

Poole STW

taking control: Wessex Water's £730,000 project to replace ageing control and monitoring system

by D. Mining CEng BEng (Hons). MIET

Wessex Water is a major utility providing almost 1.3 million customers with around 285 million litres of water a day, and takes away and treats over 481 million litres of sewage a day from around 2.67 million people at 405 treatment works. The company is responsible for a large number of assets, including a major sewage works situated in Poole, Dorset. First constructed in 1929, it was re-constructed during the 1950s to cope with increasing demand and with continuous growth since this time the works now supports a local population of some 170,000.



Background

Upgrading a process control system without disrupting operations presents real challenges in terms of logistics, planning and execution. When it is an essential public service such as a sewage treatment plant there is no room for error. This was the task facing the in-house engineering team at Wessex Water as it tackled a legacy control system upgrade at a major sewage works in Poole.

With the help of Siemens Industry Automation, not only was the project delivered on time and to budget, there was crucially no interruption during the upgrade to the essential service the site performs. Wessex Engineering and Construction Services (WECS) automation team is an in-house group that provides the majority of control and monitoring systems for Wessex Water, including detailed design, PLC software, SCADA/HMI configuration, telemetry and commissioning.

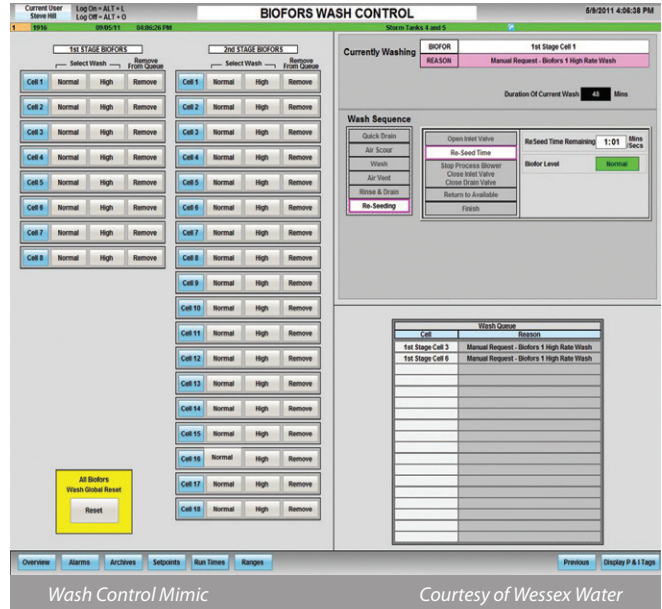
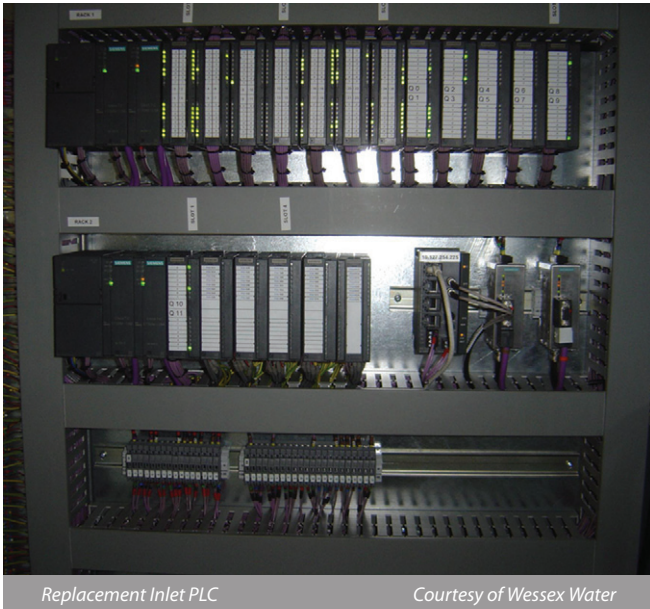
In 2009 Wessex Water entered into a framework agreement with Siemens Industry Automation for the provision of control and monitoring system components, including PLCs, HMIs, SCADA and other associated networking and communication equipment.

Existing system

The equipment that provided the control and monitoring functions for the Biological Aerated Filtration (BAF) plant, digestion and inlet works at Poole STW had been in use for over 20 years. It was beginning to suffer reliability issues, as well as becoming increasingly difficult to support in terms of software, maintenance and component supply. With a need to continually strive for process optimisation, deliver operational efficiency savings and ensure compliance with all legislative requirements, a replacement control and monitoring system would need to provide increased security, high functionality, high reliability and allow the easy identification and implementation of process improvements.

New equipment

The replacement control and monitoring system comprised redundant WinCC SCADA servers, industrial panel mount PCs as SCADA clients, redundant S7 400H PLCs, and an S7 319 PLC. Full use was made of redundant Profibus remote I/O. The fibre network infrastructure was enhanced to form a fault tolerant redundant ring. IT security was provided by the use of independent networks and firewall technology.



As well as replacing the existing control and monitoring system, it was decided to investigate the additional functionality of the Siemens equipment to provide a wide range of benefits. In particular, secure remote access to the SCADA system and the PLCs directly, better accountability through a system audit trail to show what was modified, when and by whom; automatic and regular backups to the system configuration and software, and the ability to automatically export data from the SCADA database to a remote corporate system.

