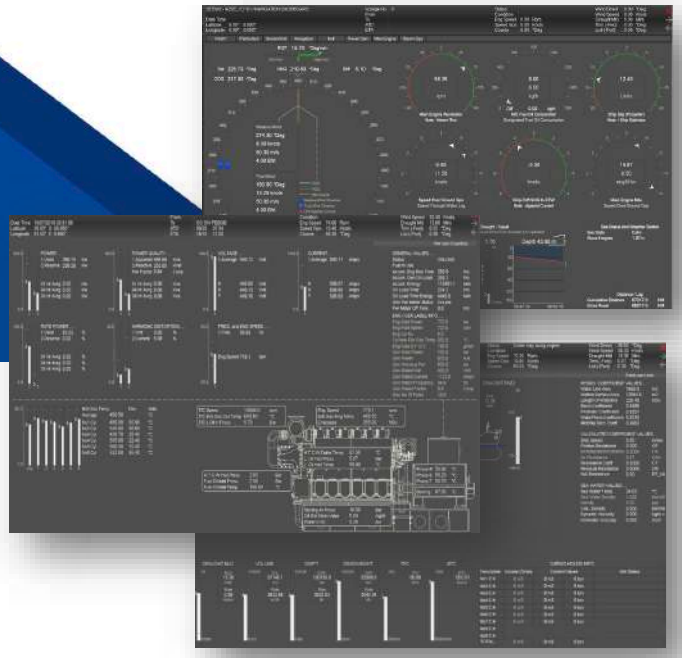
SELMA

Ship Electric Marine Control

ADVANCED CONTROL SYSTEMS



- SHIP DATA COLLECTION
- SHIP ENERGY EFFICIENCY VFD
- SHAPOLI (AUTOMATIC TYPE)
- TANK GAUGING SYSTEM
- AMS ALARM MONITORING
- VRC VALVES REMOTE CONTROL
- GAS DETECTION SYSTEM
- WATER IN OIL DETECTION
- ATMOSPHERIC OIL MIST DETECTION
- DEAD MAN ALARM SYSTEM
- WIND/MANINFOLD PRESS RECORDER
- BWTS/SCRUBBER AUX. PANELS

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SHIP DATA COLLECTION

Modern requirements and approaches for Fleet Management are focused on increasing the operational efficiency by continuously optimizing vessel performance. Fleet Management has become more challenging due to existing and future, pending regulations, the fluctuations of fuel costs, the ever-increasing and fast-adapting competition, the requirement for condition-based and predictive maintenance.

SELMA has developed an intuitive, intelligent, fully integrated Ship Data Collection System providing overall vessel's performance monitoring and allowing operators to implement targeted decisions to better manage and increase their fleet's performance, resulting to increased profits, optimal vessel performance and lower environmental footprint.

Fuel Oil Consumption

Precise Fuel Oil Consumption Monitoring of all Major Consumers
(Main Engine, Boiler & Generators Flow Meters)

Navigation Instruments Data

Extensive Monitoring of all Navigation Instruments for Operational Optimization and Benchmarking

Tanks Level Monitoring Data

Integrated Monitoring of Tank Gauging System
(Cargo, Ballast, Draught, Bunker Tanks)

MSB D/G Electrical Power Analysis Data

In-Depth Monitoring and Analysis of the Power Generation System

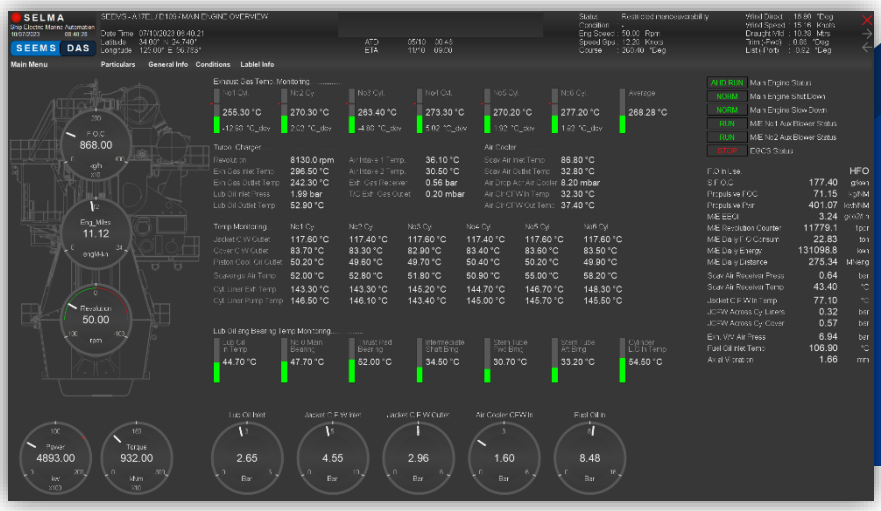
Emission Monitoring Data

Monitoring of Ship's Emissions and Evaluation of Environmental Footprint Limiting Actions.

