



TX Marine Messsysteme GmbH
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Workshop “ Alternative Kraftstoffe”
Verband Deutscher Reeder /
Maritimes Kompetenzzentrum Leer
31.05.2016 & 01.06.2016



Fuel Management

Safe switch over of fuels in ECA zones

Why problems hasn't arisen in the past ?

- **Frequency of fuel change over has increased since new ECA rules are in force**
- **Most of the fuel systems are designed as one fuel (HFO) systems**
- **Limited knowledge of crew on board to handle change over processes**
- **Engine manufacturer are allowing the fuel switch over process only under limited temperature gradients (2°/min & 3°/min)**
- **New more efficient refinery processes are leading to incompatibility problems in between different fuels**

Fuel Management

Fullfil limitations in worldwide emission control areas (ECA)

Complies with

- **MARPOL Annex VI** regulation 14 and 18
- **EU Directive** 1999 / 32 / EC & 205 / 33 / EC
for Baltic and North Sea ECA
- **CARB** California Air Resources Board
regulation 13 CCR §2299.2 & 17 CCR § 93118.2



Planned ECA's with different fuel quality:

- Mediterranean Sea
- Coasts of Mexico
- Tokyo Bay
- Singapore
- Hong Kong
- Korea
- Australia
- Black Sea
- Arctic
- Antarctica

SO_x Emission Control Areas (ECAs)

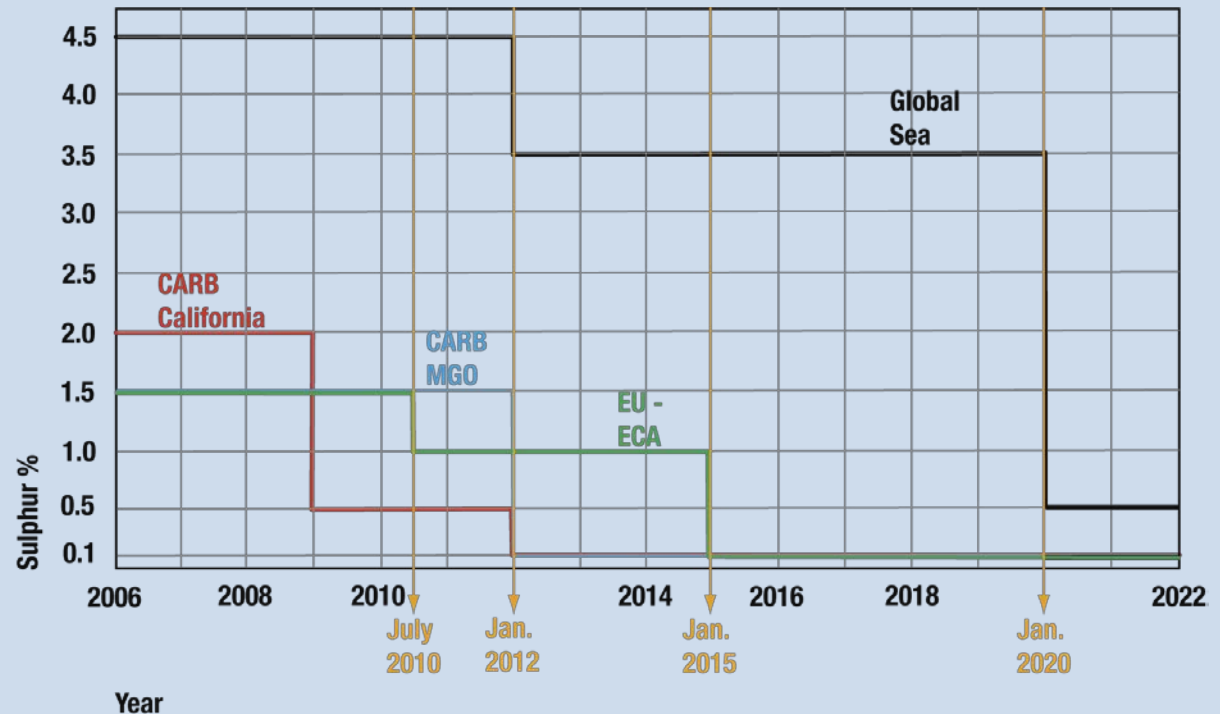
- Existing ECA area
- Potential future ECA area



