

Machinery Monitoring and Control System Fuel Consumption Monitor

Martechnic-KittiwakeHellas Group

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instrumentation & control

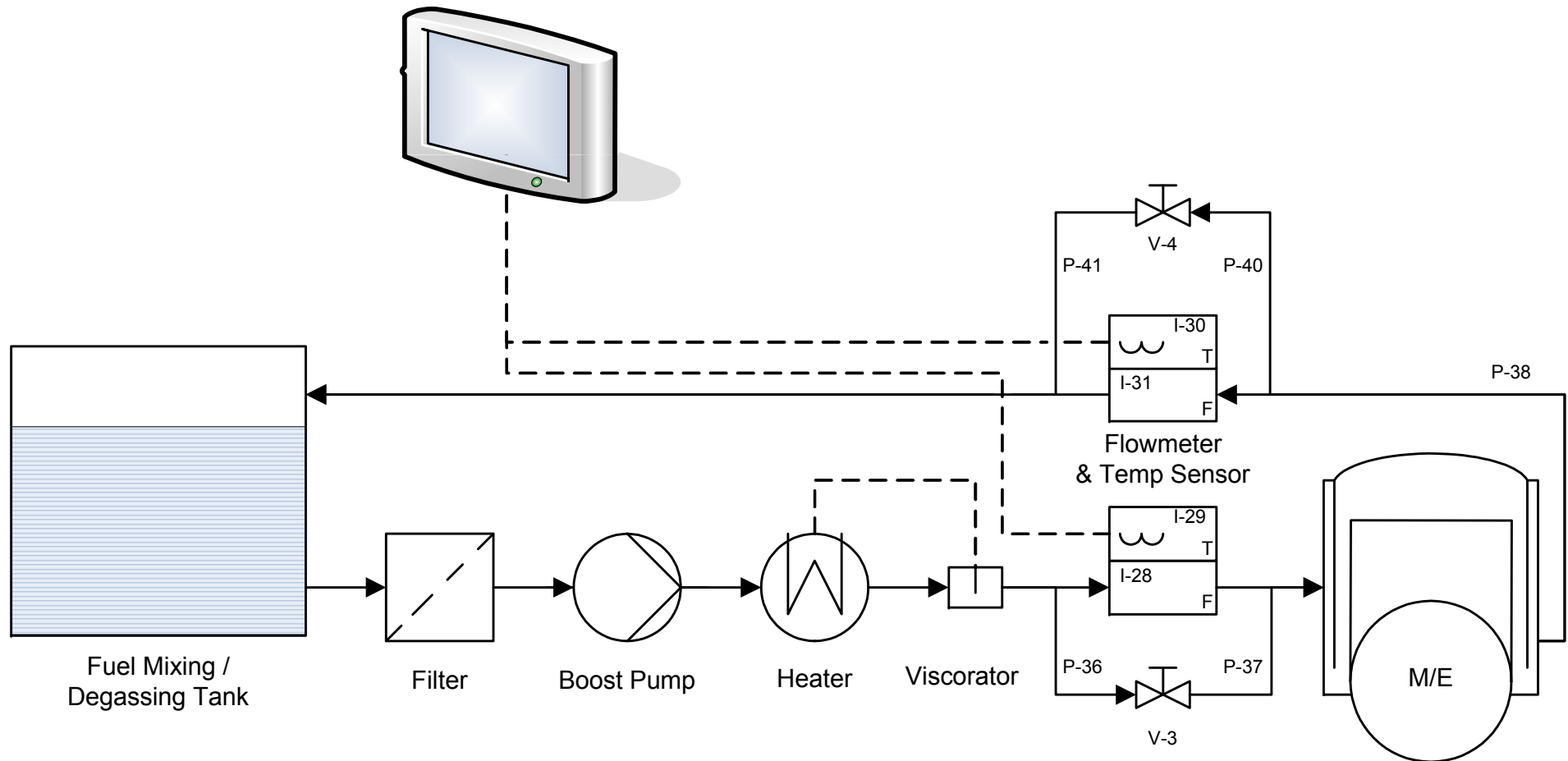
environmental control

naval engineering

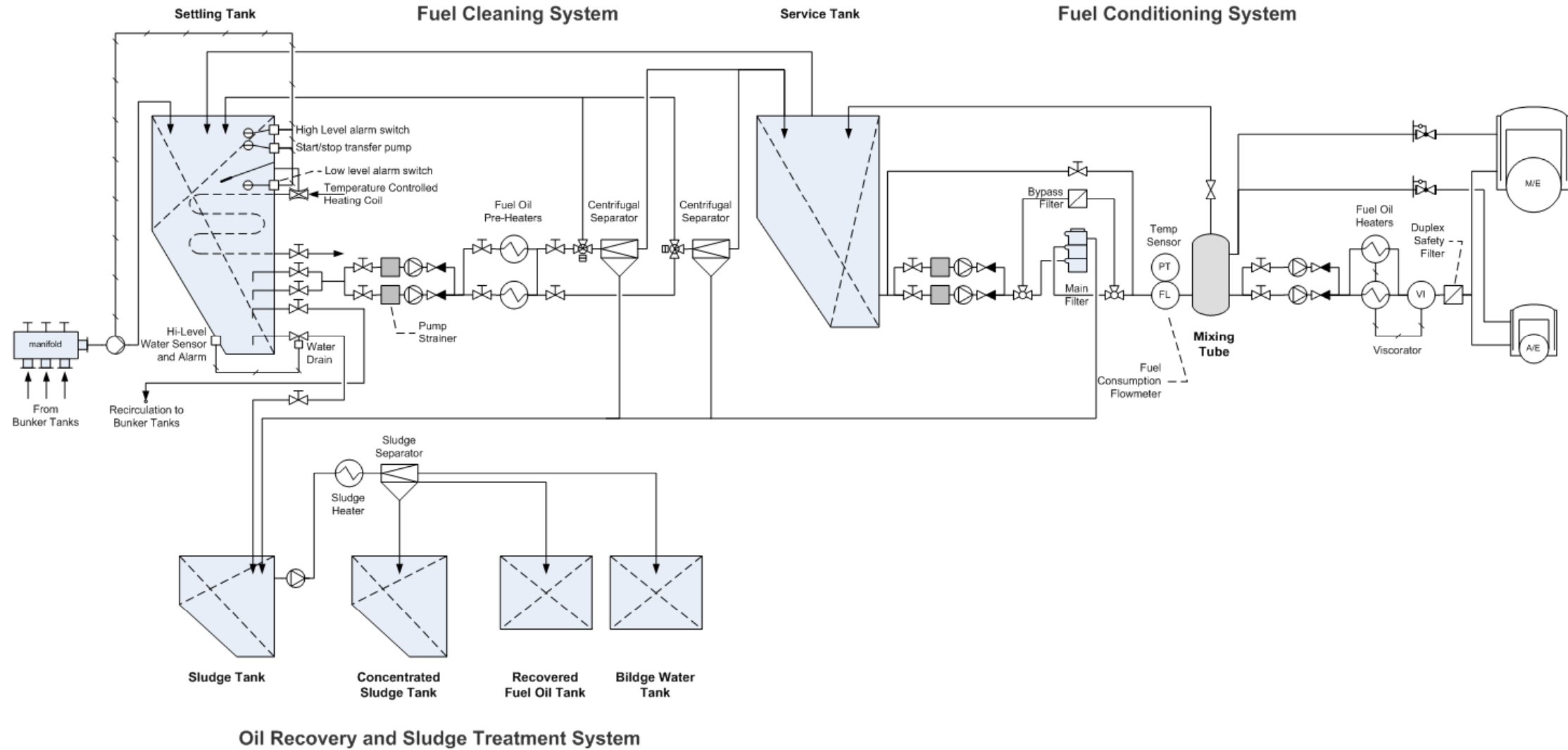
marine ip communications

- Kittiwake's MMCS Machinery Monitoring and Control System is the perfect automation solution for medium to large size vessels. It can be used as a stand-alone