AQUAMETRO
OIL & MARINE

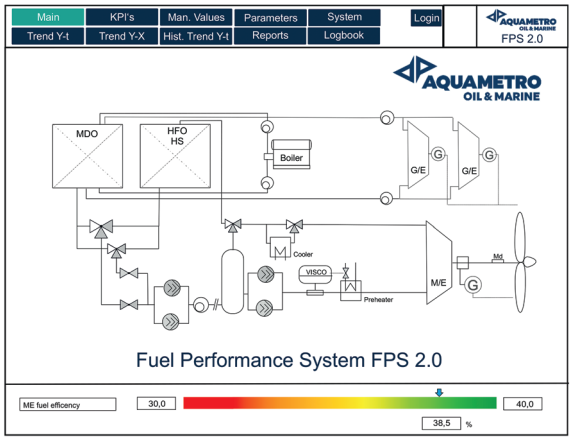
FUEL PERFORMANCE SYSTEM 2.0 (FPS)

Performance Monitoring

FUEL PERFORMANCE SYSTEM 2.0 (FPS)

Fuel Monitoring Ship / Fleet Management / Fuel Efficiency / CO_2 Reporting (MRV)

The Fuel Performance System (FPS 2.0) is an open PLC-web based system to record signals, which are important to enable full transparency of all fuel and performance parameters of ship operation process. With fuel flow meters CONTOIL® sensors, shaft power meter SPM and additional data from ship automation the fuel consumption and fuel efficiency data can be acquired and stored for further analysis and reporting (CO_2 reporting MRV).



Features:

- Web based visualization and reporting
  - Data collection
  - Trend curves
  - KPI analysis
  - Plausibility check
  - Monitoring and reporting
  - Fuel transparency and optimisation
  - Customizable monitoring systems

Benefits:

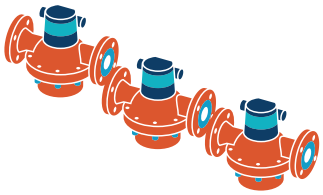
- In the office
  - Web access for fleet management
- On the bridge
  - Performance and monitoring management
- In the ECR
  - Performance and monitoring of all data calculated KPI's

SYSTEM OVERVIEW AND CO_2 REPORTING

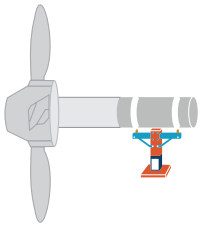
FPS on board

Measurement

Ship automation / sensors



» Fuel consumption

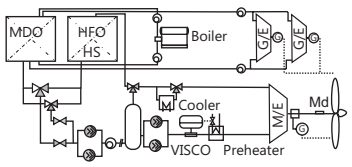


» Torque

» Data record book

» GPS

» LOG



Example system design, actual system may differ.

Fuel Monitoring System FPS 2.0

Open / full flexible web based system configuration

» Data packing / storage

» Data interface to:

Ship management - on board

Fleet management - on shore

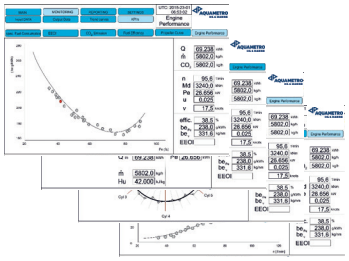
» KPI calculation

» Trend - process performance

» Plausibility check / alarm control

» Open / flexible reporting

(noon-to-noon report / CO_2 reporting)

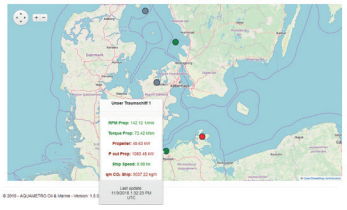


FPS on shore

Fuel Monitoring System FPS 2.0

» Data server on shore ship / fleet management

» Stationery or mobile devices



FUNCTION

- PLC based fuel monitoring and performance system FPS expandable for all available datapoints and interfaces.
- Open system for pre-configuration of the real ship operation system on board (engines [ME's / AE's], boilers, shaft generators)
- Supports multiple engines, bunkers and engines parameters on board.
- Web portal for on board / on shore.
- Real time monitoring of fuel consumptions and all implemented parameter, KPI's on shore.
- Performance charts and reports are available and free configurable.
- Data storage and data history visualization.
- Communication mode to on shore server for notification, database as well as report updates.
- Minimum human intervention is required.
- Trip reports, CO_2 reports and noon to noon reports can be generated, stored and transferred to shore.
  - Clear indication of fuel efficency, total fuel consumption and CO_2 emission for a particular trip.
- Fleet monitoring on shore based on available server database and reports (PC or mobile devices).
  - Submit requests for immediate position of the vessel and the total fuel consumption since the last report.
  - View the tracking history including events that took place on this fleet.