Fuel Management

Fullfil limitations in worldwide emission control areas (ECA)

Timeline for sulphure limitations in fuel oil



MARPOL ANNEX VI Regulation 14 and Regulation 18 “GLOBAL SEA”

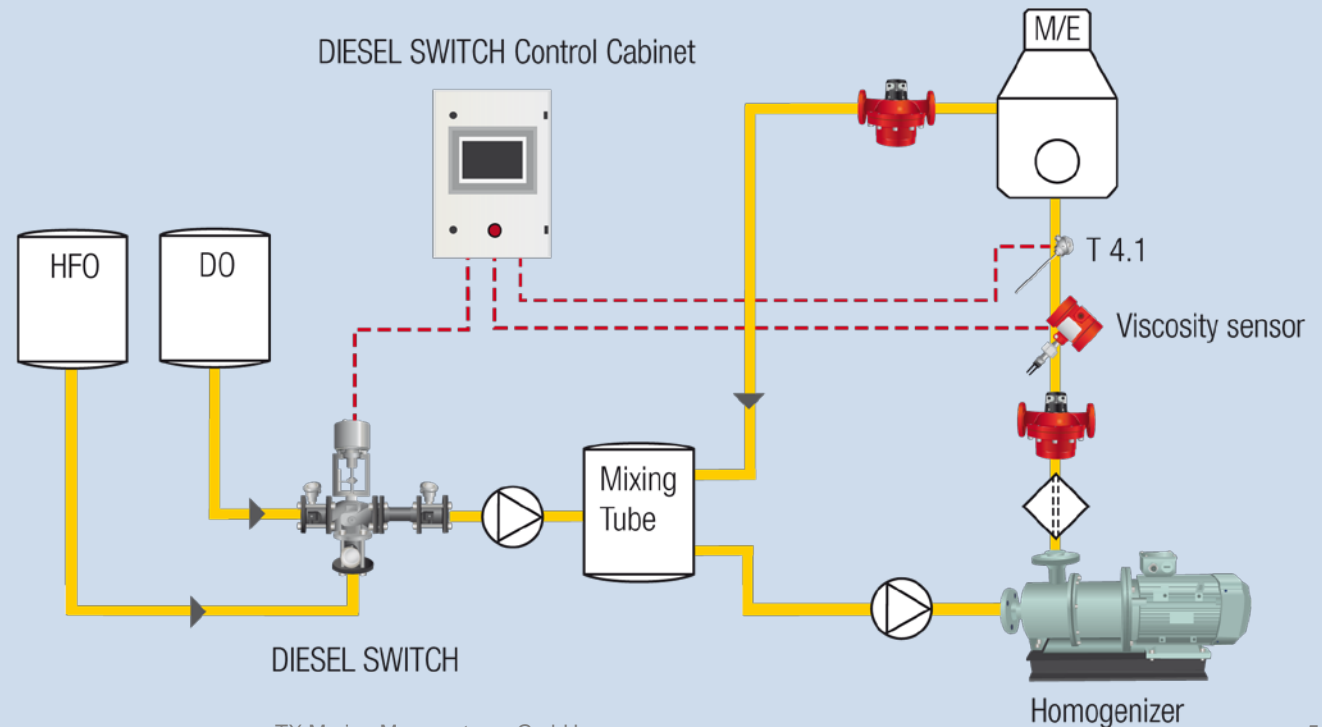
EU Directive 1999/32/EC and 2005/33/EC for Baltic and North Sea and English Channel “EU-ECA”

California Air Resources Board - Regulation 13 CCR §2299.2(e) and 17 CCR § 93118.2(e) “CARB”



