear understanding of each other's requirements and deliverables. Other contractors, sub-contracting to MBB but with decencies on OSS included the chemical dosing skid manufacturer, electrical installation contractor and valve supplier working on the schemes. An initial project rehearsal meeting followed by design meetings were organised at key points throughout the project along with weekly commissioning meetings ensured each party was kept informed of requirements, expectations and progress.

Internal/External Stakeholders: As the Contractor, we communicated regularly with the PC and MMB/DCWW and other stakeholders over the duration of the project through emails and phone calls. We also attended meetings, such as the design peer review, design HAZOP, weekly progress meetings and the pre-commencement meeting.

In addition, our teams co-operated with DCWW Operations and regulatory authorities requiring safe access to areas in which our team was working. Co-ordination of the works were carried out through the MMB/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? *In a post project review by the Principal Contractor, MMB, it was communicated back to OSS that we were the only sub-contractor to gain full marks in respect to the assessment of performance on the scheme.*

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.

OSS has been involved in similar schemes in recent years, converting OSEC schemes to bulk/dilute hypochlorite schemes on several major water treatment works, working with a variety of different delivery partners and principal contractors.

We had also worked on a number of Run-to-Waste schemes with MMB and with others. In each case our process awareness and detailed understanding of plant control philosophies allowed us to bring key insights and input to ensure that the finer points of the design were captured and that the schemes were implemented in an operationally live environment – meaning 'right first time' and minimising down time and risk to process.

At Maerdy WTW, we were able to add value to the MMB delivery team, through early contractor involvement, helping the MMB designers optimise and refine their solution.

Challenges & Innovation:
We recognised that our teams had the responsibility to act on behalf of and represent MMB/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.

There was in place a single SCADA switch that would allow site operations to switch between the old and new Hypo Dosing systems. This was key to the initial seven day testing of the new system.

Initially Operations had wanted to switch back to the old system at the end of each day whilst contractors were on site, however providing them with the ability for them to control the return to the old dosing system negated this and the new dosing system went live on day one and remains running.

The SCADA switch wrote to the PLC to perform the following functions:

- Disabling of the new dosing system and enabling of the old
- Switching of telemetry alarms from the new system to the old to provide correct out of hours monitoring, and
- Switching of Works ESD functions from monitoring the new system to the old.

Another innovation on the project was the introduction of continuous monitoring of the batch strength during its makeup. Instead of an open loop system, we employed control loops to continually adjust the batch concentration during batching. This has led to repeatable batches with little variation in concentration. As a result of this, the system can switch between its two day tanks with little variation seen in the works chlorine readings during this which is fantastic from a regulatory aspect.

Through this approach of close collaboration with our client from the outset, we experienced an excellent relationship with our clients and all other parties on site.

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