

# Ships Power Management Upgrade Improving Legacy Controls (Woodward)

# TYPE OF PLANT

Rig Power Plant.

## **PRIME MOVER**

CAT3516 1925kVA 600Vac

- (5x) Main Gens
- (1x) Emergency Gen

## SYSTEM COMPONENTS

#### Woodward

Engine control system for

- Speed governing.
- Voltage regulation.
- Loadsharing, Baseload.
- Reverse Power Trip testing.
- Monitoring, Alarms & trips
- Electrical protection.

#### MSHS HMI

Operators tool to monitoring engine parameters, status and issue operator commands.

Main Menu	Gen	Bus Stat	us)		Gen: 1
Open / Close CB Control	kW kVAr	729 -420	Freq PF Amps	60.0 -0.87 270	Hz Lead
Generator	Generator M	ode: Loss of Co	omms (EG)	Emg Bus	Setpoint 602V
1	60.0Hz		60.0Hz		0.6Hz

**Woodward Toolkit** Toolkit service tools.

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Load		85 (90) 83				
	Engine Lood	0.61		474		
0 Leck	Expresent	+ N	95,8V			

The drilling rig has 6 CAT3516 diesel generator sets. Generators 1-5 are considered main duty generator sets, and generator #6 is the emergency standby generator set.

The five Main Generators are started and stopped by operations, and Auto synchronized to the Main Bus. Generators on the bus maintain 60Hz and share load equally.



In the event of a loss of power the emergency generator will start and connect to the emergency bus. The operator can auto or manually synchronize to connect the emergency bus to the main bus. Automatic load sharing is carried out anytime the multiple generators are on line.

## **PROJECT OVERVIEW**

The existing engine control system on this Rig was an obsolete PLC system, with very custom control modules where support and parts availability was nonexistent. The Engine Generator control was becoming unreliable, load sharing was poor and alarm monitoring was limited.

MSHS offered a new control system using Woodward generator controls which are supportable from anywhere in the world.

#### **MSHS Supplied:**

- System design
- Electrical drawings, software
- Parts
- Demolition, Installation and Commissioning
- System Testing
- · Improved performance and system availability
- Spare parts
- Operator Training
- Technical Support









Figure 1: Before Upgrade

After Upgrade

## STANDARDIZED DESIGN APPROACH

A modular design approach was taken to use standard off the shelf components with no custom hard to procure hardware parts.

## FLEX500 Programmable Controller:

- Load Control
- Alarm, Shutdown, Monitoring
- Engine Safety Systems
- Interface to the HMI

#### easYgen 3400XT Generator Module:

- Generator Synchronizing
- kW Loadsharing
- kVAr Loadsharing
- bus Synchronizing via
- LS6
- Data to HMI

## easYgen LS6XT Bus Tie Module:



- Bus Tie
- Synchronizing
- Data to HMI

## **HMI Operator Control and Monitoring**



- Start / Stop
- Idle/Rated
- Raise/Lower Speed/Volts
- Synchronize
- · Loadshare/Baseload
- · Reverse Power test
- Power Plant System
- Alarm and Trip
- monitoring



Figure 2: Generator System Integration Overview

## Basler DECS150 AVR Module:



- Voltage Regulation
- Excitation Limiters
- Data to HMI

## WAGO IO Module



• Expansion IO

## SEG HighProtec-2 Module:



- Over/Under Voltage Trip
- Over/under Frequency
  Trip
- Over Current Trip
- Reverse Power Trip
- Differential Trip