Installation in fuel booster system on board

- | | |
|-------------|---|
| Features | <ul style="list-style-type: none">- Simplest and universal design / turn key product- compact and modular construction- Ship new building & retrofit in operating ships |
| Integration | <ul style="list-style-type: none">- Aquametro Homogenizer in booster system- Aquametro Fuel flow meter- Aquametro Viscomaster with Steam control valve |



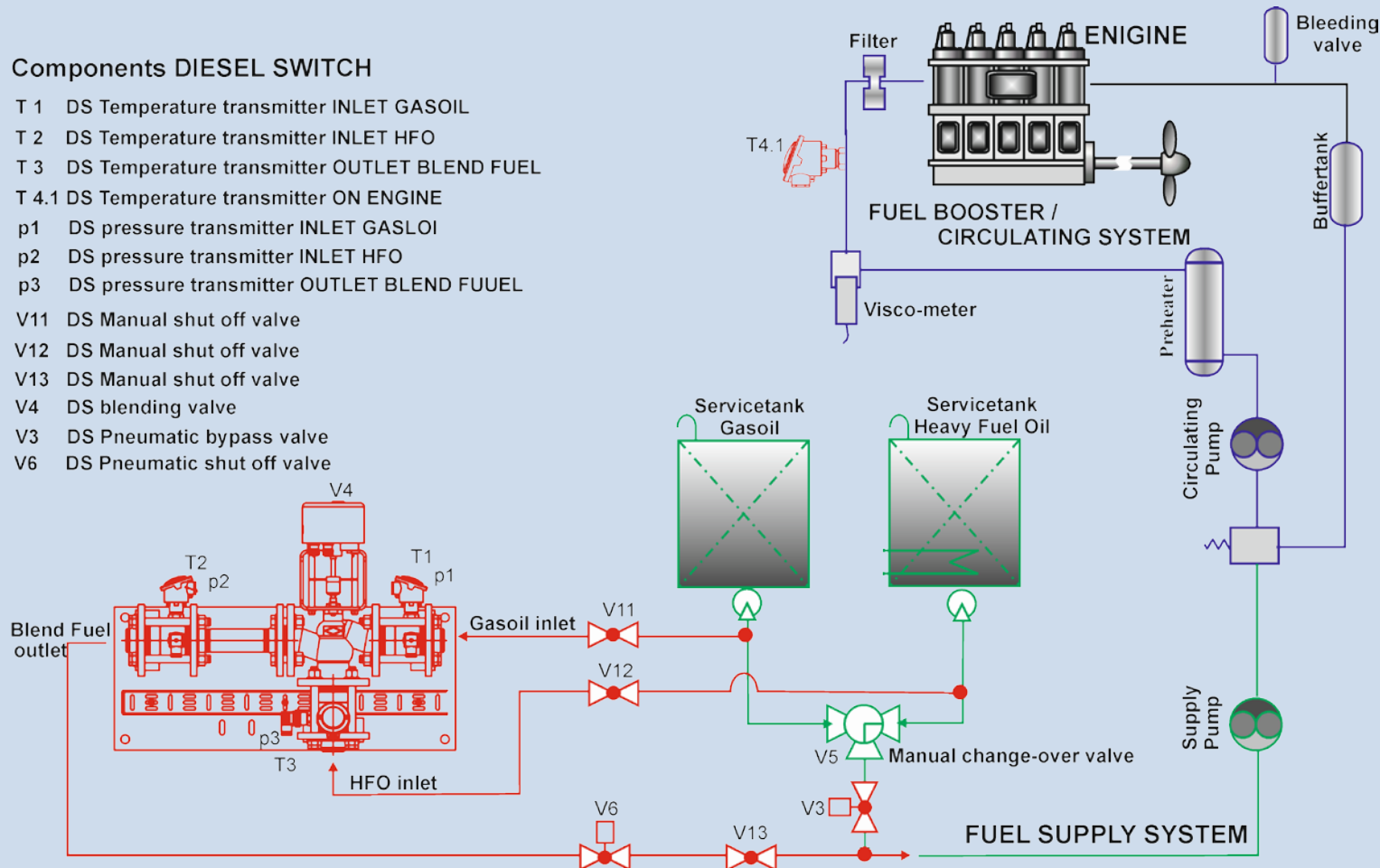


Fuel Management

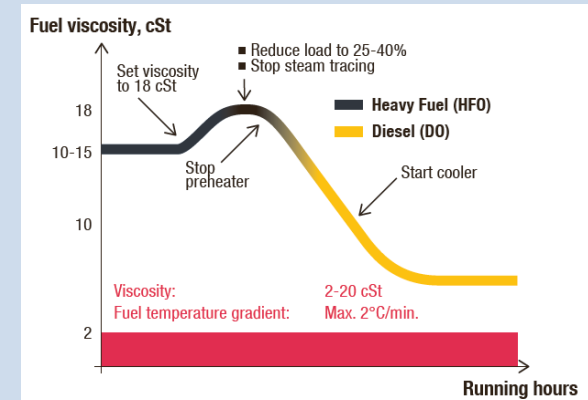
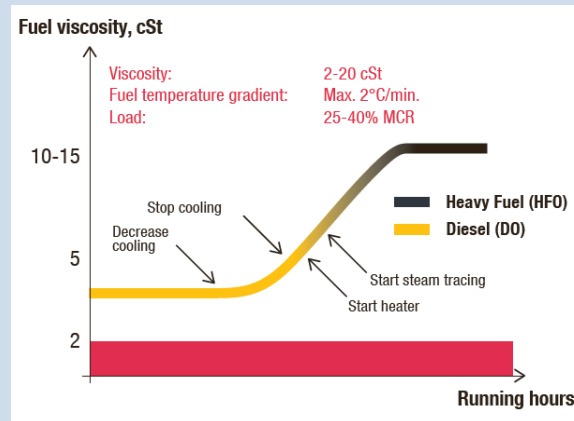