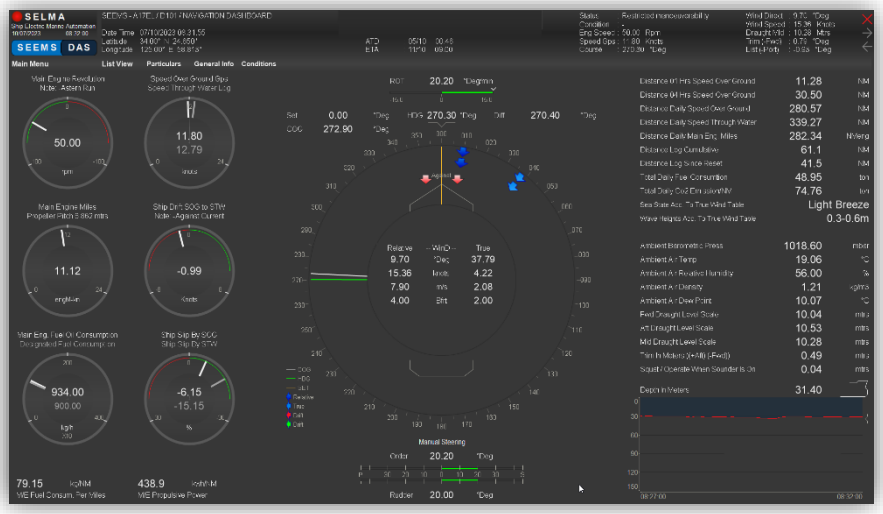
KPI Tracking

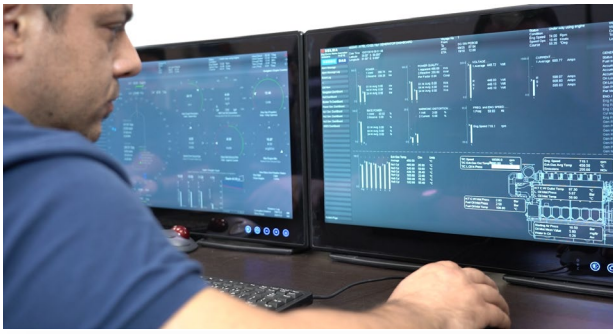
Tracking of all the Important Ship Performance KPIs
(Key Performance Indicators) and Optimization Factors

SHIP DATA COLLECTION & PERFORMANCE MONITORING



SELMA Ship Data Collection has a highly modular and flexible architecture and can be seamlessly integrated into new buildings and retrofitted to existing vessels, which can be fully customized to meet any varying degree of data collection and performance analytics requirements. SEEMS provides a compact comprehensive functionality for vessel performance monitoring, and it is ideal for shipping companies that do not intend to allocate and invest extensive resources on vessel performance monitoring.





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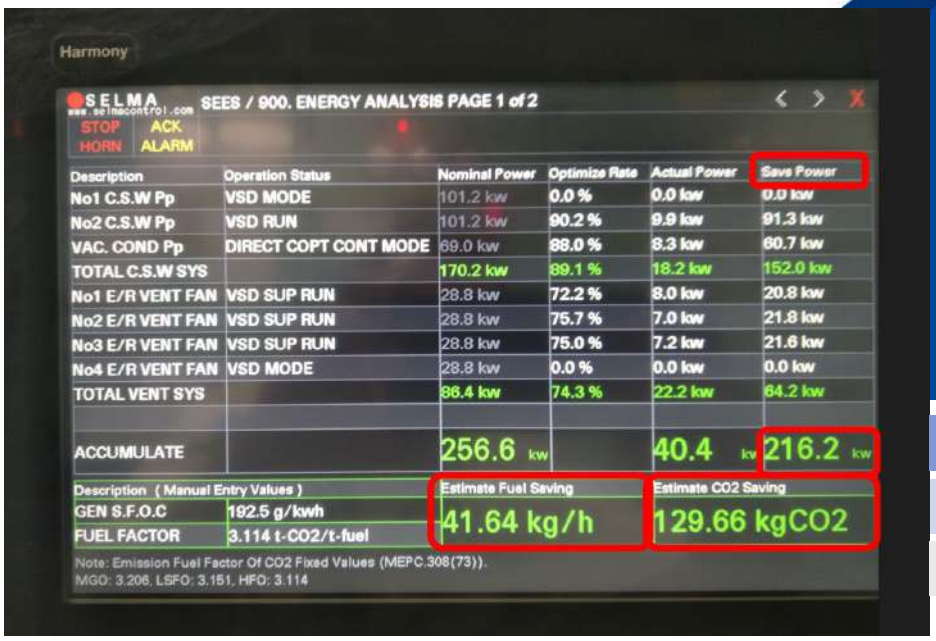
SHIP ENERGY EFFICIENCY VFD

SELMA SEES Ship Energy Efficiency System is a reliable method/application in order to reduce a vessel's fuel consumption by optimizing its power balance and in parallel by adapting the operation of the Cooling Sea Water Pumps and E/R Fans to the actual power requirements.

SELMA SEES offers a great opportunity to improve the vessel's energy efficiency by applying VFD Variable Frequency Drives in order to adjust the speed of centrifugal pumps and air ventilation system according to the actual process demand based on SELMA intelligent VFD Advanced Control Software/Algorithm.

AVERAGE POWER SAVING	
SHIP AVERAGE POWER REDUCTION	100 – 220 KW
AUX. ENGINES AVERAGE FUEL SAVING	0.7 – 1 TON /PER DAY
CO2 EMISSION REDUCTION	500 – 800 TONS/PER YEAR

SHIP ENERGY EFFICIENCY VFD (SEA WATER PUMPS & E/R FANS)



SELMA SEES is a unique system based on advanced control techniques in order to improve E/R Power balance and reduce D/G Fuel Consumption. The optimization of vessel's air ventilation and cooling water system involves Variable Frequency Control of the E/R Fans and the Cooling Sea Water Pumps (CSWP/P) according to temperature and pressure feedback signal from the process.

COOLING SEA WATER PUMPS

VACUUM CONDENSER PUMP

ENGINE ROOM VENTILTION FANS

SELMA SEES VFD ENERGY SAVING ON VLCC VESSEL

D/G POWER REDUCTION	**216 KW**
FUEL SAVING	**41 KG/PER HOUR**
EMISSION REDUCTION	**130 KG CO2 / PER HOUR**

SELMA SEES provides considerable energy savings of VFDs advanced control to E/R Fans and Cooling Sea Water Pumps with respect to the optimization of the vessel's air ventilation and central cooling sea water system. Compared to any system available in the market today, SEES provides supplementary advanced control features, i.e Vacuum Condenser Pump Control & M/E Blowers Control, resulting to even greater energy and fuel savings. Air balance and heat dissipation is based on ships specific operating profile in order to identify energy savings.

