

OUR COMPETENCE FOR YOUR PROCESS

- ✓ Fuel Measurement,
- ✓ Fuel Performance & Reporting
- ✓ Fuel Management
- ✓ Fuel Treatment
- ✓ PRODUCTS
- ✓ ENGINEERING
- ✓ SUPPORT
- ✓ SERVICE

OUR WORLDWIDE NETWORK

Your **PARTNER** for

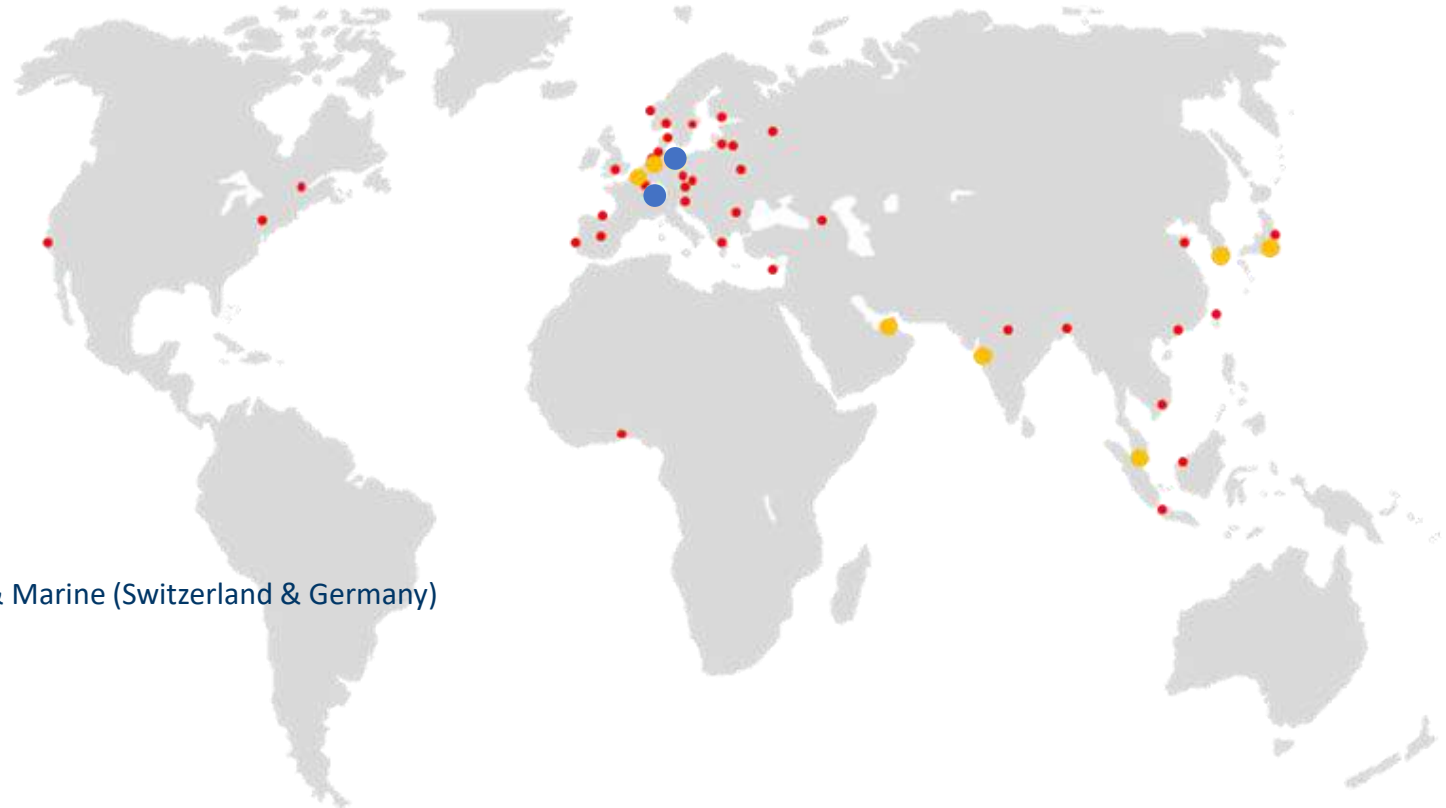
- Burners (heating boilers, industrial furnaces, tar processing, booster)
- Shipbuilding, shipping companies
- Lorries, buses and other vehicles
- Locomotives
- Stationary power plants

Our worldwide agencies provide you with local service and support

With our **PRODUCTS** in

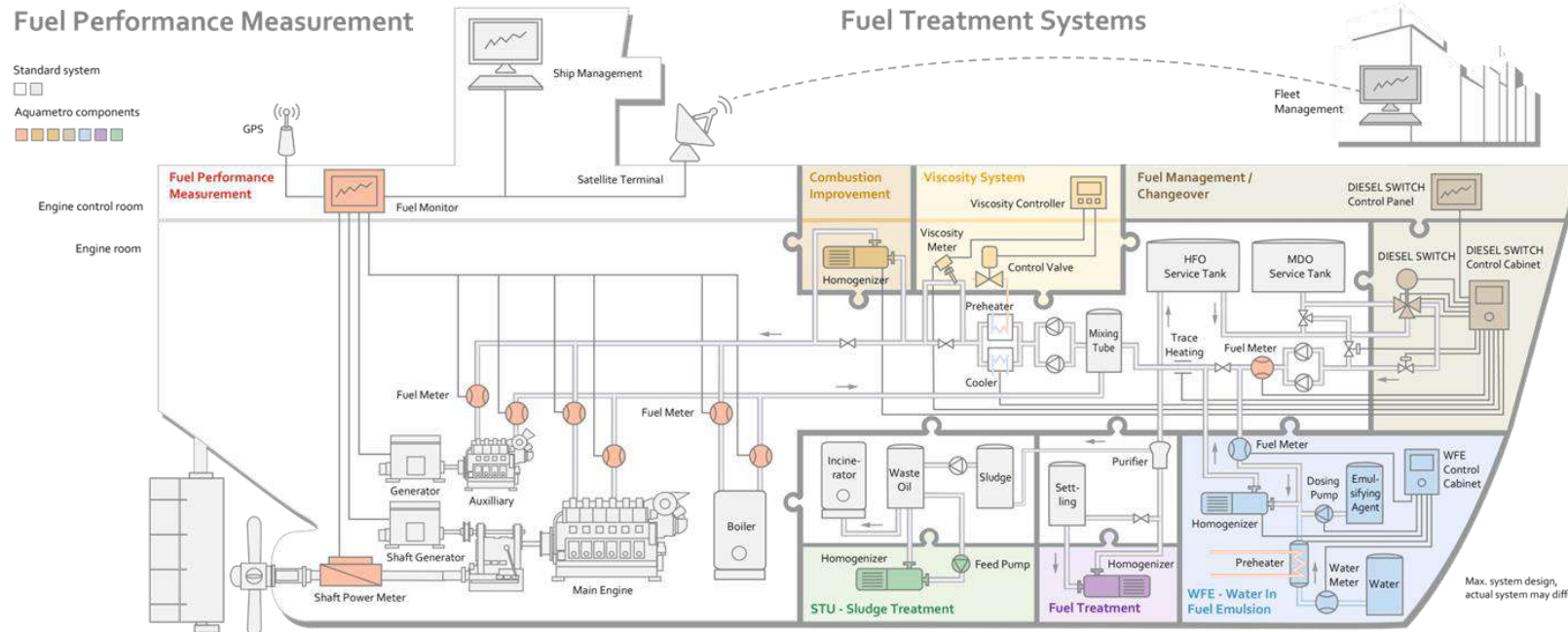
- Fuel / Oil Measurement
- Fuel Performance
- Fuel Treatment
- Fuel Management
- Service, Repair, Commissioning
Engineering, Support - world wide