Installation in fuel booster system on board

Components DIESEL SWITCH

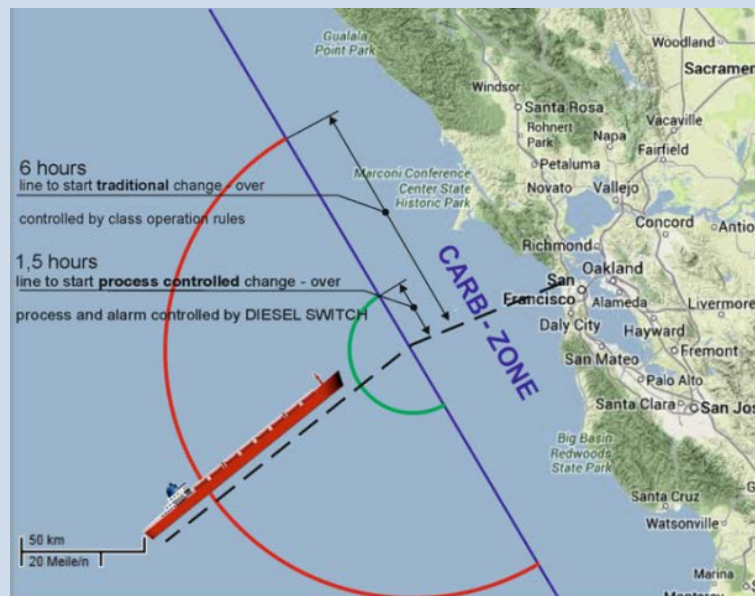
- T 1 DS Temperature transmitter INLET GASOIL
- T 2 DS Temperature transmitter INLET HFO
- T 3 DS Temperature transmitter OUTLET BLEND FUEL
- T 4.1 DS Temperature transmitter ON ENGINE
- p1 DS pressure transmitter INLET GASLOI
- p2 DS pressure transmitter INLET HFO
- p3 DS pressure transmitter OUTLET BLEND FUEL
- V11 DS Manual shut off valve
- V12 DS Manual shut off valve
- V13 DS Manual shut off valve
- V4 DS blending valve
- V3 DS Pneumatic bypass valve
- V6 DS Pneumatic shut off valve