MONITORING CONCEPT

Hardware concept

- Standard PLC with class type appr. certificate
- Web based open configuration and data visualization
- 2nd screen in ECR to display main values with status (red / yellow / green)
- Data history on board & data export on shore
- Standard data interface to communicate with other systems on board to collect and send data
- Modular design to configure according customer request

Software concept

- Free configurable in & outputs, reporting
- 0-20 mA, 4-20 mA, 0-10 V, pulse, NMEA, Modbus slave
- Engine performance or report of available data

KPI / data collection / reporting

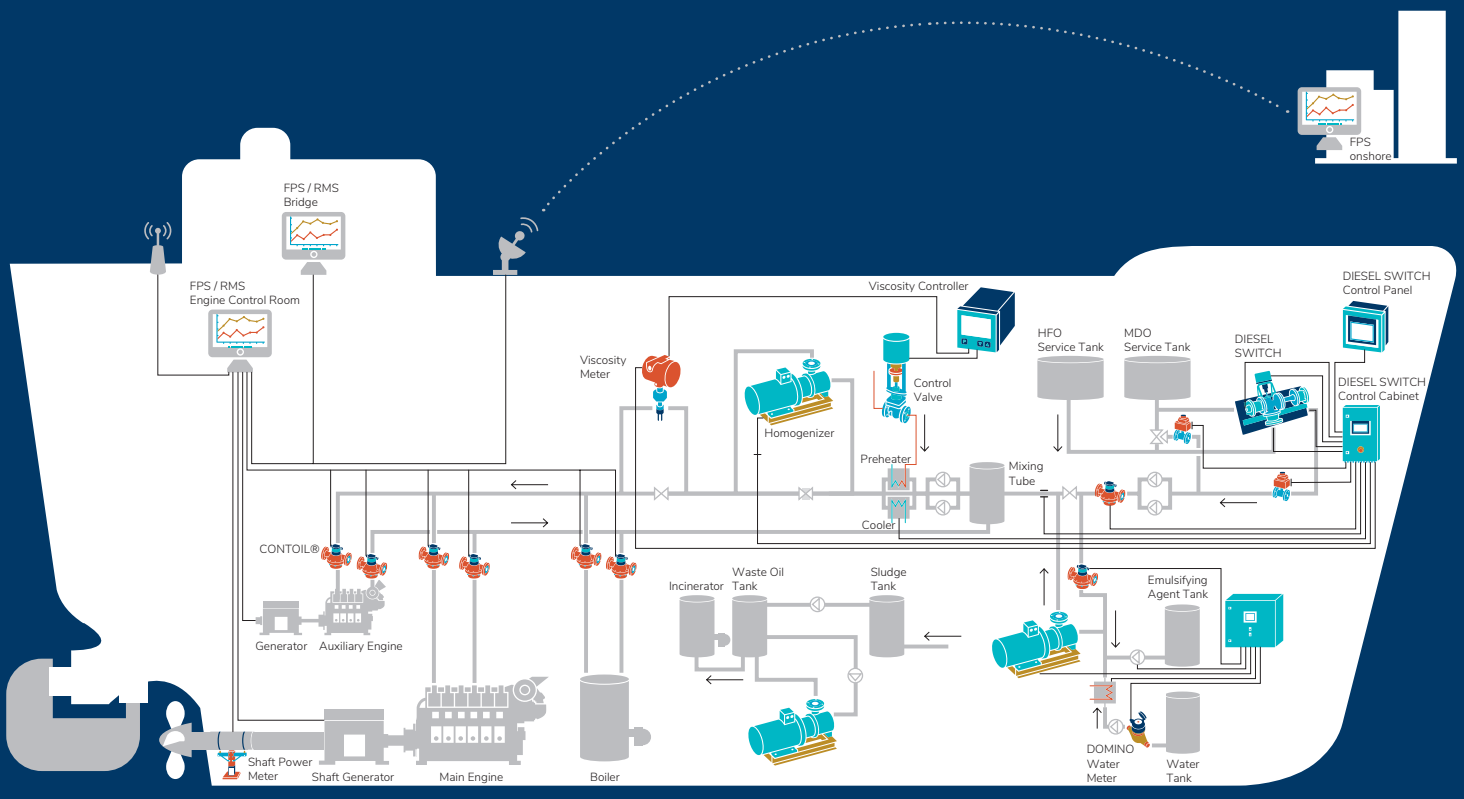
- Fuel efficiency for propulsion system
- Trend curves
- Specific fuel consumption
- Propeller curve
- Engine performance
- Data reporting
- EEOI operating index
- CO_2 emission monitoring / reporting
- Engine performance reporting