- Head office Aquametro Oil & Marine (Switzerland & Germany)
- Aquametro local offices
- Aquametro distributors



Marine Products and Applications

HFO / MDO Treatment and performance



- FUEL Management System
Fuel Change Over / Blending System **DIESELSWITCH**
- Fuel Treatment
Different applications (sludge, combustion improvement) **HOMOGENIZER**
- Fuel Treatment
Water-in-Fuel-Emulsion System **WFE**
- Fuel Measurement / Treatment
Viscosity Measurement **VISCOMASTER**
- Fuel Measurement
 - Volume flow oil meter - measurement
 - Mass flow – calculated
 - Temperature - measurement**CONTOIL VZF II**
- Fuel Performance
Monitoring System **FPS 2.0 / RMS**
- Fuel Measurement / Performance
Shaft power meter **SPM**



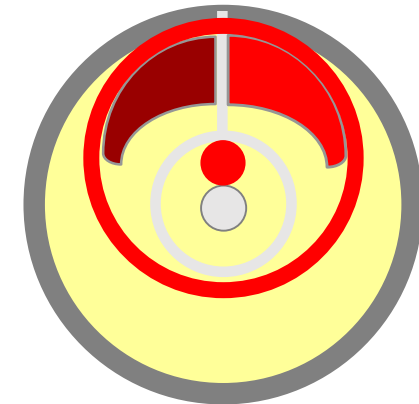
CONTOIL Fuel Measurement

Fuel Oil, Diesel Oil , Heavy Oil
Metering

CONTOIL® family “The better alternative”



Working principal



VISCOMASTER

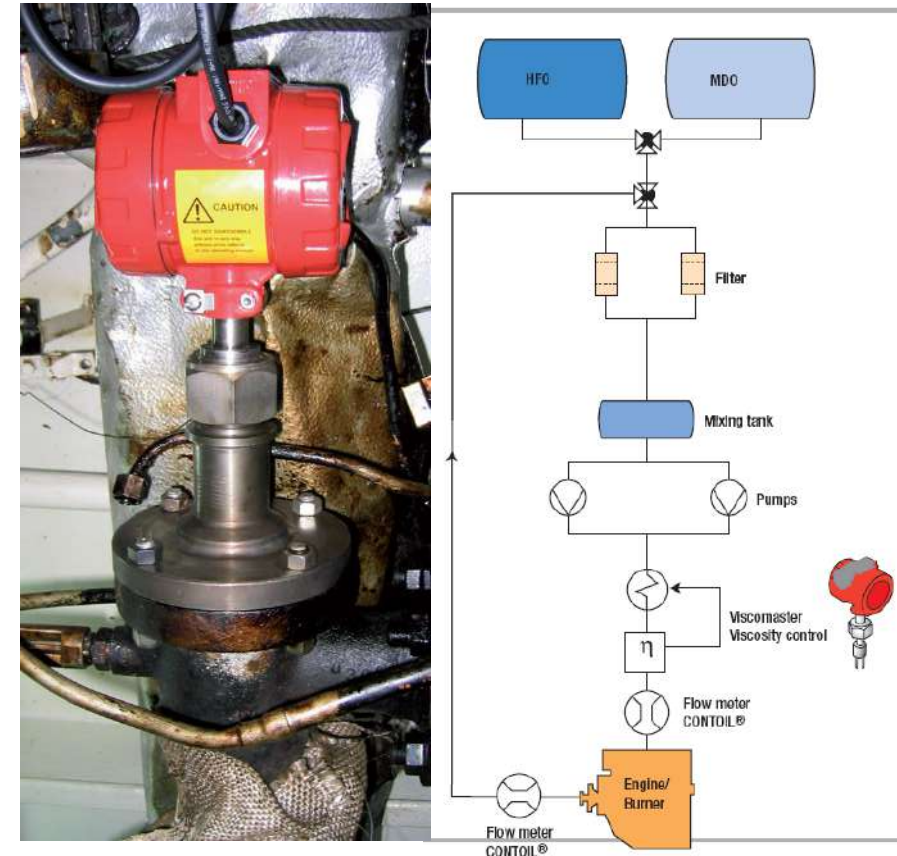
Fuel Measurement / Treatment

Benefit

- Optimum combustion efficiency
- Optimal fuel consumption
- Reduced maintenance required
- Prevention of engine damage
- True measurement enables the correct calculation of fuel mass consumption
- True Kinematic viscosity measurement