Fuel Management

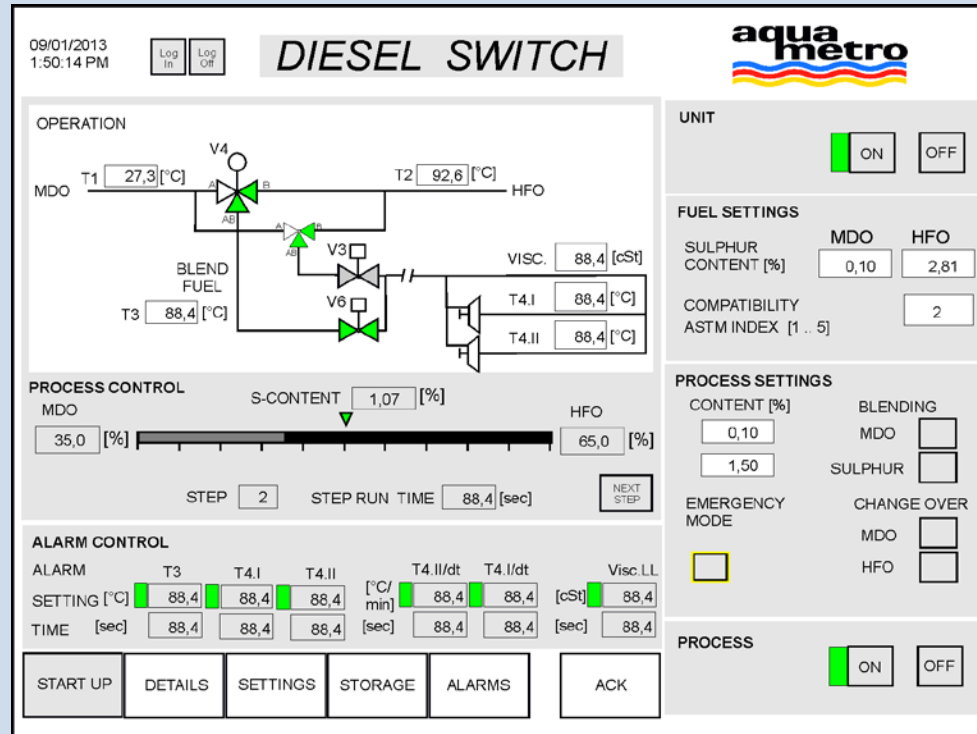


Source: MAN DIESEL Fact 1/2015



Fuel Management

Optimised control of fuel change - over or blending process



Process Control booster system

- Change - over / blending process
- Ratio of blending fuel
- Cooler (extern control)
- Heater / Trace heating (extern control)
- Homogenizer (extern control)


Alarm Control booster system

- Temperature fuel inlet & outlet DS
- Viscosity fuel (extern signal)
- Temperature fuel inlet engine
- Temperature gradient fuel inlet engine



Fuel Management

Optimised control of fuel change - over or blending process

09/01/2013 1:50:14 PM **DIESEL SWITCH** 

STEP 1 CONNECT USB STICK (USB PORT TOUCH PANEL)

STEP 2

STEP 3 COPY DATA FILES

STEP 4

STEP 5 DISCONNECT USB STICK (USB PORT TOUCH PANEL)