SELMA SEES Control System dynamically adapts the speed of S.W. Cooling Pump Motor in order to follow the optimal pump performance curve, according to the actual cooling requirements of the vessel in order to increase energy efficiency.

SELMA SEES VFD Control algorithm improves system dynamics regardless of the controlled plant as per ship particulars, ensuring safety and reliability. Power balance is improved leading to significant economic and operational benefits as well as emission factor reduction is achieved, verifying that a vessel can be greatly benefited by the **SEES** energy efficiency upgrade.

SHIP ENERGY EFFICIENCY VFD (WIND ENGINES FLETTNER ROTORS)

SELMA is proud to have successfully designed & developed the Intelligent Automatic Control System and Software Algorithms based on Variable Frequency Drive Switchboards for ANEMOI MARINE TECHNOLOGIES Flettner Rotor System on MV AFROS which is the world first Bulk Carrier fitted with Wind Engines Assisted Propulsion.

The evolution of the SEES Ship Energy Efficiency VFD (Variable Frequency Drives) System and the exploitation of its full potential is demonstrated and verified onboard the awarded vessel M/V Afros (LR Listing awarded as ship of the year for 2018) where SELMA SEES optimally controls its Flettner Rotors Wind-Assisted propulsion system in full coordination, leading to a minimal environmental footprint.

This installation acts as a technology demonstrator, as the whole system architecture follows the best practices to be implemented in future shipboard systems and its sophisticated control functions and algorithms optimize in real-time a multivariable control objective.

The Flettner Rotors take advantage of the Magnus Aerodynamic Effect through their rotation. The vertical Cylinders are installed on the Deck of the Ship and are rotated by Electric Motors with Intelligent Control of VFDs,

Through their rotation in the air flow the aerodynamic Magnus Effect is created, and the result is that the Flettner Rotors literally function as 'Mechanical Sails' thus assisting the propulsion of the vessel.

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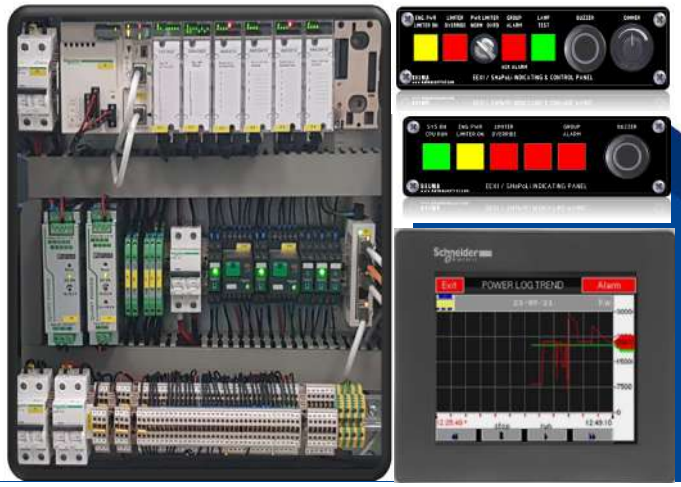
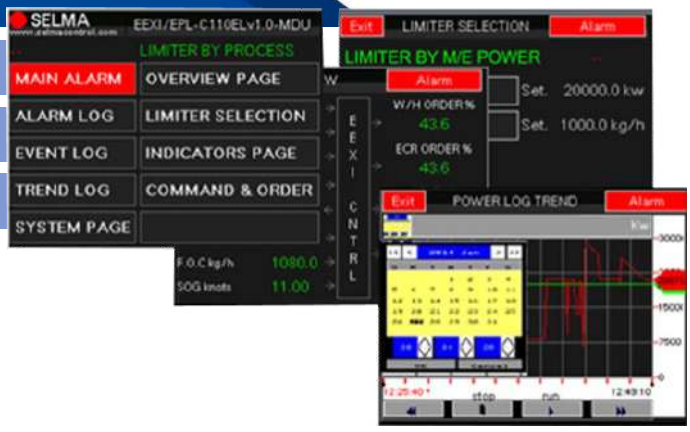


SHAPOLI (AUTOMATIC TYPE)

M/E FUEL OIL CONSUMPTION MANAGEMENT SYSTEM



AUTOMATIC SHAFT POWER LIMITER (EEXI)

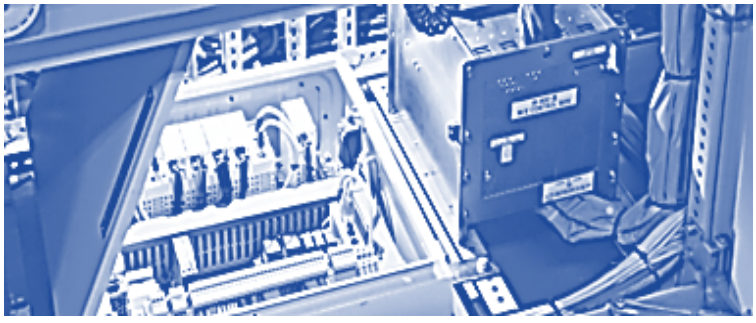
CONSTANT MAIN ENGINE FUEL OIL CONSUMPTION

CONSTANT SPEED (SOG)

SELMA SHaPoLi is presently one of the unique class-approved fully "automatic control type SHaPoLi" in the market which dynamically controls the ship's Main Engine rotational speed, for Fixed Pitch Propeller (**FPP**) vessels, and the propeller pitch, for Controllable Pitch Propeller (**CPP**) vessels, in real-time to achieve the power limitation requirements. The system's key design feature is that it can be seamlessly integrated into the existing infrastructure of any of the available Main Engine Propulsion Control and Governor systems. The system demonstrates universal applicability in terms of interfacing, and it is designed for integration with any combination of Main Engine model, engine and governor controls, and any shaft power/torque meter models commercially available.