Requirement for running with HFO

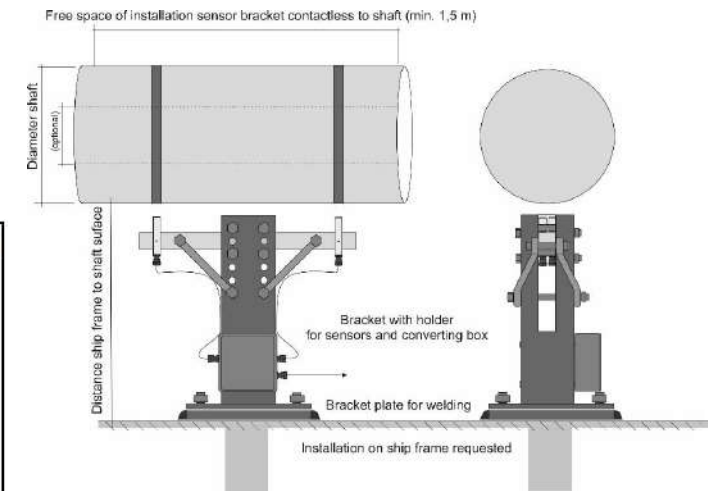
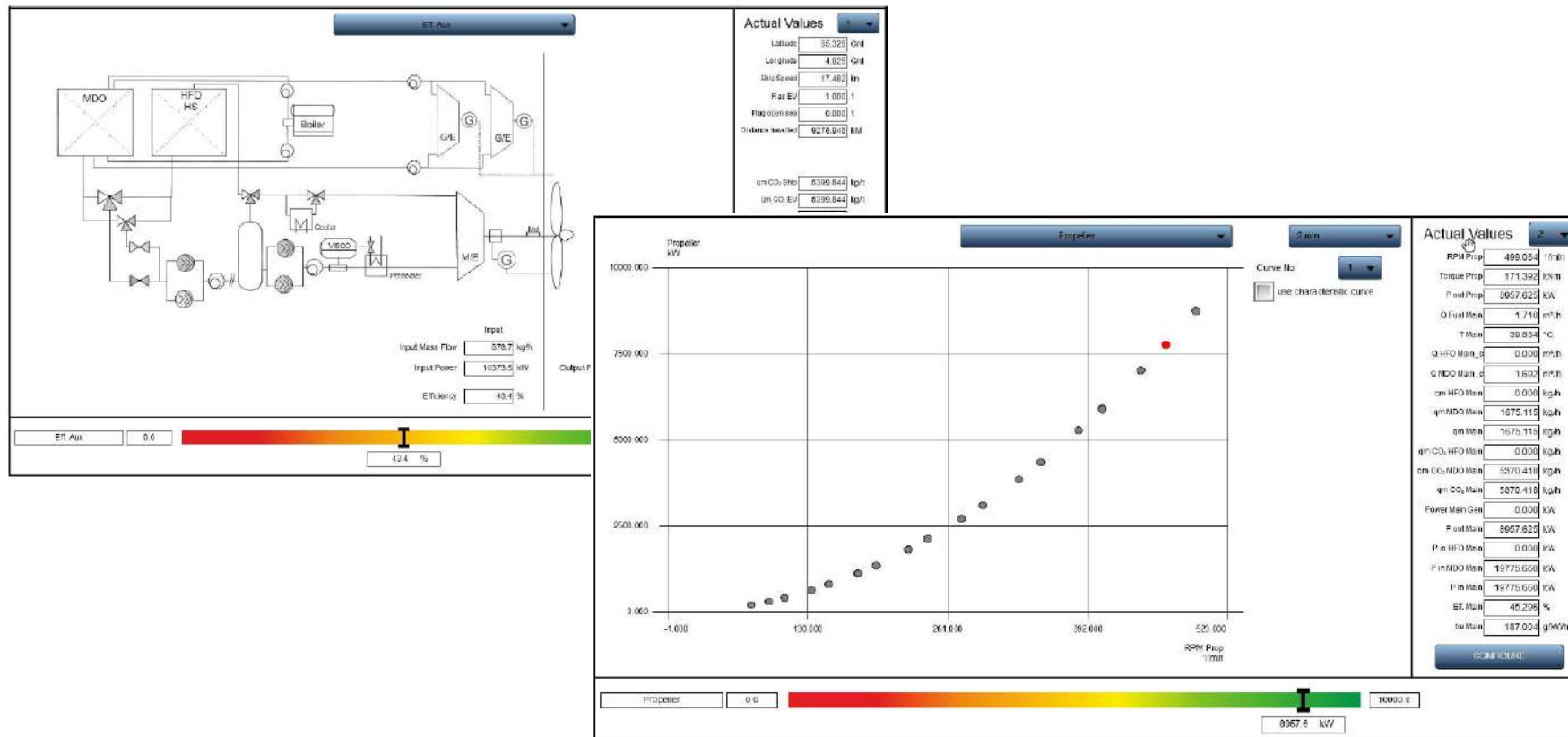
- Correct Viscosity is required for Engines running on HFO
- Fuel is heated up by Steam or Thermal-Oil and injected into the engine as droplets
- Size of the droplets is important for good combustion !!
- Droplet size HFO
 - To big incomplete combustion = smoke, high maintenance and high consumption
 - To small to early combustion = high consumption and high maintenance



Shaft Power Meter SPM Measurement

Permanent power measuring system for fuel / propulsion efficiency

The Shaft Power Meter is the cost effective solution when reliable shaft power measurement is required. The system is easy to install, requires no electronic parts on the shaft and operates absolutely contact free.



Shaft Power Meter SPM Measurement

Permanent power measuring system for
fuel / propulsion efficiency

Features

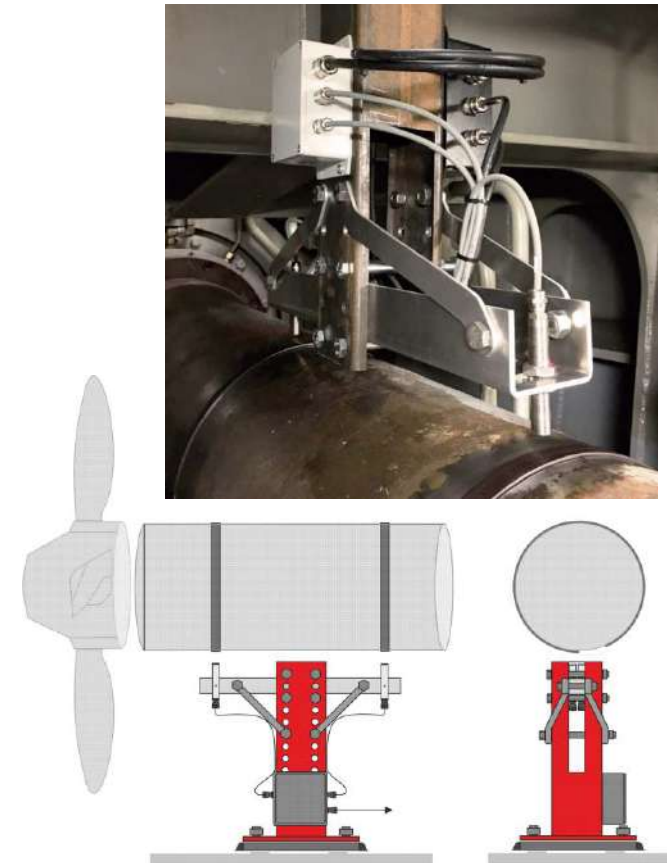
- Easy installation
- RPM, Torque and Power signals
- Reliable data
- Fuel / propulsion efficiency
- Key component for fuel performance system FPS 2.0
- PLC based system with web based visualization via Ethernet
- Data storage on SD card

Benefits

- Cost effective
- Plug & play by crew
- No installation on shaft
- Maintenance free
- Expandable to fuel performance system

Key features

- No electronic parts on the shaft
- No wear and tear
- Easy to install system
- Incl. 0 / 4-20 mA output for
- rpm, torque & power
- Optional display
- Easy expandable to a Fuel
- Performance System (FPS)
- Optional LCD remote display
- Web based configuration /
- visualization via Ethernet connection



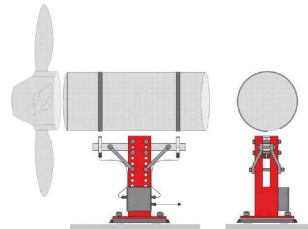
FPS 2.0 / RMS

Fuel Performance

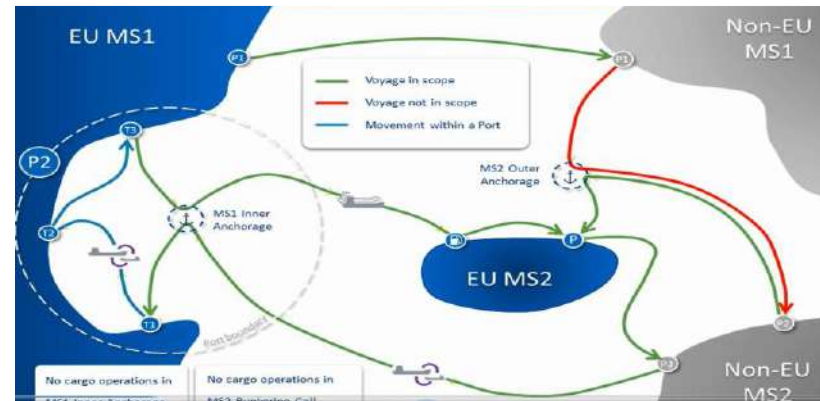
CONCEPT OF NEW MONITORING SYSTEMS FPS 2.0