Bringing in the expertise of General Panel Systems - Bristol-based specialist panel builders - to work alongside the Wessex Water team and Siemens, the existing control panels were re-worked and extended to make room for the replacement equipment. Many hundreds of cables were disconnected from one control system and re-terminated in another, presenting a significant logistic challenge.

Before the works could commence, the WECS automation team, led by David Mining spent a number of months addressing the development of standards for equipment, software and graphical user interfaces to be used with Siemens equipment, to support this project and other concurrent and future upgrades across the Wessex Water estate.

The site SCADA system

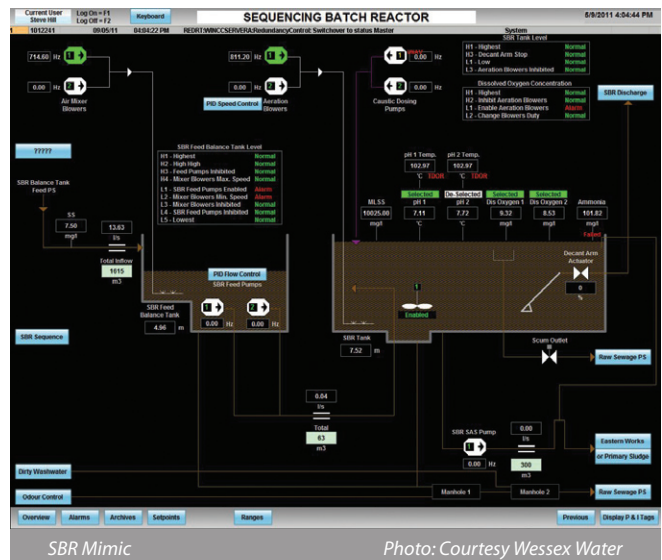
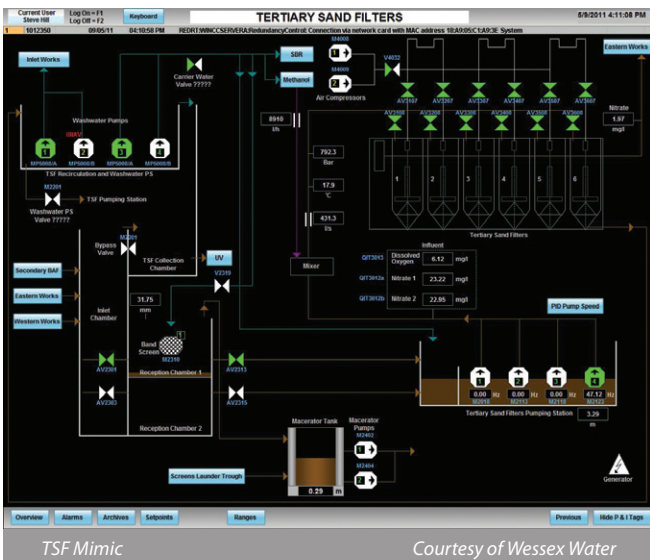
The existing documentation for the plant was not sufficient to allow the detailed development of the new control and monitoring system, hence much of the software was produced by careful reverse engineering of the existing software. The site SCADA system was completely replaced with a system that now contains nearly 30,000 tags, over 4,500 alarms and over 300 mimics.

Staged upgrade

As an essential works, the Poole sewage treatment processes had to be kept running at all times, as the major upgrade to the control system took place. To enable this, the in-house engineering team with support from Siemens and operations technicians devised an implementation strategy to minimise any disruption. The upgrade was staged to avoid having more than one area of the plant disturbed at any one time. Temporary control systems and partial manual operation of the plant were also employed

A Siemens S7 400H PLC system was utilised to increase reliability and to reduce risk. To minimise process disruption, the S7 400H system was developed as two independent S7 400 PLCs. Once completed, the two processors were brought together as a true redundant pair, so that each now offers full support for the other.

Software was developed to interface the new control and monitoring system with the standard Seprol telemetry outstation, as well as the PAKSCAN Rotork actuator network controller: approximately 200 valve actuators are controlled and monitored.



Each of the plant areas controlled and monitored by the new system were completely re-commissioned, including the testing of all SCADA and telemetry signals.

The development and installation of the new process and control system at Poole was delivered within the expected timeframes and on budget. The company now has a fully supportable control system that is driving efficiencies through its operation. Wessex has already implemented an improved inlet flow control regime at Poole, and is currently using the new control and monitoring system to analyse energy consumption for each process area with a view to carrying out further optimisation work.

Holistic visualisation

The new operator “overview” for the entire system ensures a more holistic visualisation for the entire plant, and quick and easy monitoring of essential parts of the plant’s operation such as inlet works, digesters and BAF is now to hand. The operations team also has speedy access to essential diagnostic information as and when they require it to ensure operations are maintained at all times and faults identified and rectified without undue delay.

With the pressure on to ensure services are constantly maintained, compliance is met and an ageing water industry infrastructure tackled, Wessex Water is seeing real benefit in terms of operational efficiencies and risk management with the highly reliable and efficient control system now set to support the Poole STW for many years to come.

The Editor & Publishers thank David Mining, Technical & Development Manager with Wessex Engineering & Construction Services (part of Wessex Water) for preparing the above article for publication.



400H Hot Standby PLCs

Photo: Courtesy Wessex Water