Machinery Control and Monitoring System as the Fuel Consumption Monitoring System, or the MMCS can be extended with Bunker Monitoring, Power Management, Cargo Control, Propulsion Control, Integrated Navigation and Dynamic Positioning functions.
- Kittiwake's Fuel Consumption Monitor is a modular system which by design is capable to monitor multiple engines and fuel types on ship.
 - Either it is about HFO and MGO, or one Main Engine and a couple of Auxiliary Engines for power generation, or more...
 - Or it is about a fuel supply pipeline, and a fuel return line, or any higher sophistication design...
- Kittiwake's Fuel Consumption Monitor may monitor continuously and with absolute accuracy any combination of fuel consumption information, per engine or per engines group
 - Current running consumption levels
 - Elapsed time consumption
 - Voyage Consumption
 - Historical averages

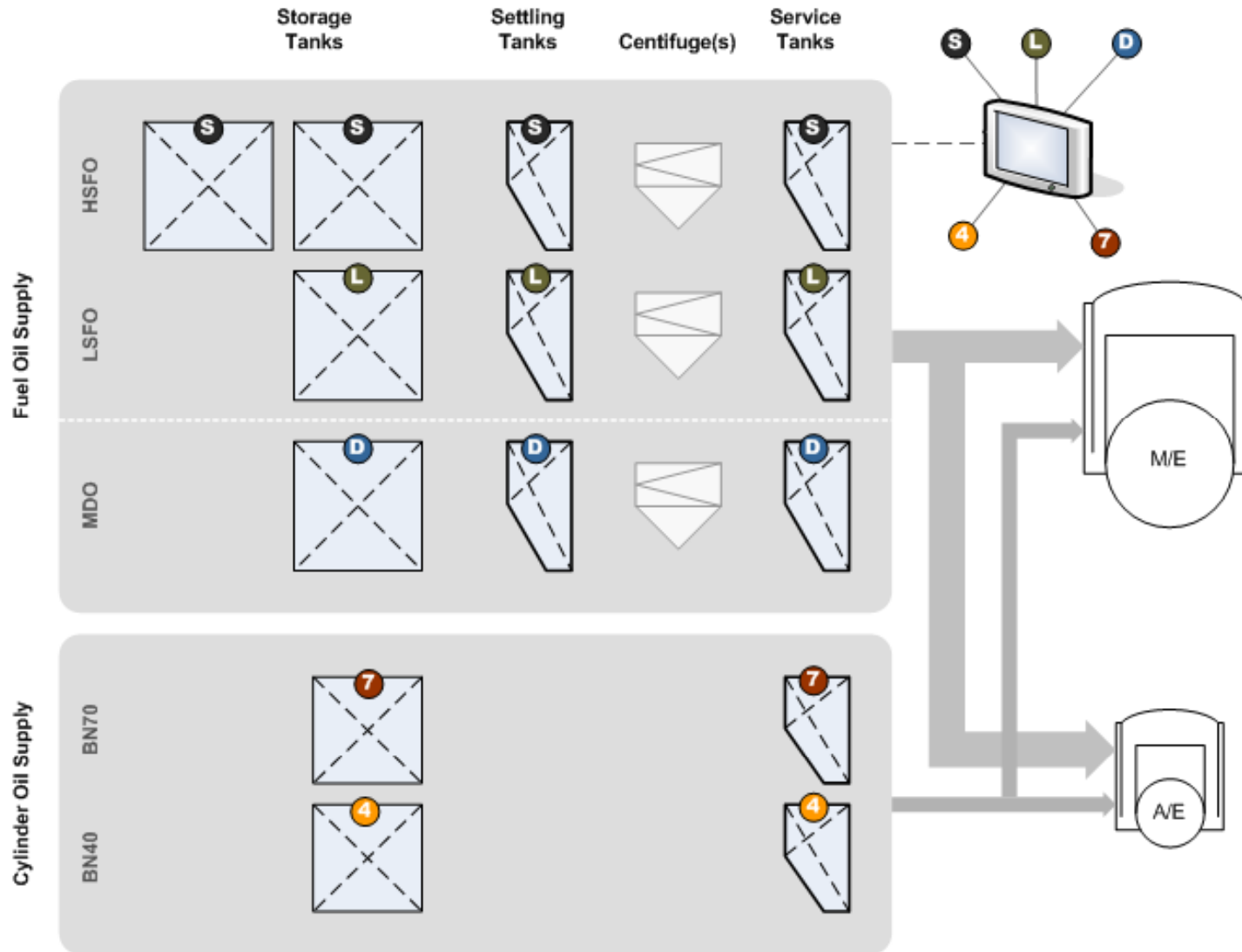
Principle of Operation and System Components