Office	Web access for Fleet Management
Bridge	Performance and monitoring Management
ECR	Web based visualization and reporting Data collection, <ul style="list-style-type: none"> ▪ Trend curves ▪ KPI analysis ▪ Plausibility check ▪ Monitoring & reporting Reporting data according engine log book
ER	Performance sensors

Depth of information



FUEL MONITORING, FUEL EFFICIENCY, CO₂ REPORTING (MRV Regulation)



CO₂ emission reporting in EU

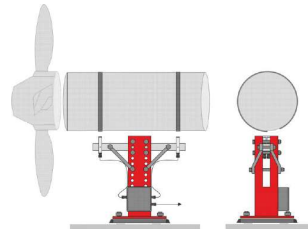
- ATA / ATD Date and time
- Time at sea
- Distance travelled
- Cargo carried
- Transport work
- Fuel consumption
- CO₂ emission
- Port

FPS 2.0 / RMS

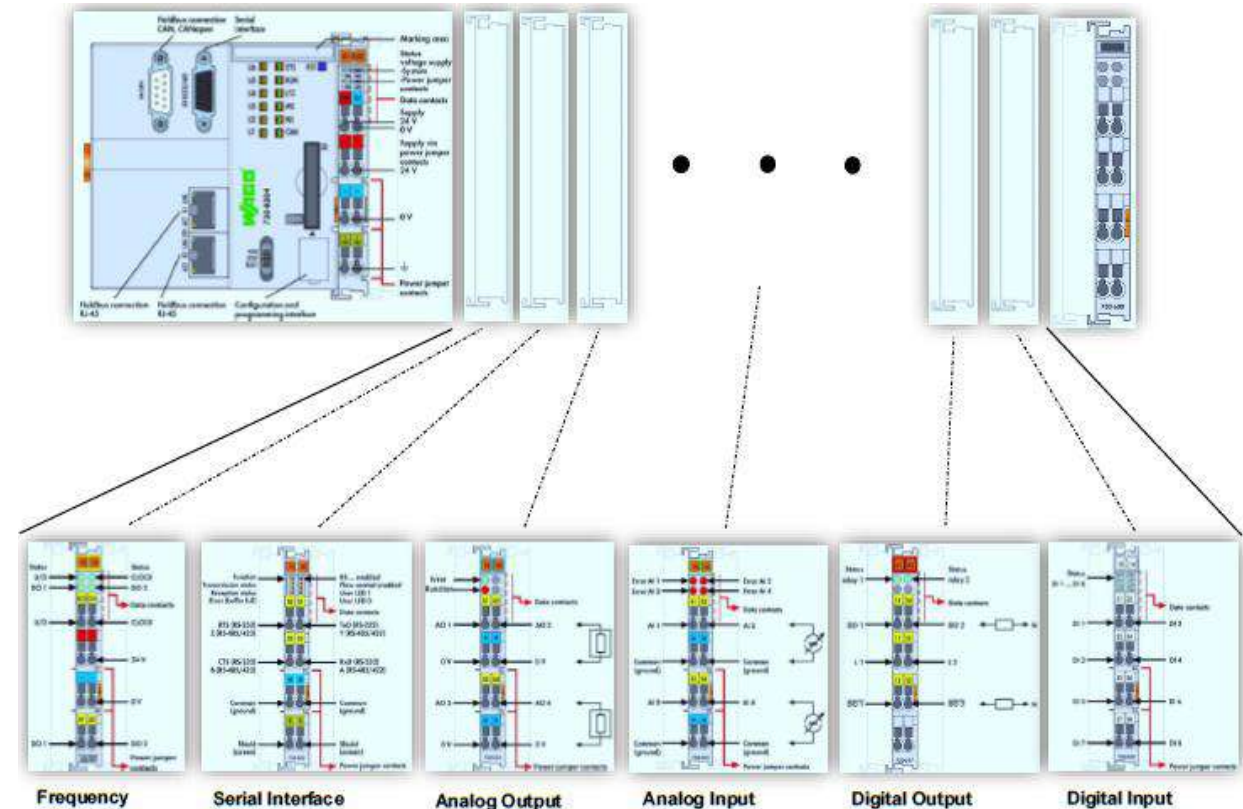
Fuel Performance

HARDWARE CONCEPT OF NEW MONITORING SYSTEMS FPS 2.0

- Simple standard PLC system with class type approval 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 (open structure) to communicate with other systems on board to collect and send data
- Reporting open configuration, CO₂ Reporting
- Modular design to configure acc. costumer request
- Synergy effects to use same hardware of different processes



CERTIFIED OPEN MODULAR DESIGN



FPS 2.0 / RMS

Fuel Performance

SOFTWARE CONCEPT OF NEW MONITORING SYSTEMS FPS 2.0

Free configurable in & outputs, reporting:

- 0-20 mA, 4 – 20 mA, 0-10V, pulse, NMEA, Modbus Slave
- Engine performance or report of all available data

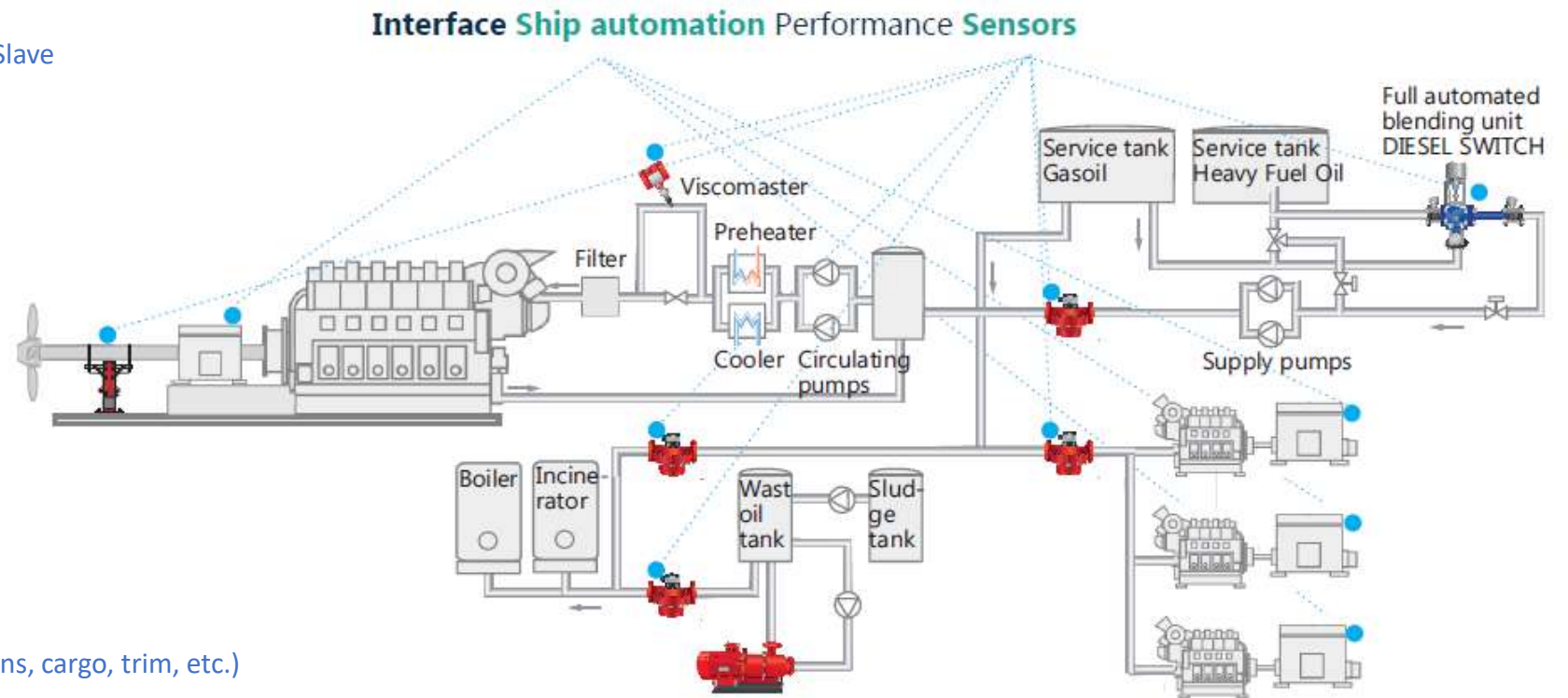
KPI – Fuel efficiency / EEOI / emission reporting

