

Case Studies:

1. Boiler and Generation Renewal

Replacement of complete distributed control and emergency shutdown systems of 17 boilers and the upgrade and replacement of associated switchgear and UPS systems. A combination of contracting strategies were used on the various portions of the work – from engineering only to complete engineering, procurement and construction.

Start date: 07/2008

Progress: 03/2011 - 5 boilers successfully completed

End date: Completion 2015

Total inputs/outputs (I/O): 36 000

Summary

The boiler project commenced as an optimisation, aimed at upgrading the distributed control system. While the project was in progress the client expanded the scope to include the replacement of the relay logic systems with a new generation emergency shutdown system.

Proconics was tasked with this upgrade and replacement of all switchgear and UPS systems. Due to the integrated nature of the scope (E&I), Proconics was well positioned to successfully manage the interfaces.

The challenge: Re-designing and engineering the control and electrical systems of an existing boiler and power generation plant, under extreme operational pressure, with several disparate process technologies and a project schedule driven by the general business overhaul dates has proved to be challenging. Add to this an obsolete, poorly documented and complex brownfields environment and a turn-around completion period of 48 days – within an ever changing schedule.

Key to success: Responding to the client's key issues throughout the process has facilitated the success of the project; time, money, and delivering a solution for a complex, practically undocumented brownfields environment. Our proven project execution methodology has allowed us to accurately capture the truth of the current operations in detail, ensuring that design has taken place from a solid foundation. Opportunities arise often without warning, and the ability to respond requires a combination of considered planning, inspired engineering and unparalleled commitment.

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 independently from the installation and commissioning phases (the design and testing of the systems are planned ahead of the general overhaul dates)
- management of engineering and design for subsections to budget and timeline, including ongoing monitoring

Highlights: Managing a successful implementation under immense schedule and cost pressure in an operations-critical brownfields environment has been an underpinning highlight of the project. In addition the facility has not presented ideal conditions with space limitations present and the need for re-utilisation of cables from the field.



Project Deliverables

PRIMARY ENGINEERING AND DESIGN TASKS

As-built of existing wiring drawings, P&ID and instruments

Basic engineering

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

SIL gap analysis – analyse and propose solutions to meet the SIL requirements on existing installations

SIL loop design – perform SIL calculations in accordance with IEC61511 to develop and design all the identified SIFs to the required SIL levels

SIL verification – verify that the installation complies to the SIL requirements in accordance with IEC61511

Signal layout

System layout and design

Detail wiring design for new DCS and ESD

Instrument / electrical interface design

Specification of instrumentation for improved control and safety with new system

Construction scope of works

INSTRUMENTATION EQUIPMENT

Install 17 Honeywell Experion C300 system controllers

Install 34 Honeywell Safety Manager systems to replace old systems

Decommission 36000 I/O

Design 3500 new DCS I/O

Design 23800 new ESD I/O

Purchase 3740 instruments



SWITCHGEAR PRIMARY ENGINEERING AND DESIGN TASKS

Load flow studies for additional equipment

Fault studies for systems

Electrical protection co-ordination

Protection, metering and control logic creation and implementation

MCC automation specification

Functional component specification

Multi functional relay specification

Create incomer schematics

Create feeder schematic

Current transformer (CT) calculation and specifications

VT calculations and specifications

Intensive factory acceptance testing

Commissioning support

SWITCHGEAR SYSTEMS DESCRIPTIONS

The switchgear provides for:

Motor control centres:

- DOL
- REV/FWD
- dual speed
- static feeder

Profibus & LON control systems:

- instrumentation interfaces
- alarms
- ESD/DCS interface

SWITCHGEAR EQUIPMENT

Motor control cubicle:

18 renewals of total MCC boards

Installation of new hand switches

36 REM and REF relay installations and programming of logics

48 Insum (ABB) control relay installations and programming of logics

36 LON + Profibus gateway installations

18 ethernet gateway installations

40 LON + Profibus control systems

30 Rotork control systems

40 Dremo actuator control systems

20 interface panels

17 lighting distribution panels

UPS PRIMARY ENGINEERING AND DESIGN TASKS

Cable sizing calculation report

Load flow study report

Component sizing and protection grading report

Specification and purchase of new 20 KVA UPS units (complete with TRFs, batteries, isolators)

Specification and purchase of new UPS output intermediate distribution boards

Detail design for the electrical field installation including construction scope of works evaluation of construction bids and adjudication

Factory acceptance testing on equipment and interface with equipment licensor

Construction management

Commissioning assistance

Specification of UPS DBs

Specification of transition boxes

Detail design of primary UPS power infrastructure

Interface with panel manufacturers

UPS SYSTEM DESCRIPTIONS

Secondary distribution boards for:

- field instrumentation on each boiler
- burner management system
- the DCS/ESD systems of each boiler
- the electronic turbine governor controls

UPS EQUIPMENT

20KVA UPS units

60min Ni CAD battery banks

Steel stands for batteries

Battery fuse isolators (zone 2)

Input transformers

Output transformers

Bypass transformers

525V switchgear equipment

UPS output DBs