Constant M/E Fuel Oil Consumption control mode offered by the **SELMA SHaPoLi** system allows the operators to achieve full management of the maximum allowed fuel consumption of the vessel in a fully autonomous and efficient manner. The advantages of this control mode allow for achieving of confident prediction and control of the fuel oil consumption, in line with the chartership agreements.

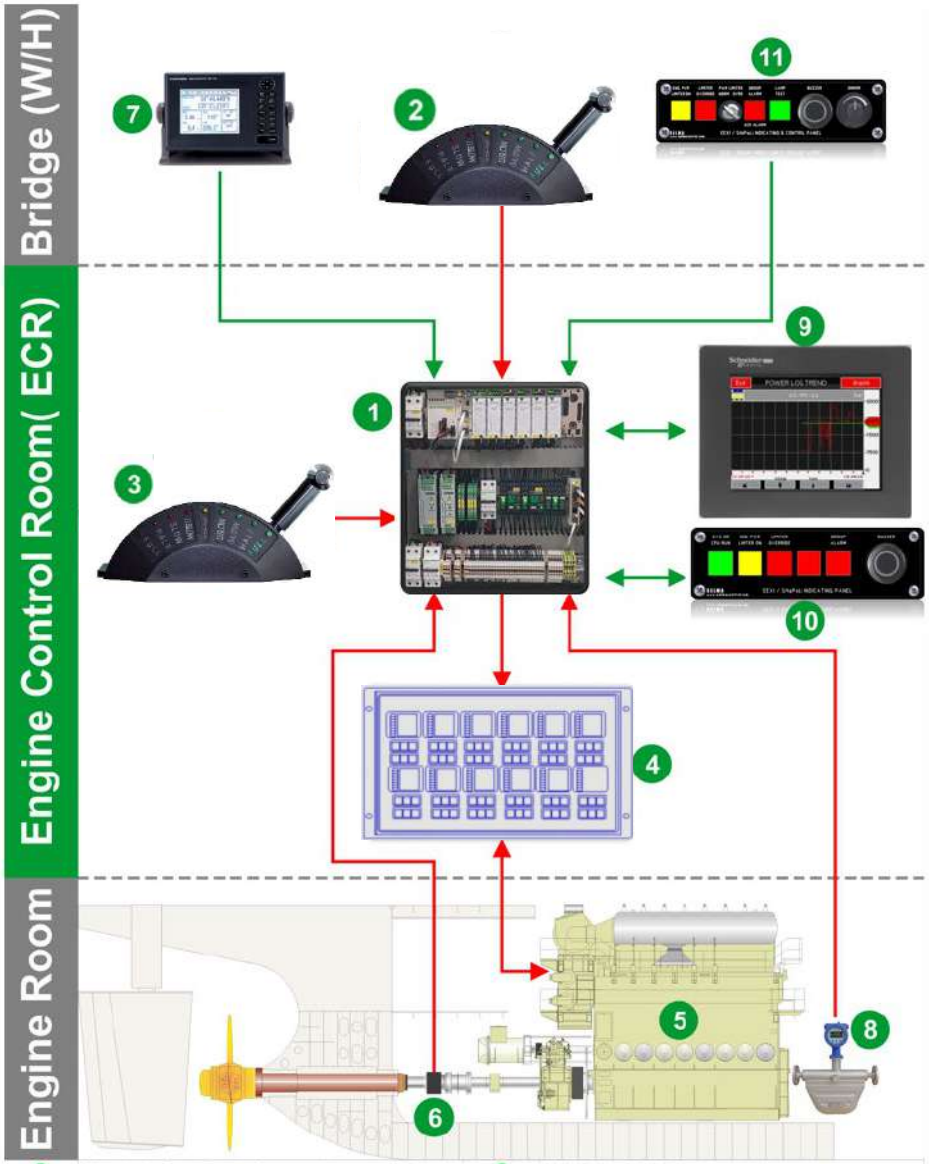
SELMA SHaPoLi during adverse weather conditions, this control mode allows for minimizing the wear and fatigue imposed to the Main Engine, the propeller shaft and its components in such adverse and unfavourable conditions. This standard feature, combined also with the vessel **Constant Speed** control mode, make the SELMA SHaPoLi system a complete and robust solution for both fuel oil consumption and speed management, available for the vessel's crew and its operators.



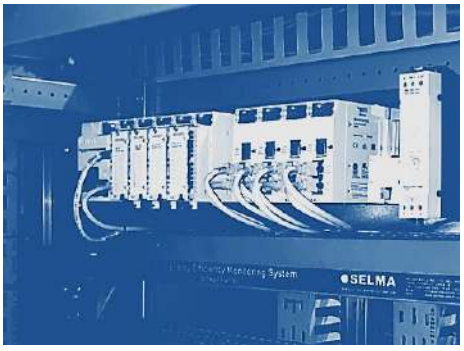
SHAPOLI (AUTOMATIC TYPE) M/E FUEL CONSUMPTION MANAGEMENT

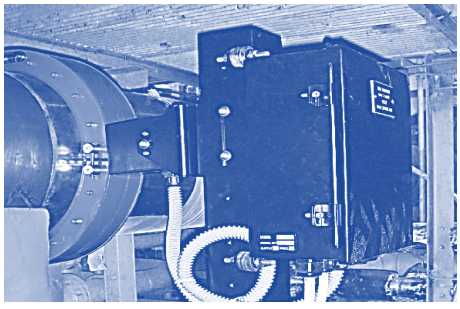
SELMA SHaPoLi is interfaced between Bridge & ECR propulsion control stations / telegraph transmitters & the Main Engine Governor and the Propulsion Control System.