Ship and fleet monitoring

- Monitoring, reporting, verification
- Reporting open configuration, CO_2 reporting
- Data verification, validation and hedging
- Free configurable reporting
- Main parameter push notification for main KPI's and ship operation data
- Monitoring and reporting of progression / development of ship performance parameter
- Comparison fleet wise of relevant efficiency and performance parameter

Interface Ship Automation - different measurement transmitter signals

- Fuel data of M / E, A / E and boiler
  - Total consumption
  - Consumption per time
  - CO_2 emissions
- Engine operation / performance data
  - Data of propulsion (power / torque / shaft rpm)
  - Data of electrical generators (power of shaft generator, A / E's)
  - Data of engine performance (temperatures, pressures fuel viscosity, fuel density, ...)
  - Digital data (alarms / status information)
- Ship operation data
  - Speed over ground
  - GPS position
  - Trip information
  - Cargo information
  - Environmental conditions



MONITORING SYSTEM HIERARCHY

FPS on shore

Office

Web access for **Fleet Management**

FPS on board

Bridge

Monitoring / Performance / **Ship Management**

ECR

Monitoring / Performance / **Ship Operation**

Web based visualization and reporting

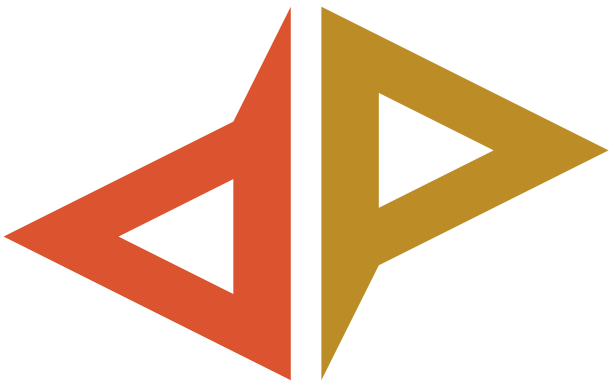
Data collection,

- Trend curves
- KPI analysis
- Plausibility check
- Monitoring and reporting

Reporting data according engine log book

ER

Interface Ship automation Performance **Sensors**



MONITORING / REPORTING AND VERIFICATION

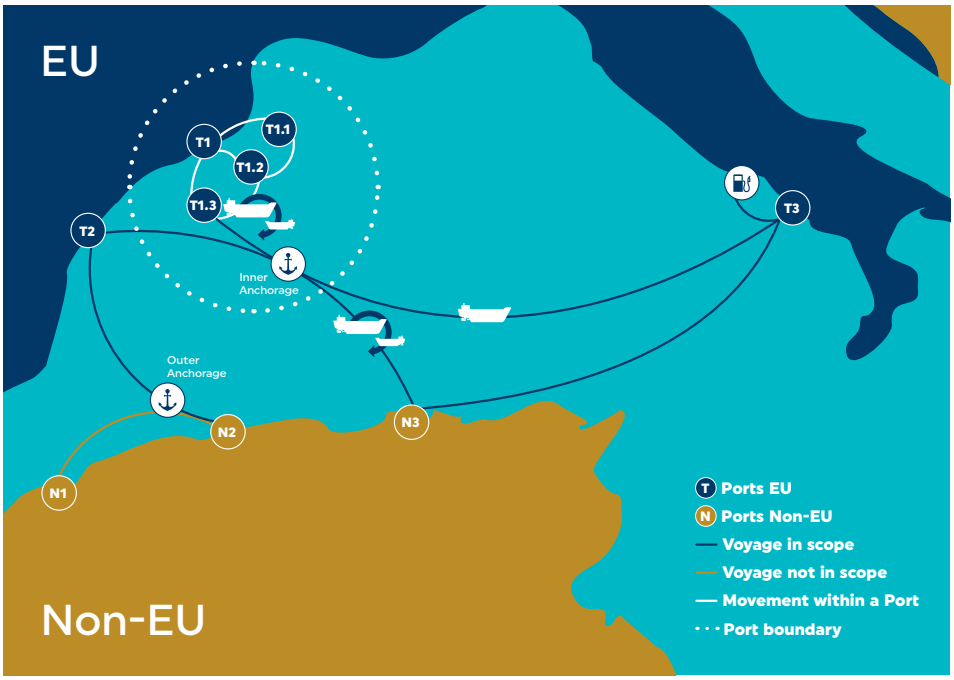
CO_2 reporting emissions control

The EU MRV regulation entered into force on 1 July 2015, and it requires ship owners and operators to annually monitor, report and verify CO_2 emissions on voyages to, from and between EU ports with the aim to quantify and reduce CO_2 emissions from shipping, including time at sea, time at berth and on anchorage as well as during ballast and laden voyages.

The FPS 2.0 will help you to bundle all required documentation in a report on a per-voyage basis including:

- Port of departure and port of arrival, including the date and hour of departure and arrival
- Amount and emissions factor for each type of fuel consumed in total
- CO_2 emitted
- Distance travelled
- Time spent at sea
- Cargo carried
