Power Management System Used on Vessel

Presented By
Jane GOH
Services Director
Type of Ship

1. Dry Cargo: Bulk carrier, Container ship, Refri Container ship, Roro ship, Heavy lift ship.

2. Tanker: Oil tanker, Chemical tanker, LNG/LPG carrier.


4. Support: Dive support, Fireboat, Supply vessel, Drill Tender, Tugboat.

5. Other: Cable laying ship, Crane Barge, Drillship, Fishing vessel, Icebreaker, Merchant submarine, Research vessel.

6. Yachting.
Cargo ship – Container ship
1. Emergency Electric Distribution

- **Diesel generator**
  - situation on the top of the ship
  - Low voltage, power between 300KW and 1 MW
  - use for emergency components, steering gear, radio, lighting, lifeboat, fire pump.
  - use to supply all auxiliaries to start one main generator: air compressor, fuel pump.
  - Automatic start when the ship lose the main power.

- **UPS**
  - power 20KW maxi
  - use for essential marine components
  - UPS type: online/offline

- **Batteries**
  - 220vDC or 24/12vDC
  - use for lighting
2. Main Electric Distribution

1. Low voltage 380v 50Hz or 440v 60Hz
   - Diesel generator
     - use for cargo ship when the power is below 3 or 4 MW
   - Shaft generator
     - use for bow and aft thruster and at sea for ship distribution.
   - Turbo generator
     - Exhaust gas boiler
     - Steam ship (LNG carrier)

2. High voltage 5.5Kv, 6.6Kv, 7.2Kv.
   - Ship with Diesel propulsion
     - Diesel generator use for power over 4 MW
   - Diesel Electric propulsion
     - Electric power between 20 and 110 MW
   - Gas turbine
     - use on cruise ship for electric propulsion
Power Mgt Systems, General Overview

- Simple ship

Available running modes:
- DG (Diesel Generator)
### Power Mgt Systems, General Overview

- **Shaft generator**

Available running modes:
- DG (Diesel Generator)
- SG (Shaft Generator)
Power Mgt Systems, General Overview

- Shaft generator with bustie breaker

Available running modes:
- DG (Diesel Generator)
- SG (Shaft Generator)
- Split (Diesels on left side, Shaft Generator on right side)
Power Mgt Systems, General Overview

- Diesel generators with bustie breaker

Available running modes:

- DG (Diesel Generators)
- Split (Diesels on either side operates independently from the other side)
Power Mgt Systems, General Overview

- Emergency generator / harbour generator

Available running modes:
- DG (Main Diesel Generators)
- EDG (Emergency Diesel Generator, main diesels have failed, tie breaker is open)
- Harbour (Emergency Diesel Generator is feeding the system alone, main diesels are stopped, tie breaker is closed)
Objectives of Power management

Main Task:

1. Control the load of the generators
2. Start and stop generators dependent on the power demand
3. Control synchronisation and load sharing in the plant
4. Make sure that blackouts do not appear

Benefits:

1. Keep generators running at the best efficiency
2. Keep number of starts and stops at a minimum
3. Equal running hours across all generators
4. Save money
An APPLICATION

By

SESG

CONOCOPHILLIPS NORTH BELUT PROJECT
PROJECT BACKGROUND

CUSTOMER:

PT. NIPPON STEEL CONSTRUCTION INDONESIA

PT. TECHNIP INDONESIA

END USER:

PT. CONOCOPHILLIPS INDONESIA
SYSTEM SOLUTION

ELECTRICAL CONTROL & MONITORING SYSTEM

MV SWITCHBOARD  LV PROCESS SWITCHBOARD  LV UTILITIES SWITCHBOARD  LV ESSENTIAL SWITCHBOARD  LV LQ SWITCHBOARD  LV WHP-C SWITCHBOARD  LV WHP-D SWITCHBOARD

CPP PLATFORM  LQ PLATFORM  WELLHEAD PLATFORM

SYSTEM FUNCTION:
- LOAD SHEDDING
- MOTOR CONTROL COMMAND
- MONITORING
- RECORDING (TRENDS, ALARM)
KEY CHALLENGES

- To complete customer requirement: load shedding if under frequency condition and fast load shedding when some generators fault

- To start/stop motor through communication within 2 sec execution time.

- Innovativeness using communication for around 500 Tsys-T to control motors using Sis Gateway device

- Develop HMI for control and monitoring includes:
  - Event handling
  - Alarm Handling
  - Event-time tagging
  - Trend & Archive Handling
  - Report
SOLUTION ADVANTAGES

- To start/stop motor and devices through communication

- An open ended and easily upgradeable solution (new devices, new communication, etc)

- Industrial PLC and remote IO modules enable:
  - specific automatic function,
  - analog digital information and other devices connection

- Standard communication (Modbus, Ethernet TCP) allows components linked to the system

- Standard data processing components and principles allow transferring data to/from other systems

- Intelligent Electrical Devices to protect, gathering necessary data for monitoring and control of electrical devices (ie: Tesys for motors, SEPAM as intelligent protection relays)
## SYSTEM SUPPLIES

### HARDWARE

- 3 HOT STANDBY QUANTUM
- 5 RIO DROP
- 501 TSYS T
- 16 SIS GATEWAY
- 43 SEPAM
- 2 SERVER
- 1 OPERATOR WS
- 2 ENGINEERING WS
- 7 MAGELIS XBTGT
- 80 Okken Panel

### SOFTWARE

- UNITY PRO XL
- 2 VIJEOL CICTECT SERVER 5000 PTS
- 1 VIJEOL CICTECT DISPLAY 5000 PTS
- SFT 2481, SEPAM CONFIGURATOR
- VIJEOL DESIGNER
- SIS CONFIGURATOR
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**LOAD SHEDDING**

**TEST MODE SELECTION**
- TEST
- NORMAL

**GENERATOR STATUS**
- G 6100 RUNNING
- G 6200 RUNNING
- G 6300 RUNNING

**SPOOLING RESERVOIR**
- G 6100
- G 6200
- G 6300

**WAX SPOOLING RESERVOIR**
- G 6100
- G 6200
- G 6300