SELMA SHaPoLi monitors in real-time and receives as control feedback the actual power output of the engine through the shaft power meter in relevance with the speed commands. When the engine's power output approaches the designated fixed EEXI power limiting setpoint, the SELMA SHaPoLi intelligent control logic automatically takes over and regulates the propulsion command to the engine, accordingly, bypassing the speed control levers and telegraph transmitter in order to limit the power output.



1	SELMA SHaPoLi Control Panel (MPU)	8	M/E Fuel Oil Flowmeter
2	W/H Telegraph / Speed Control Lever	9	SHaPoLi Main Display Unit (MDU)
3	ECR Speed Control Lever	10	SHaPoLi E/R Indicating Panel
4	M/E Governor and Control System	11	SHaPoLi W/H Indicating/Control Panel
5	Main Engine		
6	M/E Shaft Power/Torque Meter (SPM)		Feedback and Command Signals
7	Ship's GPS		Communication and Data Signals





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TANK GAUGING SYSTEM

CARGO OIL TANKS

BALLAST TANKS

BUNKER TANKS

DRAUGHT MEASUREMENT

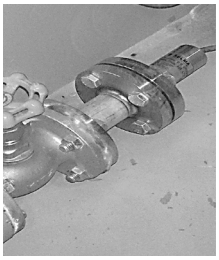
SELMA Tank Gauging System comprises Hydrostatic Level Pressure Transmission Sensors designed for new building & retrofit/upgrade of existing systems in combination with SCADA (Supervision Computing Data Acquisition) & (GUI Graphical User Interface) and is based on PLCs Platform where all the data from the Level Sensors are processed by Marine Workstations & Touchscreens performing tank gauging functions :

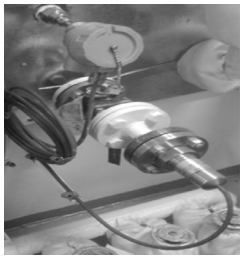
- Measured Values View / Data Logging
- Customized Reports Generation
- Working Pages
- Alarm (Hi-Hi, Hi, Low-Low, Low, Sensor Failure etc.)
- Trends & Bar Graphs
- Fine Tunning (Zero Span Adjustment)
- Manual Parameters User Input
- Secure User Access
- Historical Data

SELMA Tank Gauging System is designed customized as per ship's particular especially on retrofit/upgrade where the following standards are implemented :

- Suitably sized and specified to handle all the kind of I/O Signals
- Extended self-diagnostics functions
- Fully integrated safety functions and interlocks
- Seamless interfacing of the specified I/O signals equipment & instrumentation
- Standardized software development and deployment

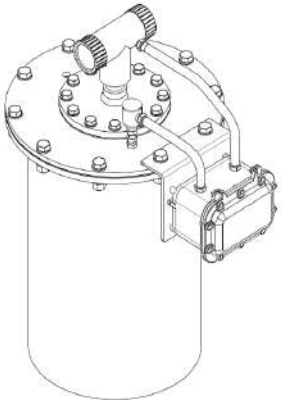
TANK GAUGING SENSORS (CARGO / BALLAST / DRAFT / FUEL TANKS)

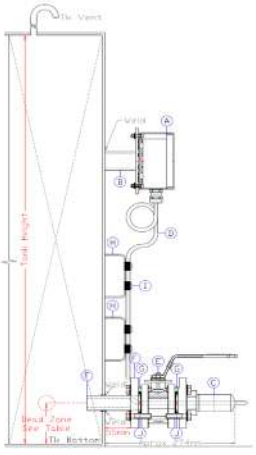




SELMA can provide a wide range of level sensors (flange type / thread side mounted / top submerged) according to tank specification and set high standards with combination of different transmitters technologies, housing materials, cable & sealing materials covering all the ship's type demands for accurate & precise measurements.

SELMA Level Sensors based on a rugged and reliable capacitive ceramic diaphragm the transmitters are qualified for measuring even small filling heights with high accuracy, due to different housing materials such as stainless steel 1.4571 (316Ti) for Oil Tanks or the special Nickel-Alloy CuNiFe for Sea Water Tanks in combination with several mounting methods.





SELMA Level Pressure Transmitters perform Tank Level Gauging with hydrostatic pressure that is applied on the Transmitter. The direct conversion of the pressure into an electrical signal is achieved by a minute deflection of sensor which changes the resistance of the bridge with the applied stress. Changes in pressure cause a corresponding change in the transmitter output in proportion to the bridge unbalance. A single electronic circuit supplies power to sensor receives its signal providing conversion into 4-20mA or HART Protocol. The method of mounting the transmitter varies according to tank configuration and sensors can be mounted either free or flange mounted submerged type.

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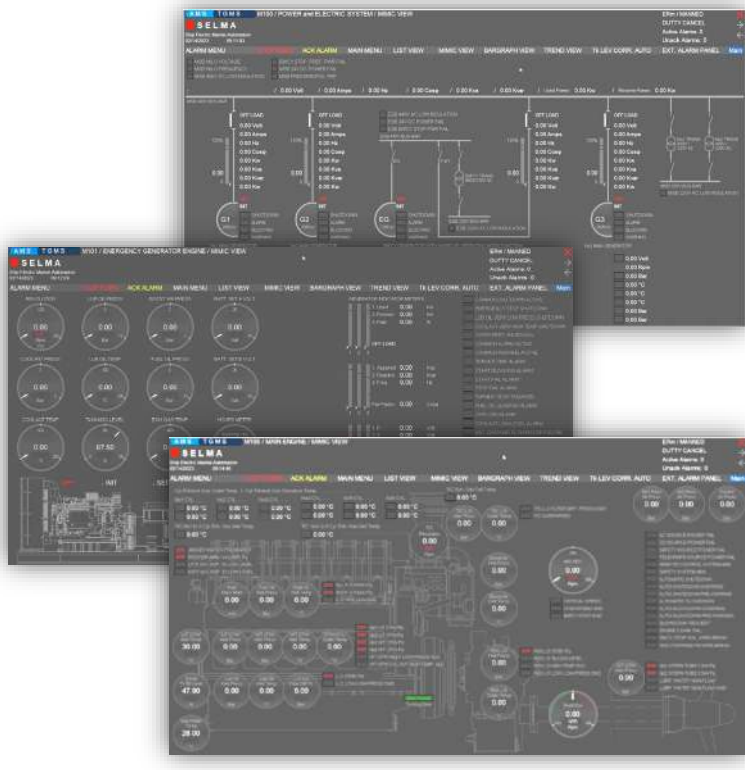
AMS ALARM MONITORING