- Transport work, which is defined as: distance travelled x cargo carried
- Proess described parameter free configurable from FPS

Reporting voyages, in port emissions and description of regulation:



FUEL EFFICIENCY AND PROPULSION EFFICIENCY

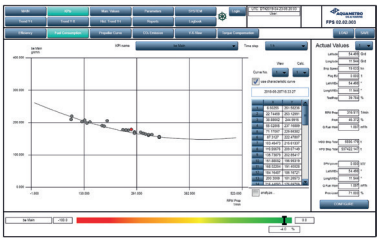
Specific fuel consumption graph

Features:

- Monitors engine fuel consumption and efficiency

Benefits:

- Consumption optimization
- Reduce CO_2 / NOx emmission
- Safe cost

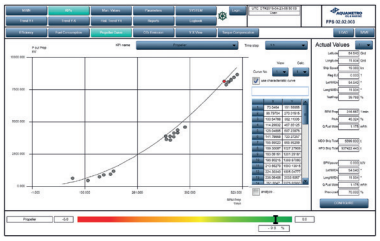


Features:

- Monitor propeller power and speed
- Displays actual propeller curve
- Displays load point in engine layout diagram

Benefits:

- Keeps efficiencies of hull under observation
- Control of changes in engine tuning, Ship condition



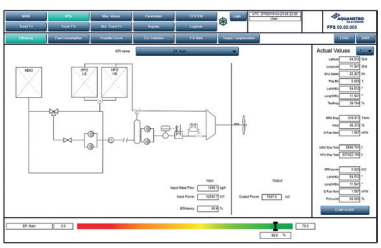
Fuel efficiency diagram

Features:

- Monitor engines fuel efficiency
- Ship overview

Benefits:

- Boost performance
- Better efficiency
- Improved costs
- Basis for MRV / DRV reporting



OPTIONAL COMPONENTS

Satellite terminal (ST 6100)

Best sensors for highest system accuracy,
as good input results in good output.

- Easy installation
- Global coverage (A1+A2+A3)
- Robust design, light weight and small footprint
- Highly reliable
- Integrated with GPS receiver

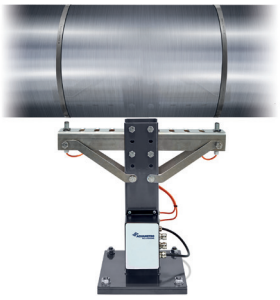
CONTOIL® VZF/A II, DN 15 - 50

- Electronic display for onsite verification
- Highest accuracy (better than 0.5 % in total)
- Paired calibration for use in supply and return measurement
- All meters with Marine Type approval (LR, DNV, RR and GL)
- Highest operational safety including burst pressure and flammable endurance tests
- Cost-effective due to minimum maintenance requirements
- Flexible to use in different fuels like heavy fuel oil (HFO, different grades), marine diesel oil (MDO) or diesel oil (DO)
- Integrated temperature sensor
- Mass & massflow calculation
- Compareable to Coriolis meter

For all other sensors onboard we are able to integrate them with standard signals like fire alarm, bilge alarm, engine trip, etc.. Please contact Aquametro Oil & Marine for more information.

Shaft Power Meter (SPM)

- RPM, torque and power signals
- Reliable data
- Fuel / propulsion efficiency
- Key component for fuel performance system FPS 2.0
- Incl. 0 / 4-20 mA output for rpm, torque and power
- Web based configuration



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