HISTORY

☐ CONTENT DATA

☐ GPS DATA

☒ DATA EXPORT

TREND Online ARCHIVE

☐ TEMPERATURE ☐


☐ PRESSURE ☐

☐ VISCOSITY ☐

☐ ANALOG INPUT I ☐

☐ ANALOG INPUT II ☐

SNo

09/01/2013 1:50:14 PM **DIESEL SWITCH** 

LINE	STATUS	DATE	TIME	I- MDO	SULPHUR HFO	-I BLEND	FUEL MDO
001	UNIT OFF	09/01/08	13:50:14	0.1	2.90	2.90	0.0
002	UNIT ON	09/01/08	10:15:27	0.1	2.90	2.90	0.0
003	BLEND ON	09/05/08	03:25:27	0.1	2.90	1.41	74.7
004	BLEND ON	09/05/08	11:45:03	0.1	2.90	0.99	94.2
005	BLEND OFF	09/15/08	19:09:36	0.1	2.90	0.99	94.2
006	SWITCH ON	09/17/08	07:57:23	0.1	2.90	0.99	94.2
007	SWITCH OFF	09/17/08	12:11:35	0.1	2.90	2.90	0.0
008	BLEND ON	09/23/08	15:25:45	0.1	2.90	2.90	0.0
009	BLEND OFF	09/23/08	23:16:26	0.1	2.90	1.48	74.9
010	BLEND ON	09/24/08	01:24:14	0.1	2.90	1.48	74.9
011	BLEND ON	09/05/09	05:45:35	0.1	2.90	0.99	94.2
012	BLEND OFF	09/06/09	09:26:15	0.1	2.90	1.41	74.7
013	SWITCH ON	09/06/09	15:47:11	0.1	2.90	1.41	74.7
014	SWITCH OFF	09/11/09	16:08:01	0.1	2.90	1.41	0.0
015	UNIT OFF	09/14/09	23:58:24	0.1	2.90	2.90	0.0
016	RESET to A	09/23/09	03:59:32	0.1	2.90	2.90	100.0

HISTORY

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TREND Online ARCHIVE

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☐ VISCOSITY ☐

☐ ANALOG INPUT I ☐

☐ ANALOG INPUT II ☐

SNo

09/01/2013 1:50:14 PM **DIESEL SWITCH** 

LINE	STATUS	DATE	TIME	Latitude N/S	Longitude E/W
001	UNIT OFF	09/01/08	13:50:14	0049.58 N	0005.18 W
002	UNIT ON	09/01/08	10:15:27	0036.02 N	0006.03 W
003	BLEND ON	09/05/08	03:25:27	0036.01 N	0006.02 W
004	BLEND ON	09/05/08	11:45:03	0043.10 N	0007.09 E
005	BLEND OFF	09/15/08	19:09:36	0043.10 N	0007.09 E
006	SWITCH ON	09/17/08	07:57:23	0043.10 N	0007.09 E
007	SWITCH OFF	09/17/08	12:11:35	0035.51 N	0008.32 W
008	BLEND ON	09/23/08	15:25:45	0035.55 N	0072.72 W
009	BLEND OFF	09/23/08	23:16:26	0040.42 N	0074.01 W
010	BLEND ON	09/24/08	01:24:14	0040.42 N	0074.01 W
011	BLEND ON	09/05/09	05:45:35	0026.80 N	0084.16 W
012	BLEND OFF	09/06/09	09:26:15	0026.39 N	0084.43 W
013	SWITCH ON	09/06/09	15:47:11	0026.39 N	0084.43 W
014	SWITCH OFF	09/11/09	16:08:01	0026.39 N	0084.43 W
015	UNIT OFF	09/14/09	23:58:24	0024.04 N	0088.32 W
016	RESET to A	09/23/09	03:59:32	0006.25 N	0080.20 W