SELMA AMS Alarm Monitoring system is an intelligent, fully integrated solution providing overall control, monitoring, and alarming functionality over the interconnected vessel's auxiliary systems, sub-systems, auxiliaries and sensors.

SELMA AMS fulfils the requirements for the acquisition of the UMS notation and allows the operators to have full operational awareness of the vessel's status, in order to implement targeted operational decisions, and easy operation of the system itself.

SELMA AMS comprises state of the art advantages :

- Facilitate Control System Design
- Increased Productivity
- Incorporate Recognized Standards
- Adaptive Development according to Ship Specific Particulars

AMS ALARM MONITORING

SELMA AMS relies on a 35 years experience on Retrofit & Conversion Projects in Marine Industry undertaking the replacement of Old / Outdated Monitoring Systems with PLC platforms/ SCADA state of the art heavy duty technology securing long lasting operation of Ship Condition Monitoring. **SELMA** engineering teams review existing installations and produce new interconnection drawings between sensors, plant and new monitoring platforms for wiring on the as fitted installations. The final Monitoring Platform solution is tailor made so that the on-board adaptation and installation meets vessel schedule and demands.

SELMA AMS scope of supply will comprise 2 Main Workstations Marine Type. One of the Workstations will be installed in the W/H and the other will be installed in the MSB Room at the E/R where both Workstations will be based on same technical specifications and will operate independently providing full redundancy for the AMS functionality. The whole system functionality will be available from both the Workstations. Each Workstation will comprise a Marine Industrial PC, a Marine Panel 24" Display and a rugged industrial keyboard and mouse. Interfacing with the various auxiliary systems, subsystems and sensors is performed via various PLC I/O stations throughout the vessel.

SELMA AMS implements supervision of Main Engines, Generators & Aux. Machinery meeting highest modern technology standards :

- Bar graphs & Value trending
- Multiline trends & Zoom-in trends
- Live data display
- Data Logging, Historian & Reporting
- User defined alarm setpoints
- Intuitive, interactive process displays (Mimic diagrams)
- Sensor failure detection & flexible Calibration
- Remote Data Monitoring Transfer to Owner Office

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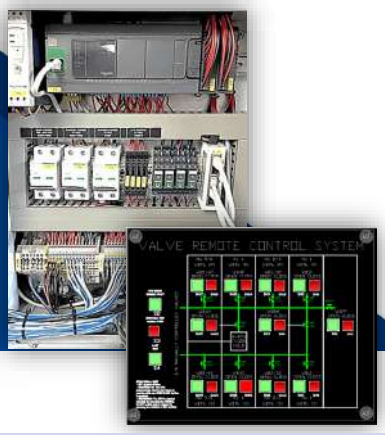
Ship Electric Marine Control

VRC VALVES REMOTE CONTROL

SELMA implements design, development & installation of **VRC** Valves Remote Control Systems tailor mad for the most demanding customized installations for any type of vessels.

BWTS BALLAST WATER TREATMENT VRC MODIFICATION

SELMA implement customized compact design of BWTS Ballast Water Treatment System VRC Valves Remote Control System based on double acting hydraulic actuators as retrofit to existing HPU or stand alone electrohydraulic power packs and valves.



DEWATERING SYSTEM BULK CARRIERS MODIFICATION SOLAS XII/12 & IACS SC179

SELMA implement design/development of Dewatering System based on Electrohydraulic Power Pack for valve remote control located on forward void spaces and comprises hydraulic double acting actuators & IP Electric Valves in compliance with regulation SOLAS XII/12 & IACS SC179 for Bulk Carriers.

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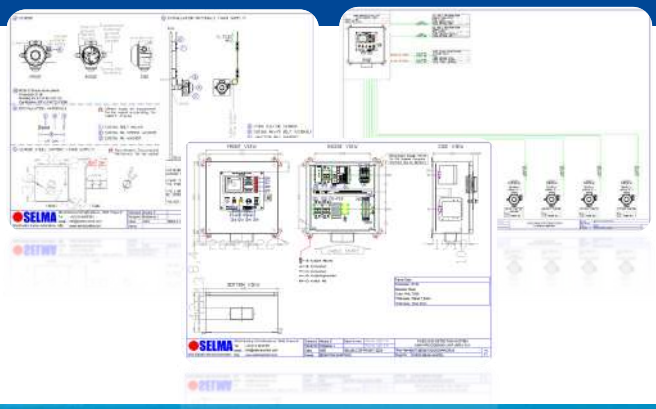
GAS DETECTION SYSTEM

SELMA Gas Detection Monitoring Alarm System implement continuous, area & personnel supervision / protection and it is designed to alert crew of the potential danger of poisoning by the toxic gas exposure, asphyxiation due to lack of oxygen or explosion caused by combustible gases.



