

Prioress Mill RWPS

Automation & Control of River Intake

Prioress Mill Raw Water Pumping station (RWPS) is located in Rhadyr, near Llanccayo, Monmouthshire, on the south bank of the River Usk. It abstracts at a rate of up to 318 ML/day, and is the primary supply to Llandegfedd reservoir, which then feeds Sluvad Water Treatment Works (WTW).

OSS is a systems integration framework supplier to DCWW. Our engineers are trained and authorised to configure the preferred enterprise SCADA system and are experienced with Mitsubishi PLCs and trained and experienced with Profibus.



At this project, our teams carried out the following:

- *Work as a contractor liaising with Principal Contractor Skanska*
- *Bespoke software (Mitsubishi GX Works 2 PLC and Servelec PRISM SCADA)*
- *Automation of screening plant and (HV) pumping station to comply with National River Authority abstraction license;*
- *Interfacing of Profibus Networks, Remote I/O Systems, Control Systems and intelligent motor control assemblies;*
- *Full project lifecycle including 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.*

Pre-Construction Stage: The OSS team took part in initial kick-off meetings with the site and design team with collaboration the key to making this project successful. The site was required to operate fully automatically and to comply with the new National Rivers Authority (NRA) abstraction license. There was no room for error – it was mandatory to avoid over-abstraction and the aim was to achieve this by using a combination of four high rate pumps 6.6kV – 1730KW - 1600 l/s – 138.2mld and two low rate pumps - 6.6kV - 710kW - 600 l/s - 51.8mld.

The new license had not been issued at time of contract but arrived later, and this required some study regarding the constraints. It was decided that OSS would create a bespoke logic solution whilst continuing to align as much as possible with the customers standardised function blocks.

The equipment selection designs were not fully developed, package plant details had not been finalised and wherever possible OSS engineers engaged with the designers to achieve the desired outcome to allow the project to continue without delays. Technical queries were raised for package plant suppliers to provide an estimate for I/O interfacing with cabling costs versus use of distributed Profibus slice I/O racks also considered.

The Medium Voltage drives were not part of the existing suite of standard devices, so needed to be interfaced with the customer's SCADA, as either a new bespoke SCADA object or as a best fit to the existing SCADA object. The incoming HV power supply was to be upgraded and would be one of the last items to be installed, with only a month or so to meet the commissioning dates.

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Live Operational Site: The works were undertaken at this fully operational water treatment works that remained in operation for the duration, and our teams worked closely with DCWW Operations to ensure construction activities did not impact normal site operations. The site suffered from delays due to inclement weather during Storm Dennis that resulted in the site flooding during civils construction and flooded again whilst the mechanical and electrical installations were underway.

Enabling Works: OSS was engaged as a subcontractor at this scheme. All Electrical and ICA enabling and installation work from/to the MCCs was designed and constructed by others. All earth bonding was also carried out by others. As subcontractor, OSS provided full details of its electrical requirements, including power connection and I/O details to the main contractor.

Multiple Work Disciplines: OSS was a subcontractor at this scheme and where required, we worked in close quarters with other work disciplines. For example, whilst working with Skanska and Arcadis design engineers, we were able to raise technical queries and also suggest alternative options to them for their due consideration. This form of collaboration led to a more open working relationship and helped with TQ response times. As part of the contract, OSS provided 24/7 support for the Skanska commissioning team and had several out of hours visits to the site to remedy unforeseen issues.

OSS worked closely with MCC contractor and Siemens to further develop the drive solutions.

The SCADA/PLC control system was designed and built at our premises. The Skanska commissioning team were engaged early in the process and through to factory acceptance tests. Collaboration between OSS, Arcadis and Skanska made for a better experience with particular reference to dry commissioning and assisting with resolving of Profibus installation issues and wet commissioning and assisting with resolving operational issues where tweaks are always to be expected. The system included:

- Seven fish screens and an actuator;
- Two washwater pumps, three pressure instruments and a flow instrument;
- Four high rate flow pumps with eight actuators 1600 l/s;
- Two low rate flow pumps, four actuators 600 l/s;
- Six penstocks wet well, three level instruments, two flow instruments, three pressure instruments;
- Four surge vessels, eight actuators, four level instruments, four pressure instruments; and
- Ten mains control/isolation valves.

Innovative Solutions: The Siemens medium voltage drives were interfaced to the Mitsi Q25-PRH redundant controllers via Profibus. Testing the Profibus interface within a medium voltage system was not practicable, so Siemens engineers were invited to our facility, in accordance with

Covid compliance, along with a Siemens emulator test rig. This allowed us to test, within reason, the bespoke code required for interfacing and functioning with the MV VSDs. Whilst this form of off-site testing was reassuring, further timing issues with the interfacing of the actual

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actual drives had to be resolved during the on-site commissioning period in conjunction with the Siemens engineers.

The pumps and motors (pump sets) were monitored for efficiency in terms of electrical power, fluid in/out temperatures and flow rates. The efficiency data was extracted from the efficiency monitoring devices using Anybus Profibus to Modbus protocol convertors. The most efficient pump sets were prioritised to operate above all others, as even a small percentage on these very large drives is a significant saving on operational costs over the year.

In addition, to solve the duty selection process; we recycled one of the standard function blocks used for sorting the filters due for washing on water treatment plant. The block was already sorting on a weighted number and with a little thought we were able to produce the desired 'locked for duty' selection outputs. This solution was fully tested in-house and signed off as satisfactory, ready for the factory acceptance test (FAT) with the client in attendance.

Internal/External Stakeholders: As the subcontractor, we communicated regularly with Skanska, 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 stakeholder 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 areas under our control.



Co-ordination of this work was carried out through the Skanska/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 engineers brought the experience and skills to the benefit of the project:

- Mitsubishi PLC control systems,
- Certified Servelec PRISM SCADA,
- Process control including PID Loop tuning,
- Sequencing, and
- ICA Electrical Installation and fault finding.

Throughout the scheme the OSS engineers provided 24-hour, 7 days a week support whilst the plant was being commissioned and acceptance tested including weekends.

This is above and beyond their normal daytime role and it is very much appreciated by our clients as it gives them the confidence to continue forward with the changeover process. It also helps build upon our reputation for providing a fantastic service.

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Customer Services Challenges: By collaborating closely with the PC and our client from the outset, we did not experience any customer services challenges. However, during the commissioning period, the main engineer on the project was not always available to attend site on the required dates. That was never an issue for us as we have engineers who are prepared to step in for another engineer to keep the project on track as we aim to please. It has been commented by others on how OSS engineers will go above and beyond that which is reasonably expected of them, aiming to provide a first-class service to our customers.

case study