



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

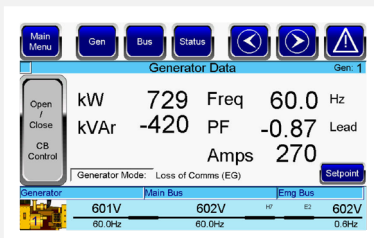
Woodward

Engine control system for

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

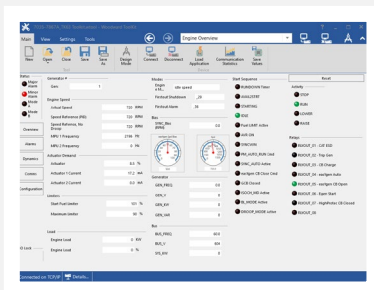
MSHS HMI

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



Woodward Toolkit

Toolkit service tools.



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.

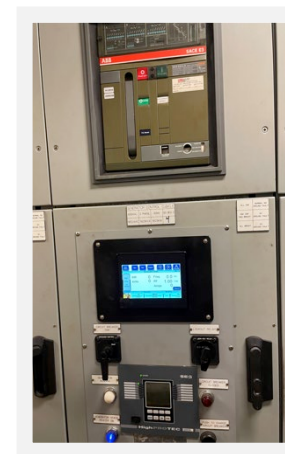
PROJECT OVERVIEW

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



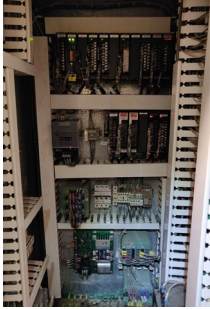


Figure 1: Before Upgrade



After Upgrade

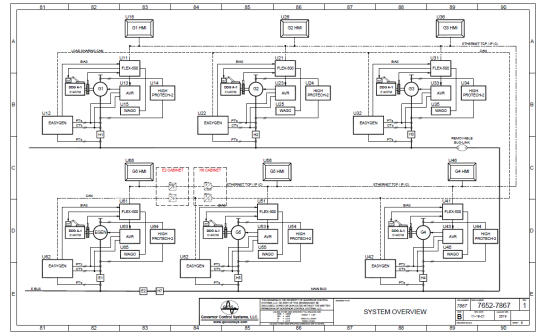
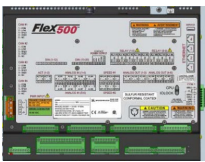


Figure 2: Generator System Integration Overview

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

Basler DECS150 AVR Module:



- Voltage Regulation
- Excitation Limiters
- Data to HMI

easYgen 3400XT Generator Module:



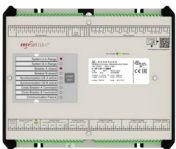
- Generator Synchronizing
- kW Loadsharing
- kVAr Loadsharing
- bus Synchronizing via LS6
- Data to HMI

WAGO IO Module



- Expansion IO

easYgen LS6XT Bus Tie Module:



- Bus Tie Synchronizing
- Data to HMI

SEG HighProtect-2 Module:



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

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