

2. Water Works Control Optimisation

Distributed control system replacement for the water plants.

Start date: 02/2009

Progress: 03/2011: 3900 IO completed and successfully commissioned

End date: Completion 12/2011

Total inputs / outputs (I/O): 7800 IO

Summary

In a plant over thirty years old and which over time had implemented multiple systems, the client's need to replace the multiple, now obsolete control systems with one new integrated system, became evident. This changeover required online work to be conducted on a live plant.

The challenge: The project kicked-off in tandem with another critical interdependent project – the implementation of a new control room. This second project was stopped whilst in progress, requiring immediate amendments to the remaining project, namely; incorporation of changes in field routines and console design and many other late changes to scope. This heightened the already pressurised schedule, with the high possibility for errors due to the brownfields nature of the project. Despite the shifting landscape the project is following schedule, and is a successful implementation to date.

Key to success: Our ability to respond quickly to a changing and already complex environment and project dynamic has contributed greatly to the success of the project. This coupled with our extensive experience in brownfield facilities ensured a robust foundation that could withstand the many changes in scope and project conditions.

Primary responsibilities:


Engineering Management:

- expert engineering support and project leadership
- internal interface management between instrumentation and electrical (a major source of cost and schedule impact on many renewal projects)
- quality assurance and control of all design and engineering deliverables
- intimate understanding of client requirements, allowing for optimal combination of local, site specific and international specifications.

Project Management:

- generation of schedule to implement the system in phases and to manage the completion of designs and testing independent from the installation and commissioning phases
- management of engineering and design for subsections to budget and timeline, including ongoing monitoring

Highlights: This project has faced ongoing challenges; the loss of a critical sister project, late additions to scope, changeovers to a live brownfields plant. Our greatest highlight has been responding quickly to these challenges, ensuring that a tight schedule has been maintained with the highest level of integrity.



Project Deliverables

PRIMARY ENGINEERING AND DESIGN TASKS	CONTROL SYSTEMS DESCRIPTIONS	INSTRUMENTATION EQUIPMENT
<p>SIL reviews - identify trips which will be protected with SIFs and to assign SIL levels to each of those SIFs. Using layer of protection methods, HAZOP & SIL review</p> <p>SIL gap analysis – analyse and propose solutions to meet the SIL requirements on existing installations</p> <p>SIL loop design – perform SIL calculations in accordance with IEC61511 to develop and design all the identified SIFs to the required SIL levels</p> <p>SIL verification – verify that the installation complies to the SIL requirements in accordance with IEC61511</p> <p>Software “as-built” of current systems and control optimisation to new systems</p> <p>Application engineering for the new control systems (ESD and DCS)</p> <p>Assistance during the development of the HMI graphics</p> <p>Conduct factory acceptance testing (FAT) of new systems</p> <p>Flow sizing calculations; existing and new</p> <p>Control valve calculations; existing and new</p> <p>Specification of Honeywell DCS systems</p> <p>Specification of Honeywell ESD systems</p>	<p>The instrumentation provides for:</p> <p>Basic water treatment including clarifier control</p> <p>Hot lime softener treatment of raw water</p> <p>Fire system controls</p> <p>Ion exchange reactor controls</p> <p>Regeneration of ion exchange resins</p> <p>Sand filter based water filtration for supply to exchangers</p> <p>Safety shutdown systems for demineralisation and auxiliary units</p> <p>Various flow, level and temperature control loops including multiple cascaded control levels</p> <p>Motor control up to 6.6kV</p>	<p>Installed 15 Honeywell Experion C300 system controllers</p> <p>Installed 4 Honeywell Safety Manager systems to meet the SIL requirements</p> <p>Application configuration of the systems:</p> <ul style="list-style-type: none"> - 5700 hard I/O configured on the Experion C300 systems - 300 hard I/O configured on the Safety Manager systems - Developed 165 Sequences <p>Procure and install two new control consoles</p> <p>Design two new local control panels</p> <p>Decommission 7800 I/O</p> <p>Design 4500 new DCS I/O</p> <p>Design 450 new ESD I/O</p> <p>Purchase 102 instruments</p> <p>Design and install a fire detection system</p> <p>Design and install a gas detection system</p> <p>Design and install a fire and gas alarm system</p>

**PRIMARY ENGINEERING
AND DESIGN TASKS**

Instrument specification and technical evaluations

Detail design of electronic instrument loops

Detail design for the Instrument field installation including construction scope of works, evaluations of construction bids and adjudication

Interface with mechanical, piping, electrical and civil disciplines

Commissioning assistance

Specifications for fire system

Specifications for gas system

Cable sizing calculations

Specification of UPS DBs

Specification of SP&L DBs

Specification of transition boxes

Specification of changeover panels

Detail design of electrical infrastructure for new building

Detail design of primary UPS power infrastructure

Interface with panel manufacturers

Site assistance during construction and commissioning

**ELECTRICAL SYSTEMS
DESCRIPTIONS**

Electrical provides for:

Primary UPS distribution network

Small power and lighting (SP&L) in new buildings

Power for new HVAC systems

Earthing network integration

**ELECTRICAL
EQUIPMENT**

Install 20 new UPS distribution boards to replace old UPS DBs

Install 12 transition boxes to accommodate new UPS distribution network

Install 2 main distribution boards

Install 2 small power and lighting distribution boards

Install 4 upgraded MCC withdrawable buckets

Install 4 changeover panels