TURNER ENGINE CONTROL SOLUTIONS

WOODWARD Business Partner

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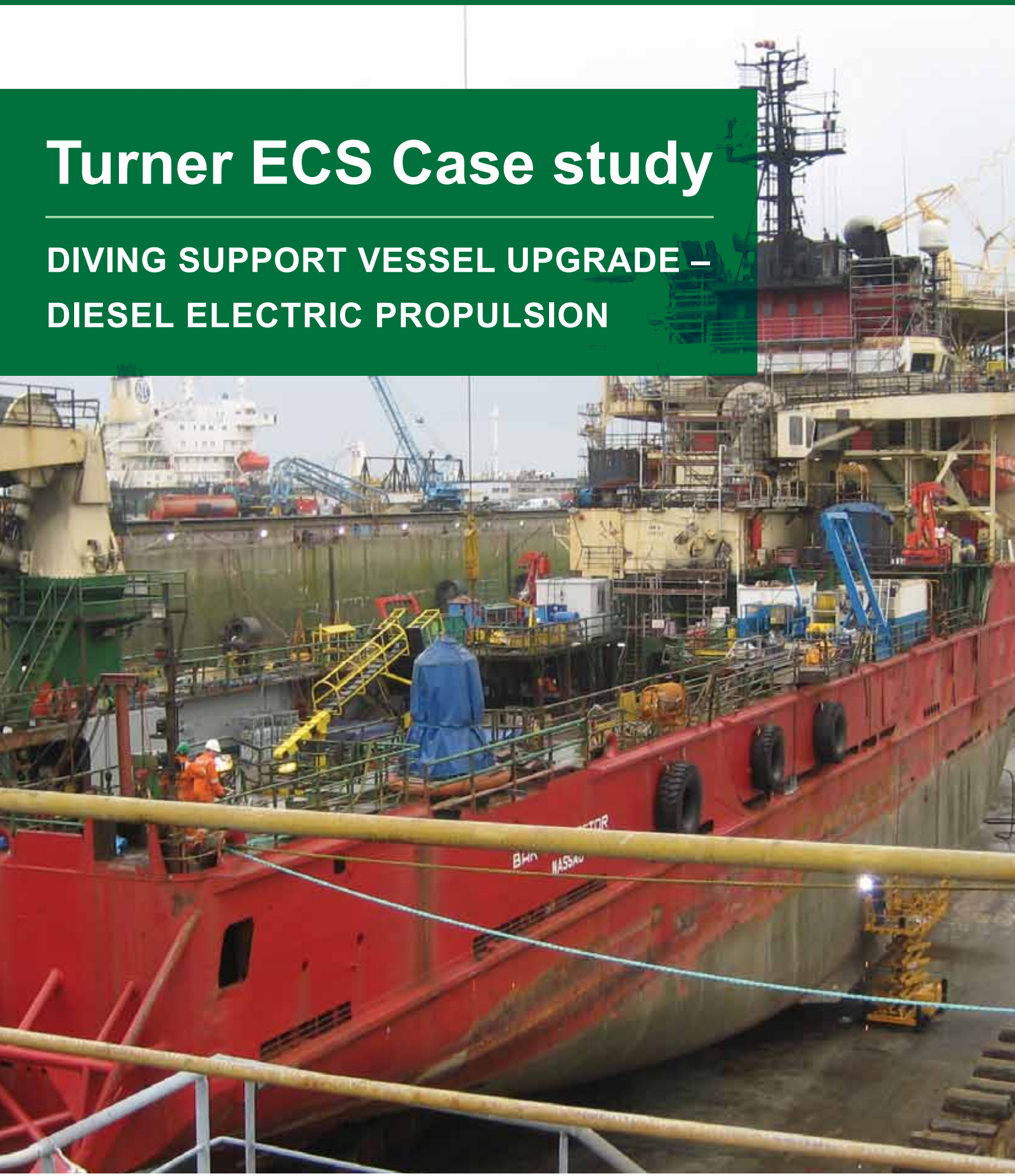
Turner ECS Case study

DIVING SUPPORT VESSEL UPGRADE – DIESEL ELECTRIC PROPULSION



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

Background

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

Parts obsolescence, engine instabilities and failures of the Barber Colman governing system was the reason why Turner Engine to replace complete governor system, speed control, loadsharing, synchronization system and finally the PLC's that are controlling the diesel engine has been replaced as a turn key project.

The PLC was installed in drawable cabinets. All field wiring connections was made by connectors which made it very difficult and time consuming for troubleshooting.

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

More information?

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Colmen actuator


Speed control

Introduction

This vessel is equipped with five diesel generators. Each diesel generator is 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 bus-tie breaker which is normally closed under DP operation.

In brief, the upgrade consisted of engineering, deliver of hardware, installation of hardware and commissioning of the complete system described below including FMEA - classification meetings and DP trials.

One of the challenges during the execution of this project was limited time and availability of working space to finish the job on time. The installation work was prevented by the fact that the diesel engines were overhauled simultaneous with the control upgrade.

Besides this during the upgrade it appeared that the existing electrical drawings were not 100% correct.

Actuator

The obsolete Barber Colmen 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 and pull the fuel rack to zero.

PRODUCTS USED:

PROACT ACTUATOR
- Healthy status output
- Software configurable
- Advanced diagnostics
- Marine listing
- Error logging
- PWM or mA speed setting

ATLAS SC CONTROLS
- Smart core board
- Power sense board
- Power supply board

Local operating panels
- Overspeed module
- Local control
- Raise/Lower

Human Machine Interface
- Touch panel
- Citect software

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Load sharing system and synchronization

The functionality offered by the obsolete Barber Colmen load sharing, type DYNZ 80100 and synchronization, type DYNZ 10100 has been replaced by the Woodward ATLAS SC control.

The Woodward ATLAS SC control selected for this application consist of a smart core board, power supply board and a power sense board. The power sense board consist of two three phase voltage, 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 take care for 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 switch bumpless over to droop mode and an alarm will be active.

Software ATLAS SC

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

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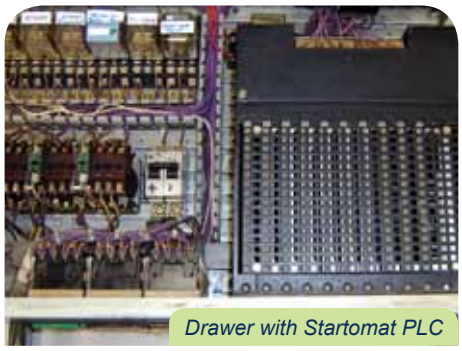

Drawer with Startomat PLC

New HMI & start/stop buttons

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 programmed in the ATLAS SC control. As the operators wanted to maintain the same operation an HMI and a plate with start, stop and reset switches includind lamps have 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 to remote switch, the speed/load of the engine can be increased or decreased d manually.

Old diesel control drawers

New control system after completion

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