- Fuel efficiency for propulsion system
 - Trend curves
 - Specific fuel consumption
 - Propeller curve
 - Specific fuel consumption
 - Engine performance
 - Data reporting
- EEOI operating Index
- Emission reporting (CO₂ – monitoring / reporting)
- Engine performance reporting

Based on:

- Fuel specification acc. BDN (bunker delivery note)
- Nautical information (ship speed, weather conditions, cargo, trim, etc.)

FUEL MONITORING, FUEL EFFICIENCY, CO₂ REPORTING



Diesel Switch Fuel Management

Automatic control of fuel change over with blending process

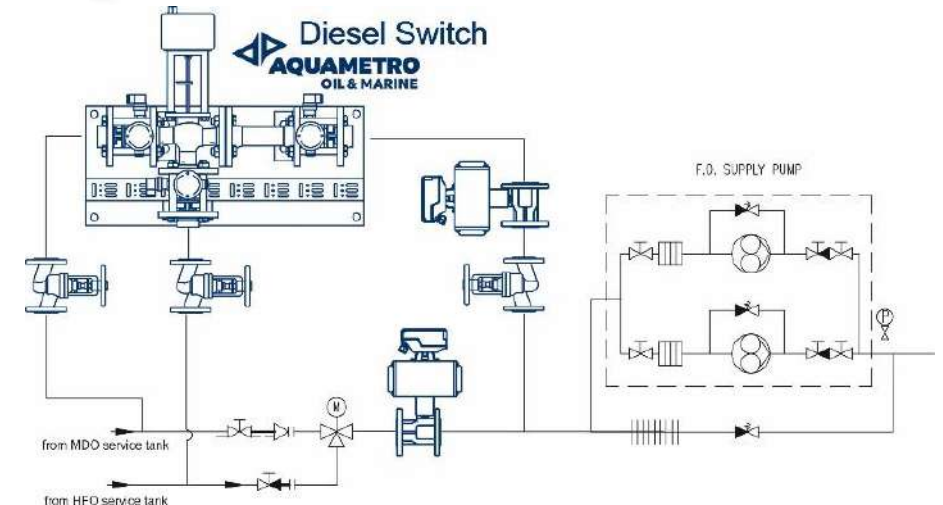
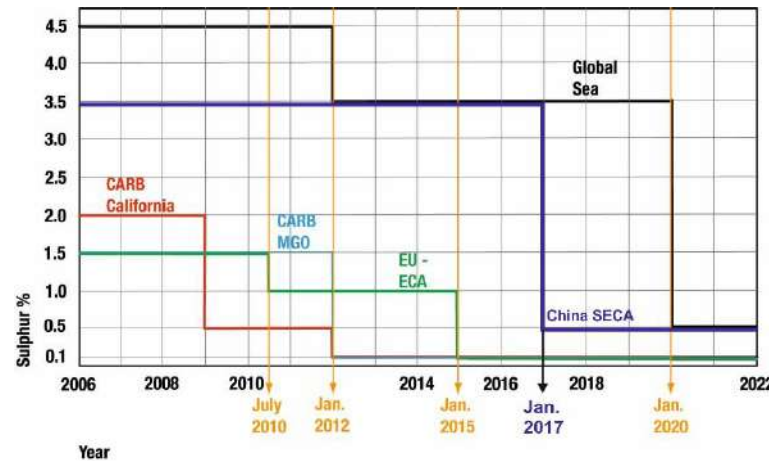
Features

- Automatic fuel changeover or blending
- Management of processes (Trace heating, Cooler, Homogenizer) in fuel systems
- Prevents thermal load or damage on engine
- Fuel saving potential considering fuel blending
- Certified by class -> unique feature worldwide!
- Accepted by state control

ECA / SECA world wide limitations

Complies with

- MARPOL Annex VI
- EU Directive 1999
- CARB California Air Resources Board Regulation 13





Diesel Switch Fuel Management

TRADITIONAL CHANGEOVER BY RULES - HIGH HUMAN RISK! -

OUR SOLUTION

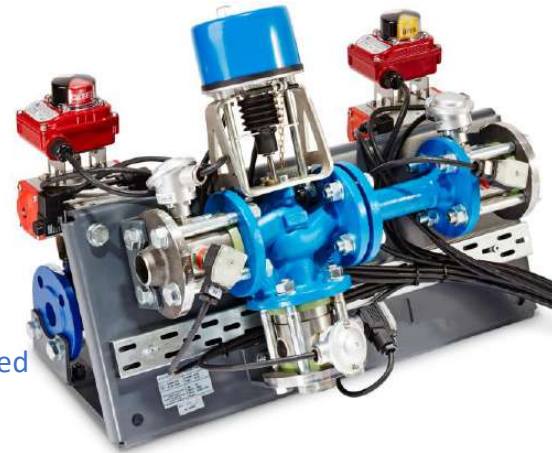
- No HUMAN RISK! -

DIESELSWITCH

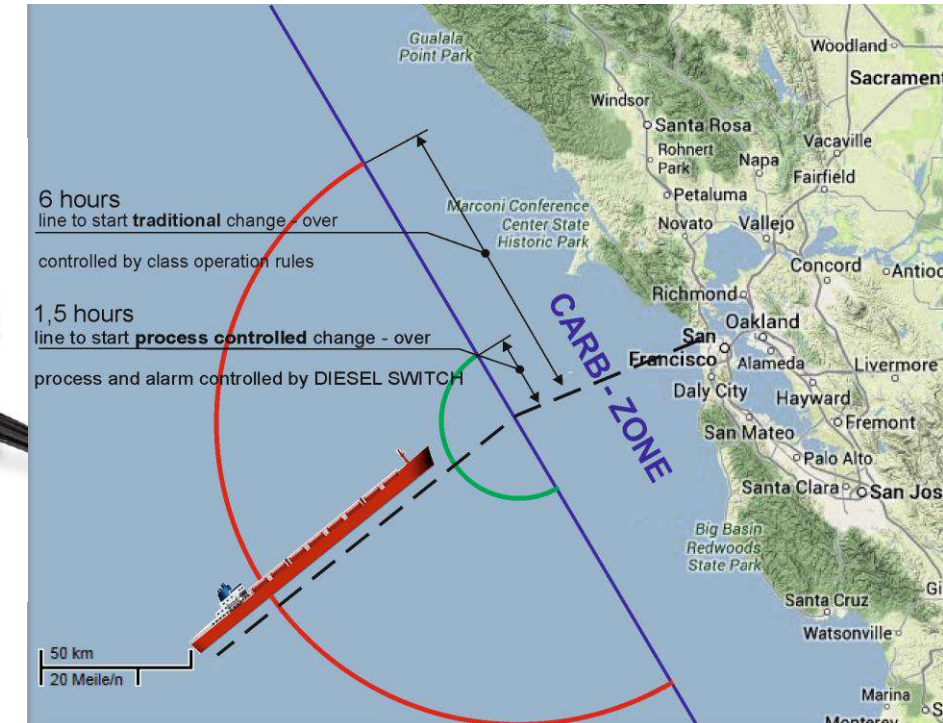
Change over time **1,5 hours** fully process & alarm controled

