# Whitacre Hi Lift Pumping Station
automation maintains city water reserves at precise levels

S evern Trent Water's Whitacre High Lift Pumping Station which maintains reserves of fresh water for large areas of the city of Birmingham, was a legacy site that the company was keen to modernise. The key issue was identified as being able to ensure that the inflow and outflow of water always matched each other within a given tolerance band; the main goal being to ensure that the site had pumping capability at all times day and night.
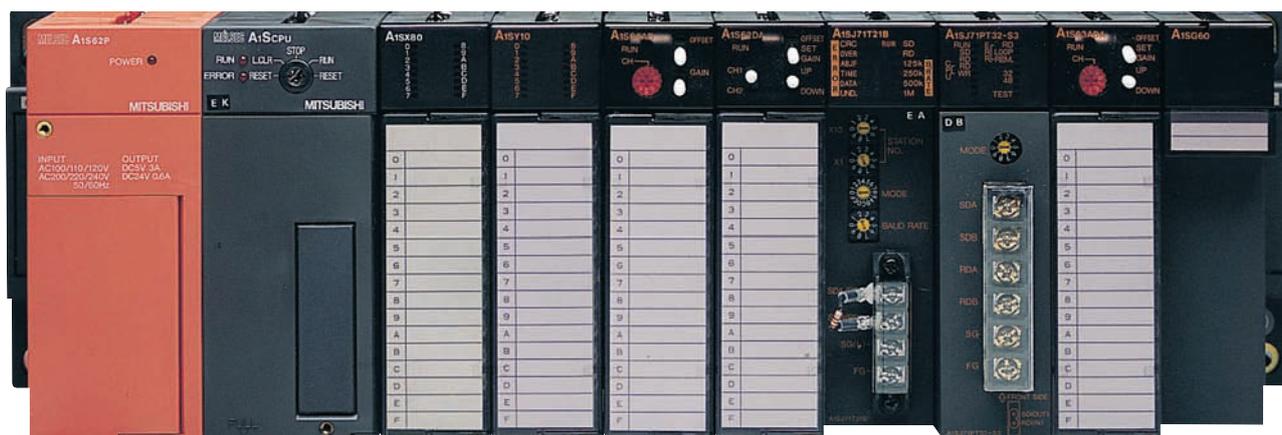
A series PLC *(courtesy Mitsubishi Electric).*

At the heart of the station are six variable speed pumps, two of 130kW, two at 250kW and two 630kW Their job is to pump water from the nearby treatment works, that gravitates into a contact tank, and extract water from a reservoir, ready to feed through on demand to the mainly residential area. Without regulation there is a danger that the tank will run dry or, more likely, overflow and flood nearby roads. If the tank overflows, it would almost certainly be necessary to significantly reduce flow through the treatment works – causing massive inconvenience and possible disruption to supply.

Solution
Solution has been a new control system consisting of a hot standby master PLC, connected to individual pumps' PLCs using a dual network. The system, based on *Mitsubishi Electric* automation equipment, was designed and installed by *Tyco Control Systems plc* Norwich, one of *Mitsubishi's* registered systems integrators, which was tasked with upgrading the plant from its original single-PLC set up.

To ensure availability of control it was decided to use a dual redundant, hot standby architecture for both the master PLC and the associated communication networks to the pump PLCs. Thus, if the active master PLC processor fails for any reason, the standby PLC processor takes control immediately with a 'bumpless' changeover.

The master PLC included two Mitsubishi Q4AR PLC processors, two power supplies and two CC-Link cards, CC-Link is *Mitsubishi's* proprietary open communications protocol. Each of the six pumps has a local PLC, consisting of a *Mitsubishi* 'A' series PLC, fitted with two CC Link cards, these PLCs receive commands from the master PLC and transmits pump status information. The operating regime is selected from an HMI communicating with the master PLC, from this the combination of pumps and their required operating speed will be sent via the network to the individual

pumps. If an operating pump fails, the master PLC will decide which available pumps can be operated to maintain the selected operating regime's requirements.

The status of all pumps, the flows and levels are displayed on the HMI. Also, the flows and levels are trended to enable Severn Trent operations to monitor the history of the plant over the previous twelve hours.

The HMI is a *Mitsubishi E900 HMI* which gives comprehensive graphic presentation of the pumps and their performance. It is a top of the range unit rugged enough for the harsh working environments and combines user friendly programming with powerful operational performance. The E900 has a large, wide angle colour TFT screen and upgradeable firmware so that the site can be kept at the cutting edge of display technology for many years to come.

Link to plant control system
The whole network also links to an existing plantwide DCS (digital control system) running ModbusII protocol. The interconnectivity of *Mitsubishi's* entire range of automation products proves itself on such applications as Whitacre, where there is already installed equipment that would become redundant if interfacing was impossible.

Severn Trent's Whitacre High Lift Pumping Station now maintains its water reserves for large areas of Birmingham to precision levels day and night, with the inflow and outflow of water matching each other within a given tolerance band, following this automation of its pump control system. ∎

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