SELMA Gas Detection Monitoring/Alarm System is integrated/comprehensive and fulfil Ex-proof requirements for the hazardous operating area. The oxygen concentration is sampled by two (can be extended to up to eight) fixed oxygen sensors situated in the area to be monitored. It consists of one cabinet including all electronic equipment, alarm relay outputs, terminals for O2 sensor connections along with system's indication lights/buttons/system buzzer and the operator's touch panel in the front side (removable for console mount). The system cabinet is located in safe area, typically in the cargo control room. Intrinsically Safe box is available as part of the system and can be delivered depending on system requirements.

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ATMOSPHERIC OIL MIST DETECTION

OCIMF SIRE 11.25 – IMO MSC / Circ.1086
"Code of Practice for Atmospheric Oil Mist Detectors"

SELMA Atmospheric Oil Mist Detection System is designed for Tankers & LNG Ships complying with OCIMF Requirements for supervision in the area of Hydraulic Power Packs. In particular the system reliably detects an oil mist in the atmosphere of the Engine Room / Hydraulic Room before it can reach saturation levels that cause a risk of fire.

In order for the ship to determine suitable positions for mounting the detectors a smoke test is required to verify air movement. In general, air will move towards ventilation extractors and turbocharges so the detectors will be positions as close as possible to the machinery

According to OCIMF SIRE 11.25 in case that a vessel is fitted with deep well pumps driven by hydraulic pressure packs, pressure in the transmission pipes can be very high. In case that the aggregate pumps are located within the engine compartment it is advisable that the Atmospheric Oil Mist Detector should be installed.

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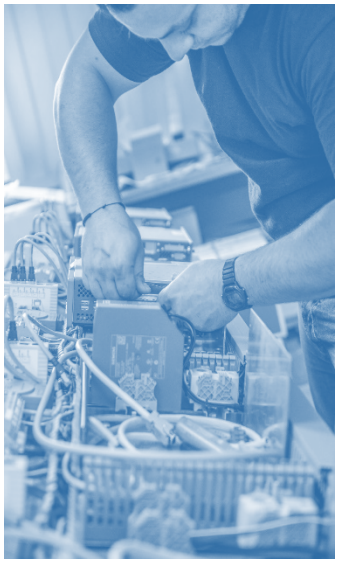
WATER IN OIL DETECTION

- MAIN ENGINE LUB. OIL SYSTEM
- GENERATOR LUB. OIL SYSTEM
- STERN TUBE LUB. OIL SYSTEM
- MAIN LUB. OIL PURIFIER
- GENERATOR LUB. OIL PURIFIER
- STEERING GEAR OIL SYSTEM

SELMA WIO Water in Oil Monitoring & Alarm System is designed to detect Water Contamination in any kind of Oil or Fuel in the marine industry. SELMA WIO System performs monitoring/recording of the amount of moisture contained in vessel's Main Engine Oil feed line. Conventionally, water in oil has been measured by a method of determining the moisture content of a sample and expressed in ppm, which is the total absolute water content, thus not giving any indication whether water is dissolved or free. However, due to differences in oil types and difficulty in predicting aging effects, ppm values are often not sufficient for setting alarms in control systems and relative values like water activity (expressed in aw) is used instead. Water activity is the partial vapour pressure of water in the oil or fuel divided by the standard state partial vapour pressure of water.



The working principle of the sensor is based on capacitive measurement operating on absorption of water in the oil. The physical measured value is the so called "water activity" value aw. New oil has the ability to hold a certain amount of dissolved water. The maximum amount oil can hold is called "saturation point". Above the "saturation point" free water will fall out which can cause corrosion in the machinery. The "saturation point" is influenced by temperature and other various factors like composition if mineral or synthetic, formulation of additives and will change during the lifetime of the oil. The sensor measures the dissolved water content in the oil and gives alarm if more water than fixed as PAV (Pre-Alarm Value aw) or MAV (Main Alarm Value aw) are measured.

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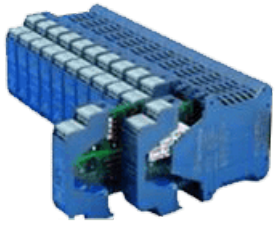
EXXON CCR MANIFOLD PRESS RECORDER

ExxonMobil MESQAC H28 it is strongly preferred that the vessels should be fitted with a device in CCR capable of monitoring/recording the load and discharge of manifold pressure outboard of each port and starboard manifold valve

SELMA Manifold Press Recorder & Alarm Integrated System comprises new pressure sensors located on manifold local gauges or interconnected with any type of existing pressure transmitters implementing recording/data log/alarm in CCR. The system comprises state of the art ATEX Marine Pressure Transmitters (IP67 Weatherproof) and heavy-duty Main PLC / HMI Touchscreen Control Panel in combination with EX Isolation Barriers in order to secure Intrinsically Safe Installation.

SELMA Manifold Press Recorder & Alarm Integrated System is designed to perform installation under sea going condition without requiring welding by the use of only mounting threads where the new pressure transmitters are fitted with isolation valves on local gauges of manifold outlets.



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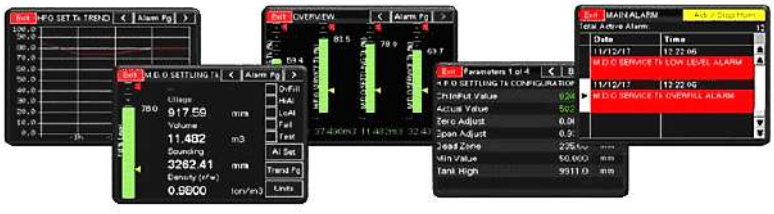
EXXON CCR BUNKER TANK LEVEL ALARM

SELMA Tank Gauging System comprises Independent ATEX IP68 High Level Switch Sensors & Hydrostatic Level Pressure Transmitters for Bunker Tanks with Remote Tank Gauging/Volume Calculation & Alarm System in CCR.