Typical Fuel Oil Treatment System



Typical Vessel Tanks Arrangement for Fuel Oil and Cylinder Oil





Machinery Monitoring and Control System

The Fuel Consumption Monitor, part of the integrated MMCS Ship Automation System is the most reliable and field proven automation system in the market due to the following facts:

- Operator Workstations built-up with Marine Personal Computers under Windows 7 (WES7) operating system and redundant Ethernet link.
 - Solid state disk is used instead of hard disk.
 - Main and optionally Back-up Workstation to further ensure safety and reliability.
- Distributed Processing Units built-up with Control Processors, I/O Modules and Serial Link Isolators.
 - A Control Processor is equipped with a redundant Ethernet link.
 - Each I/O Module has its own isolated sensor supply and earth fault detector.
 - A Serial Link Isolator can be connected to external equipment with a serial communication link.
- Whole system inter-connected by redundant Ethernet link.
 - Cabling with Star topology or Ring topology or a combination of Star and Ring topology.
- Whole system operating directly on 19–32VDC power supply, while all components have low power consumption rating.
- Uninterruptable Power Supply providing fail safe 24VDC output.
- Programming in accordance with international PLC programming standard IEC61131–3 (ST).
- Type approved by all major class classification societies

(*) typical

Operator Workstation(s)



Operator Workstations

- An Operator Workstation consists of a TFT color graphic screen, Operator Keyboard with Trackball, Marine Personal Computer and optional Printer. The Operator Workstation provides a reliable and user–friendly operator interface to ensure safe operation.
- The Operator Workstations are connected to each other via a redundant Ethernet link based upon UTP and/or S/FTP cabling.
- Two Operator Workstations, called the Main Server and the Back–up Server, are communicating via the redundant Ethernet link with the Control Processor with I/O Modules (Distributed Processing Units) and to the Extension Alarm System. This ensures a full redundant lay–out.
- Client Operator Workstations communicate with either the Main Server or Back–up Server Operator Workstation via the redundant Ethernet link.



TFT color graphic screens are used for Operator Workstations .

They are available in various sizes, depending of adequate space availability.

Popular sizes are:

- 17" and 19" with 4: 3 ratio
- 22" and 26" widescreen with 16:10 ratio

The Operator Keyboard with Trackball includes the following selection keys:

- Alarm summary page
- Group page
- Graphic page
- EAS page
- Acknowledge alarm
- Stop Horn

The Operator Workstations are extremely reliable and service friendly, with a high MTBF because of the following facts:

- Windows 7 (WES7) operating system and MMCS software installed on Compact Flash card.
- Software updates easily executed by exchanging the Compact Flash card
- Very low heat dissipation of the Marine-grade Personal Computer (25W).
- The Marine Personal Computer case is small (L=263mm, W=217mm and H=60mm) so it is not prone to vibrations and easier to install.
- The Marine Personal Computer, Printer and TFT screen are operating directly on 24VDC and are fed by the UPS.

