

PROJECT SUMMARY

DATE	2010	LOCATION	E-ON, Karlshamn Power Station, Sweden
SUBJECT	Retrofit of Control Systems for EO2 RR Olympus Generator		

Overview

E-ON operates a twin Olympus gas turbine generator (EO2) at their Karlshamn power plant in southern Sweden. The unit operates in simple cycle mode and is used for grid support and for black start of the main generators at the power station. The gas turbine was installed by GEC in the mid 1970's.

The Problem

The key requirements of the gas turbine to start reliably at short notice following long periods of being shutdown.

The existing control system fitted to the gas turbine consists of:-

- Off-engine servo valve controlling the swash angle of the on engine HP fuel pumps
- Relay based sequence control system.
- Analogue electronic AVR

The off-engine fuel control components were a major source of system unreliability. This equipment included a delicate hydraulic actuator which was susceptible to the aggressive environment of an industrial application, particularly in terms of fuel quality. Hydro-mechanical equipment is notoriously difficult to maintain and troubleshoot and being of an aero-space standard it is also very expensive to repair.



Figure 2 Posiflow fuel pump



Figure 1 Karlshamn EO2 Gas Turbine

The analogue electronic AVR and relay based sequencer were also prone to frequent breakdown. The system had very limited diagnostics which had the effect of extending the fault finding process. Ever increasing maintenance costs were being witnessed in order to achieve the start reliability.

E-ON employed TCL to supply a replacement control system because of their past experience with the RR Olympus and their ability to supply a tried and tested off-engine fuel system.

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The Solution

Replace the gas turbine control system with a modern state of the art microprocessor based system. In this case the Allen Bradley ControlLogix5000 range of PLC equipment was selected. This was configured in a simplex processor configuration with redundant ControlNet communications for key control signals. The new PLC replaced the existing off-engine fuel control and the relay based sequencer control equipment.

The on-engine fuel pumps were removed and replaced with the Posiflow off engine liquid fuel system which has been installed on numerous similar installations by TCL. This system uses a positive displacement gear pump driven at a variable speed by an electric motor and frequency converter. The gear pump is very rugged and ideally suited to an aggressive industrial environment.

The existing analogue electronic AVR was replaced with a digital unit, in this case the Basler DECS200N in a dual redundant configuration.

The following equipment was removed:-

- Hydro/electric fuel control
- Unit control panels
- On-engine fuel HP fuel pumps
- DC MCC boards
- Generator protection

The following equipment was installed:-

- New control panel suite
- TCL Posiflow fuel system
- Dual channel AVR DECS200N
- DC MCC boards
- Generator protection Siemens dual redundant system



Figure 3 TCL Karlshamn GT control panel

The equipment had to be compatible with retained equipment and adhere to the overall control system philosophy devised by Rolls-Royce and GEC.

Following successful installation and commissioning of the equipment the gas turbine start and operating reliability has significantly improved.