Turner ECS Case study

DIVING SUPPORT VESSEL UPGRADE – DIESEL ELECTRIC PROPULSION
SPEED CONTROL
- Isochronous load sharing
- Droop mode
- Bumpless switch over droop/isochronous mode

SYNCHRONISATION
- Auto/manual
- +/- 3Vdc voltage interface
- Raise/lower speed interface

LOAD SHARING
- LON load sharing lines check
- kW load sharing
- kVar load sharing
- kW load error check

DIESEL PROTECTION & SEQUENCING
- Start/stop sequence
- Alarm/shutdown handling
- Soft loading/unloading

UPGRADE OF ALL ELECTRIC ACTUATORS, SPEED CONTROLS, SYNCHRONISATION, LOAD SHARING AND DIESEL PLC MODULES.

Background
The Bar Protector is a 112 meter DP2 diving support vessel, sailing under Det Norske Veritas classification.

Parts obsolescence, engine instabilities and failures of the Barber Colman governing system were the reasons why Turner Engine Control Solutions received a turn key order to replace the complete governor system, speed control, loadsharing, synchronization systems and the PLC’s that controls the diesel engines.

The PLC’s were originally installed in withdrawable cabinets. All field wiring connections were made by connectors which made troubleshooting very difficult and time consuming.
Introduction
This vessel is equipped with five diesel generators. Each diesel generator is rated at 2.5MW and has a 6.6kV generator. The 6.6kV switchgear system consists of two sections, starboard and port side. Both busbar sections can be coupled by a tie-breaker which is normally closed under DP operation.

In brief, the upgrade consisted of several elements; engineering of software, production of electrical drawings, delivery of hardware, installation of hardware and commissioning of the complete system described below, numerous meetings technical and commercial, DP trial and FMEA tests were held and witnessed by Global Maritime and DNV.

This project threw up many challenges to our remit of ensuring work was completed on time and to the satisfaction of the client; very tight schedules, restricted working space, existing drawings that appeared not have been updated and major overhaul work being carried out on the diesel engines simultaneously with the upgrade of controls were a few of them.

Actuator
The obsolete Barber Colman actuators, type DYNC 16001-002-0-024 have been replaced by a Woodward Proact digital model III actuator.

The Proact actuator has an integrated driver board and has a status failure output contact. This output contact is fed back to the Atlas SC control system for supervision and alarming.

When the healthy status output signal from the actuator is de-energised the ATLAS SC will activate the “start next diesel” relay and at the same time the ATLAS SC will activate the fuel solenoid valve in order to stop the diesel engine (in unhealthy state) and pull the fuel rack to zero.
Load sharing system and synchronization

The functionality offered by the obsolet Barber Colman load sharing units, type DYNZ 80100 and synchronization unit, type DYNZ 10100 have been replaced by the Woodward ATLAS SC control.

The Woodward ATLAS SC control selected for this application consists of a smart core board, power supply board and a power sense board. The power sense board consist of two three-phase voltage inputs, two three-phase current inputs, a speed bias input, voltage bias output to the voltage regulator and a LON channel communication port.

ATLAS SC control

Together with the application software the ATLAS control will undertake the synchronization and load sharing. All ATLAS SC controls are connected through the LON communication port. By using the LON lines a load share error can be detected. In case a load share error occurs the applicable control will implement a bumpless switch over to droop mode and an alarm will be activated.

Software ATLAS SC

- Diesel start/stop sequencing
- Diesel protection logics
- Speed control algorithm
- Droop/isochronous logics
- Auto/manual synchronizing
- Soft loading & unloading
- Active load sharing algorithm
- Reactive load sharing algorithm
- Load share error detection
- Modbus HMI communication
- LON network communication
- Back-up overspeed protection

More information?
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Diesel PLC
The obsolete NEBB Startomat PLC’s had been installed in drawers. Over time the connectors have been damaged which resulted in unexpected shutdowns.

All functionality provided by the Startomat PLC has been converted and programmed into the ATLAS SC control. As the operators wanted to maintain the same mode of operation an HMI and a plate with start, stop and reset switches including indicators has been installed.

Local control cabinet
A Jaquet overspeed protection module has been installed. In the old situation the crew had the possibility to lower the actual overspeed trip set point by means of a potentiometer.

In the new situation, an overspeed test-switch is used to lower the actual overspeed set point to test the overspeed trip circuit.

By switching the local/remote switch to remote, the speed/load of the engine can be increased or decreased manually.

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