Without:

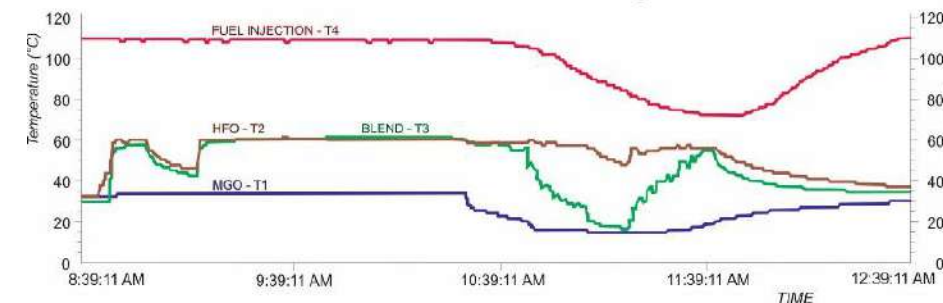
- Long change over time approx. up to **6 hours** without automatic controlled process
- Lot of Manual steps in atuomated processes to:
 - Increase fuel viscosity up to 18 cSt target - reduce the fuel temperature
 - Reduce engine load up to 25 – 40% target - low fuel consumption slowly change over process
 - Stop trace heating fuel line fuel target - no addition thermal load in fuel
 - Stop preheating fuel fuel target - no addition thermal load in fuel
 - Start fuel MDO cooler target - cooling down MDO increase viscosity, reduce thermal stress



Fuel cost saving potential 10 - 15 %



Full automated Diesel Switch process controll



Diesel Switch Fuel Management

Fuel cost saving potential 10 - 15 %

Permanent fully automated control of:

- Diesel Switch and fuel system
- Type of fuel on engine
- Time control of changeover process
- Sulphur content control

Start / stop function controlled by:

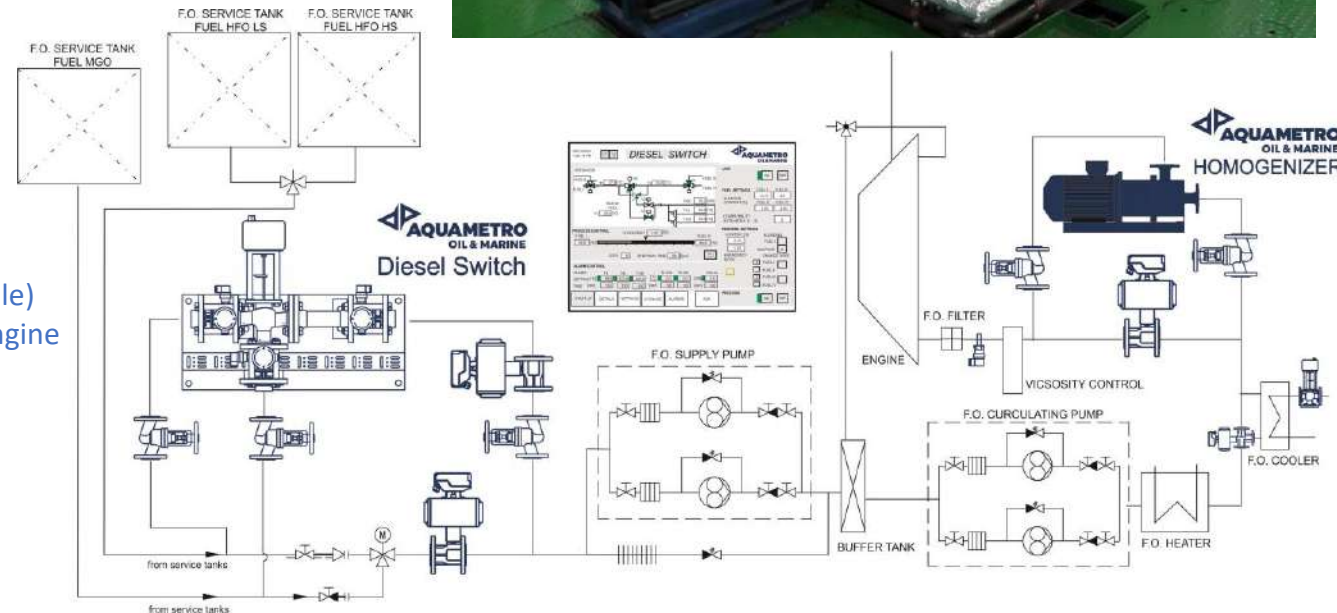
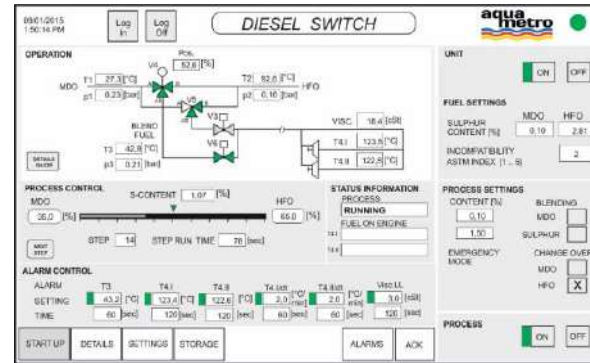
- Fuel temperature outlet DIESEL SWITCH
- Fuel temperature inlet engine
- Fuel viscosity (external signal)

External control of components in booster system:

- Automatic control - MDO / MGO COOLER / process
- Start/Stop control - HEATER / TRACE - HEATING
- HOMOGENIZER
- Additional components free configurable

Optional:

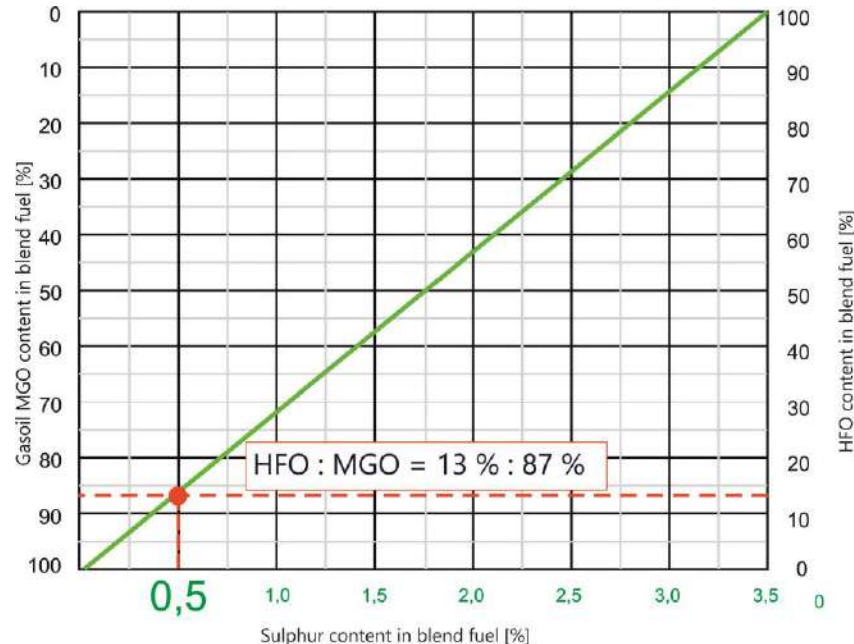
- 2nd display in ECR (complete wired to connect to control cabinet with ethernet cable)
- Temperature transmitter FUEL ON ENGINE T4.2 to alarm control more than one engine
- GPS module
- Viscosity measurement on request
- Fuel Compatibility Kit acc. ASTM test (D 4740)



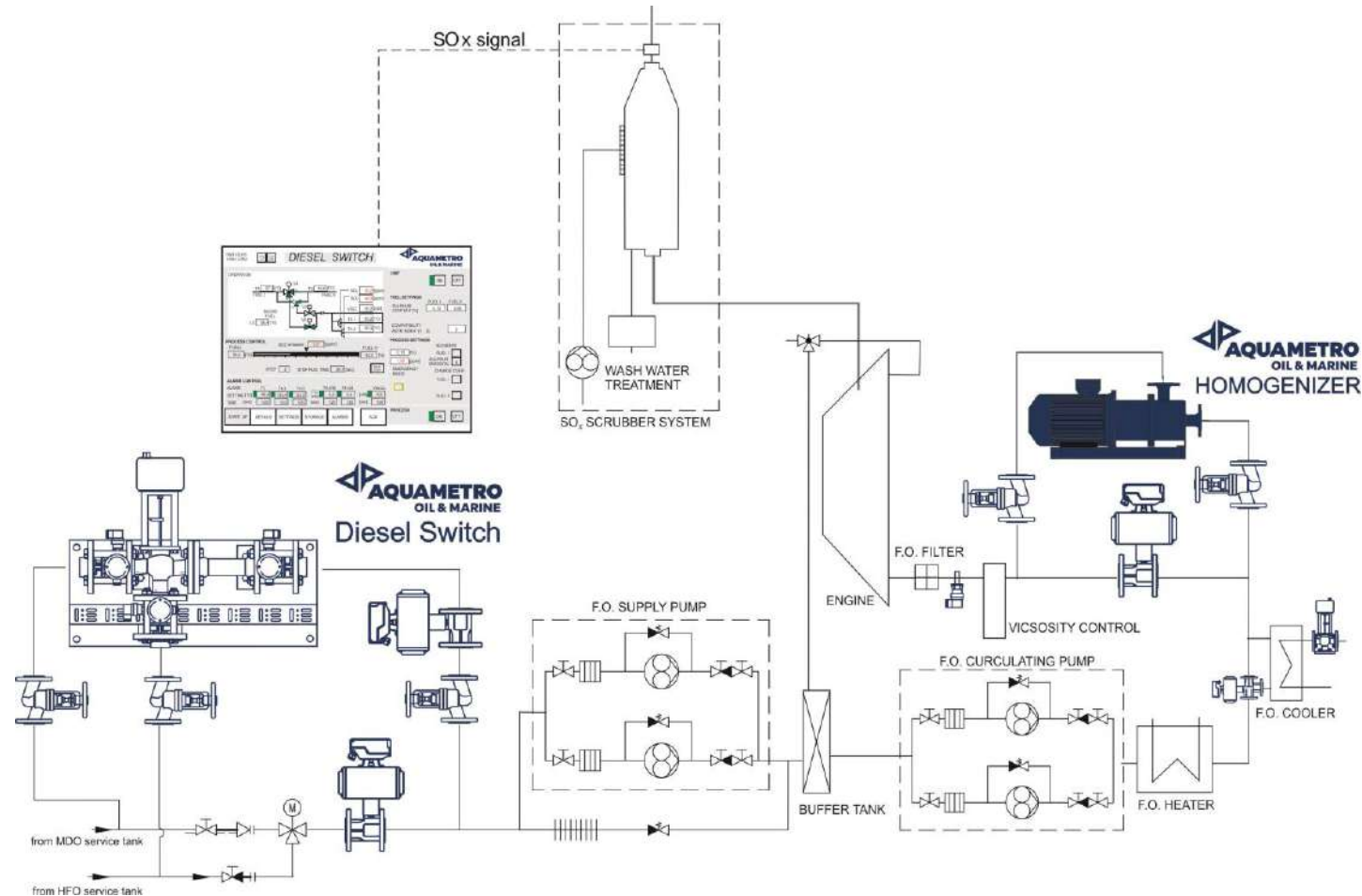
Diesel Switch Fuel Management

0,5% Sulphur – limit - fuel blending on board

- no extra bunkering / tank of several fuel qualities
- no extra fuel type for bunkering
- saving fuel costs up to 10 %
- Blending confirmed by MARPOL Annex IV



Blending process
Fuel cost saving potential up to 10 %

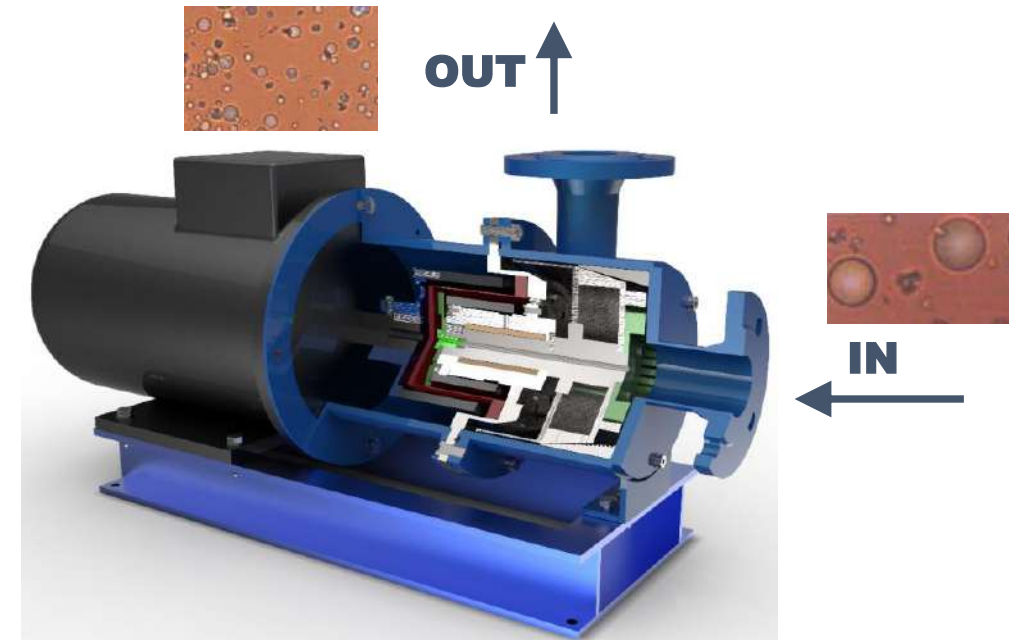
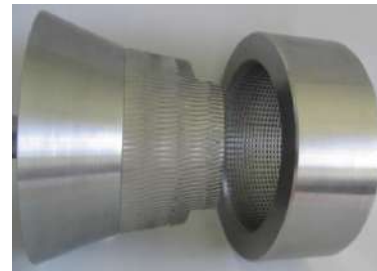