Distributed Processing Units



- Control Processors with I/O Modules and Serial Link Isolators (also called DPU) are mounted on a DIN rail; positioned close to machinery, sensors and actuators to minimize cabling.
- The Control Processor is connected to the redundant Ethernet Link for communication with the Main and Back-up Server Operator Workstations and for communication with other Control Processors.
- Each I/O channel on an I/O Module has a LED indication and a channel identification text window. This can be used for back-up and local read-out of alarms and status.
- Each I/O Module is equipped with an isolated sensor supply in order to feed sensors. In addition, the I/O Module contains an earth fault detector.
- A Control Processor with I/O Modules fully executes control, alarm and monitoring functions even when no Operator Workstation is connected.
 - Programming of control functions is done via the programming language PAL1131 which is in accordance with international PLC standard IEC61131-3 (ST).
- Sensors and actuators are directly wired to the detachable terminal strips on the I/O Modules.

I/O Modules Available



- The following I/O Modules are available
 - Digital Input I/O Module
 - Digital Input and Relay Output I/O Module
 - Analog Input I/O Module
 - Mixed I/O Module with Analog Outputs
 - Configurable Inputs and/or Outputs (AI, AO, DI, DO, PI)
 - PMS I/O Module
- Each Control Processor supports up to eight I/O Modules.
- In addition, up to 4 Serial Link Isolator modules can be connected to the Control Processor for communication to serial link devices.
 - Serial interface links will be connected via the Modbus RTU or NMEA protocol (other protocols optional).
- Control Processors, I/O Modules and Serial Link Isolator modules are installed in DPU Cabinets or inside a console on a DPU DIN rail.

Will be carried out by “Kittiwake Hellas” and includes:

- I/O-Lists:
 - I/O-List will show Channel description, Sensor type, Range, Alarm limits, Delay time, etc.
- Project drawings:
 - With System overview, Mounting and dimension drawings and Connection diagrams.
- Documentation packages:
 - Manuals, Operator guides
- Project Configuration:
 - Consisting of customized Set-up, Mimics, Tank gauging presentation-layer software
- Mimic Diagrams:
 - will be made in accordance to the yard's or owners specifications
 - One time adjustment included free to the standard system price

More Vessel Subsystems...

towards an Intelligent Ship



Engine and Supporting Machinery

- Fuel Consumption Monitor
- Tank Level and Bunkering Monitoring and Control
 - ballast and service tank gauging
 - tank overflow protection subsystem
- Main Engine and Generators Monitoring and Automation
 - bearing wear monitoring system
 - crosshead & crank monitoring
 - cylinder liner monitoring
 - torque and power measurement
 - water in oil
- Engine Control Room and Peripheral Devices
 - pump room monitoring subsystem
 - HVAC monitoring and lifecycle management
- Power Management System
 - Primary Components
 - Diesel generator monitoring and control
 - Diesel engine safety and start/stop
 - Circuit breaker synchronize & connect
 - Bus line voltage and frequency control
 - Generator voltage and frequency control
 - Generator load in KW and %
 - Secondary Components
 - Symmetric or asymmetric load sharing
 - Load control with load shedding
 - Separation of alarm, control and safety
 - Single or multiple switchboard control
 - Heavy consumers management
 - Automatic start and connect after blackout
 - Automatic line frequency adjustment
 - Control of diesel electric propulsion

Cargo and Deck

- Stress and Stability, Loading, Anti-Heeling
 - cargo monitoring and control subsystem
 - water ingress detection system
- Bow Stem Slamming
- Navigational & Bridge Alarms Tracking
- Potable Water (Chlorine Level, Temperature)
- Safety System Watch
 - Emergency shutdown
 - Fire & Gas detection and protection
 - Process shutdown



We are always prepared to:

- **discuss** your needs
- **assist** you in planning forward a best practice implementation scheme
- Size and **configure** system alternatives, under fair cost approach
- Be flexible and **adaptive** to your own way of managing your fleet and the new builds operations

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End

Thank you



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