ExxonMobil MESQAC H17 : Tank Level Measuring Devices MUST be available for all cargo tanks, slop tanks and bunker tanks (including Storage, Service & Settling Tanks). Automatic Fixed Tank Gauges are Strongly Preferred. Where automatic tank gauges are fitted, these MUST have remote readings in the CCR.

ExxonMobil MESQAC H22 : Independent high-level alarms MUST be fitted for all cargo tanks, slop tanks, fuel and diesel oil bunker tanks in addition to the high-level alarms incorporated in the fixed/automatic tank gauging system. The independent high-level alarms MUST have separate wires (feeders) back to the CCR.

ExxonMobil MESQAC H7A : Automatic Fixed Tank Gauges, Tank Level Measuring Devices and Independent High-Level Alarms MUST be fitted in all cargo, slop and Bunker Tanks (including storage, service, and settling tanks) with Remote Readout and Alarm in the CCR.



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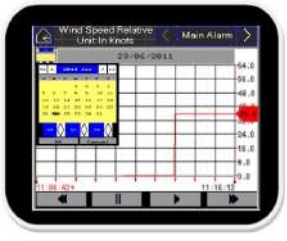
EXXON CCR WIND RECORDER / ALARM

- COMPATIBLE WITH EXISTING NMEA OR SYNCHRO
- GRAPHICAL HISTORICAL ANALYSIS SPEED & DIRECTION
- DUPLICATED DIGITAL RECORDER (USB STICK/HMI)
- 8 ALARM SET POINTS (PASSWORD PROTECTED)
- LOCAL & REMOTE ATEX AUDIBLE/VISUAL ALARM
- OPTIONAL STAND ALONE WIND SENSOR

ExxonMobil MESQAC E17/E1A Vessels MUST be fitted with an anemometer Display or Monitoring Repeater in the CCR with the capability to Record (paper or digital) wind speed and direction and designed to be capable of setting a minimum of two (2) desired wind speed limits with Audible/Visual Alarms in the CCR and on Deck if the set limits are exceeded. SELMA System is interconnected with Existing Bridge Wind Instrument Signal NMEA, Synchro or Analogue in order to implement recording in CCR and Remote Visual/Audible Alarm on Deck.



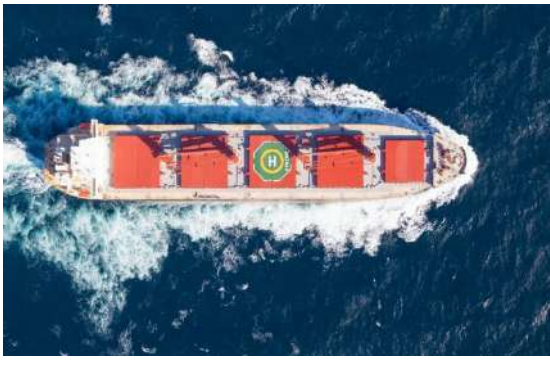
SELMA

Ship Electric Marine Control

DEAD MAN ALARM SYSTEM

SELMA Engine Room Personnel Alarm System (Dead Man Alarm) is designed in order to monitor & supervise the presence of ship personnel in unattended positions in Engine Room based on Heavy Duty PLC Central Control System and Remote Reset & On/Off Stations.

SELMA Engine Room Personnel Alarm System (Dead Man Alarm) is used when the Engineer on duty enters the Engine Room where the system must be set in operation from Remote On/Off Stations and the timer counter must be reset from remote stations in order to ensure acknowledgement that the Engineer on duty has entered E/R. After exiting the E/R the Engineer must put turn off the system from On/Off remote stations.



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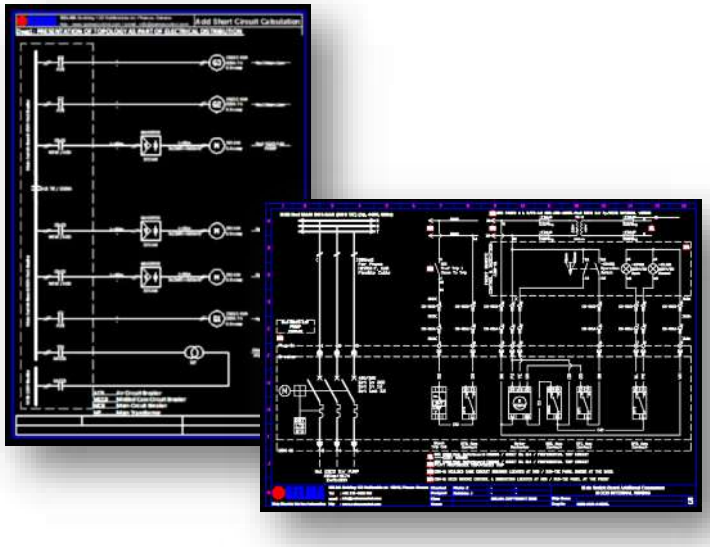
BWTS/SCRUBBER AUX. PANELS & MSB UPGRADES

BWTS/EGCS makers require the modification of the existing MSB in order to accommodate newly installed MCCBs (Molded Case Circuit Breakers) for the Power Distribution of BWTS/EGCS system.

SELMA provides a complete, turn-key solution, from the electrical study and sizing of the components (MCCBs), the conduction of a new, augmented short circuit study calculation considering the contribution of the new electrical loads from the Ballast Water Treatment system/EGCS, the arc flash calculation for the new dedicated power distribution board and its pre-assembly of the Breakers/Panels.

As the required modification on the MSB can be challenging, especially in cases where the free space at the MSB is limited, **SELMA** has proven experience of delivering the optimal, technical solution for each case & class-approved

- **MSB Modification Breakers**
- **Motor Control Starters Boards**
- **Power Distribution Boards**
- **MSB Upgrade Electrical Drawings**
- **Short Circuit Current Calculation**
- **Arc Flash Analysis**



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