- Dynamic stator-rotor milling machine
- Best chemical-free approach for treating residual fuels

- Solves problems when running HFO with large size of asphaltenes
- Creates fine, even fuel structure with limited risk of sludge forming
- Prevents fuel instabilities or incompatibilities
- Extended life time of filters and injection parts
- Uniform and fine spray pattern at injection

- Conical shaped layout
- Concentrically mounted
- Slightly decreasing clearance
- inlet gap (2mm)
- outlet gap ($\sim 20\mu\text{m}$)





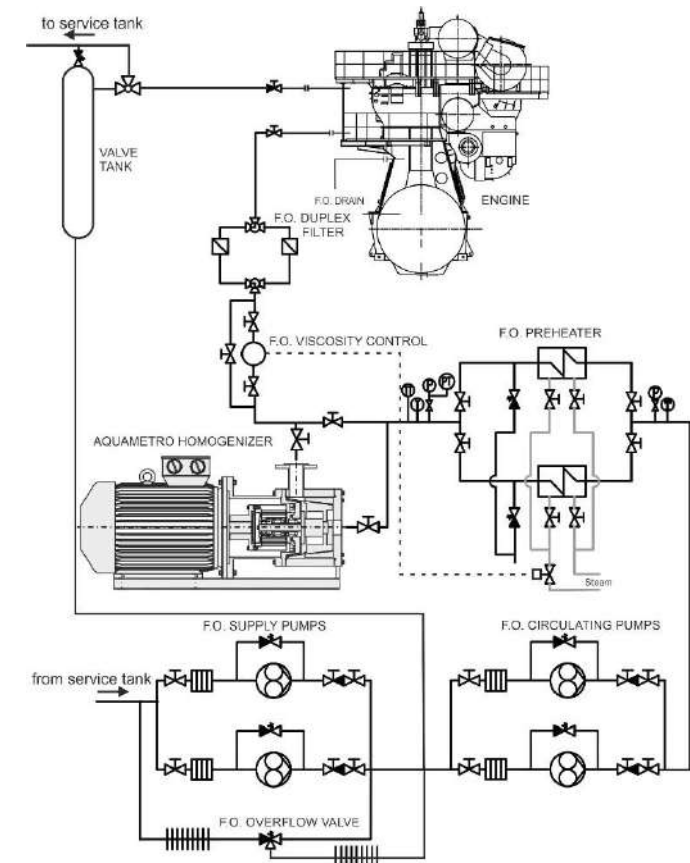
HOMOGENIZER Fuel Treatment

BENEFITS:

- **Asphaltenes clusters**, which are forming under high pressure and temperature, will be **shared down to smaller droplets** of appr. 5µm
- **No risk of instabilities or incompatibilities** when switching between different fuel qualities (HFO and MGO)
- **No clogging effect** at filters, injection and combustion elements
- **Uniform and fine spray pattern** during injection results in more complete burning with **reduced harmful exhaust emissions**
- **Reduced soot and deposits** at engine parts and turbo-charger



Fuel circulating system Combustion Improvement



HOMOGENIZER Fuel Treatment

WATER-In-FUEL-EMULSION

Improved Combustion Process – effects

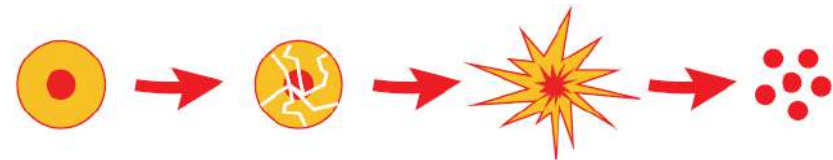
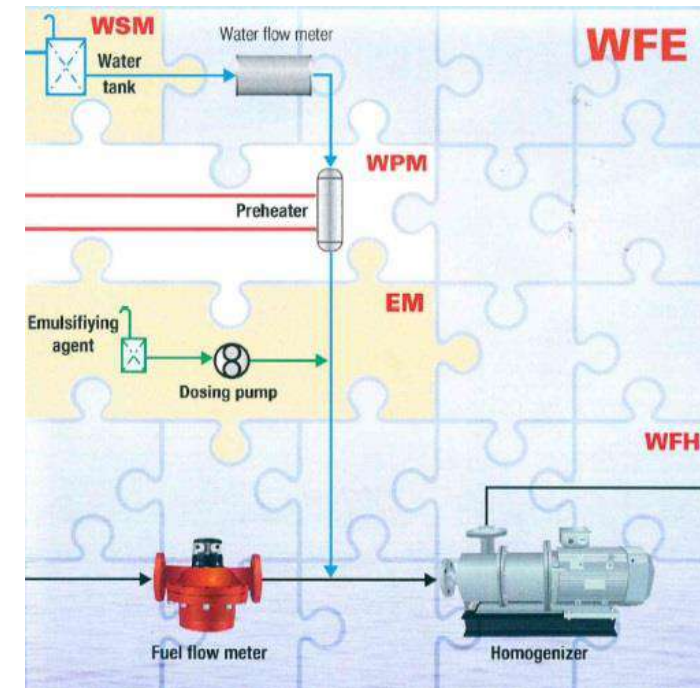
- **Injection of Water** in fuel emulsion
Lot of small water droplets ($< 5\mu\text{m}$) coated with oil
- **Water evaporates** due to high temperature
Creates micro explosion – fuel cloud – smaller droplets
- **Create more reacting surface** for fuel and oxygen
Optimized combustion – reduce PM emissions
- **Cooling combustion process**
Lower combustion temperature – reduce NOx emissions

Operating principle

The WFE/WFH operates on the principles of mechanical shearing and ultrasonic forces.

It utilizes a special conical shaped milling gear, to generate high hydrodynamic power consisting of shearing, friction and acceleration forces with pressure waves of high frequency.

- **Water Supply Module WSM**
 - With or without water tank
 - Full automated tank control
- **Water Preheating Module WPM**
 - Steam or electrical preheater
 - Full automated control
- **Stabilizer Module SM**
 - Add Stabilizer (for light fuels)
 - Full automated control
- **Water-Fuel-Homogizer WFH**
 - Homogenizing water in fuel
 - Full monitoring control
- **WFE Control Cabinet WFECC**
 - PLC/touch screen/ monitoring system/ data record & transfer



HOMOGENIZER Fuel Treatment

WATER-In-FUEL-EMULSION

Features

- Creates stable Water-Fuel-Emulsion with HFO/MDO
- Improved combustion process
- Full automatic controlled emulsification
- Compact and modular design
- Small footprint

Benefits

- Reduce NOx/PM emissions
- Creates invisible smoke
- Reduce surface layers on parts of combustion exhaust gas system
- Economical solution for optimized emission reduction

Improved Combustion Process – effects

- **Injection of Water** in fuel emulsion
Lot of small water droplets ($< 5\mu\text{m}$) coated with oil
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