HISTORY

☐ CONTENT DATA

☐ GPS DATA

☐ DATA EXPORT

TREND Online ARCHIVE

☐ TEMPERATURE ☐

☐ PRESSURE ☐

☐ VISCOSITY ☐

☐ ANALOG INPUT I ☐

☐ ANALOG INPUT II ☐

SNo

Data displayed on screen

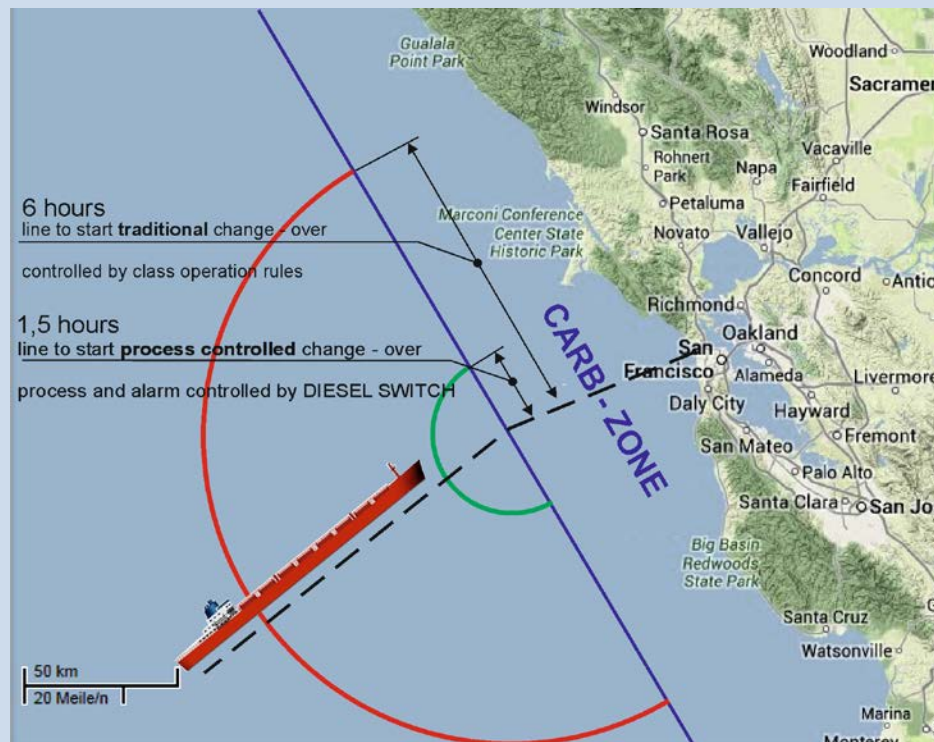
Data Storage on SD card – copy to USB available (csv – file)

- DIESEL SWITCH status (history data)
- GPS position
- DIESEL SWITCH alarms & settings (settings & archive messages)
- DIESEL SWITCH process data (archive process data max. 3 day's)

DIESEL SWITCH

Saving potential considering change - over process

- Automatic controlled process
- Minimal time for complete change - over
- Automatic alarm control of
 - Fuel temperature
 - Fuel viscosity
 - Fuel temperature gradient on engine



Example:

Traditional change – over
by rules

- Change over time app. **6 hours**

Automatic controlled change – over
by **DIESEL SWITCH** process & alarm control

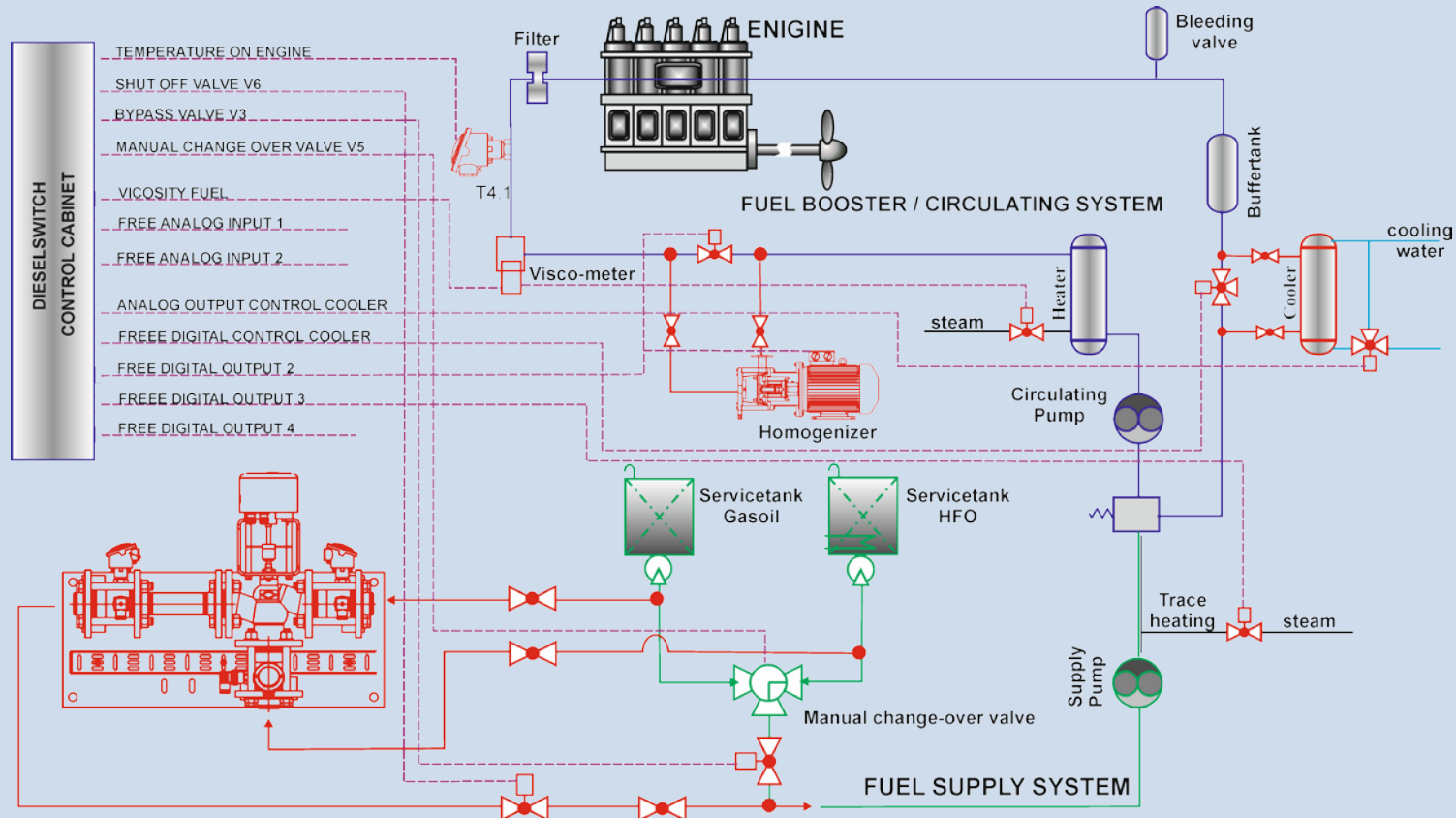
- Change – over time **1,5 hours**

- **SAVING** Fuel costs app.: **10 - 15 %**

Fuel Management

Extern control of components in booster system

- | | | |
|--------------------|---|---|
| Automatic control | - MDO / MGO COOLER / process | Start / stop function controlled by: |
| Start/Stop control | - HEATER / TRACE - HEATING | - fuel temperature outlet DIESEL SWITCH |
| | - HOMOGENIZER | - Fuel temperature inlet Engine |
| | - additional components free configurable | - Fuel viscosity (extern signal) |

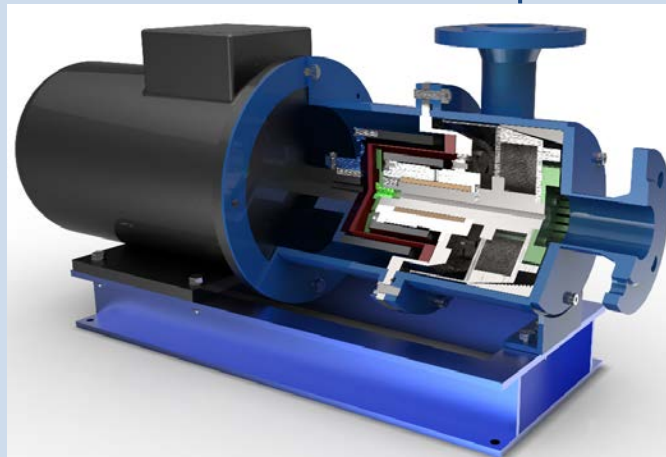
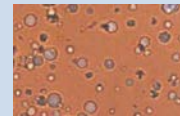


Fuel Management

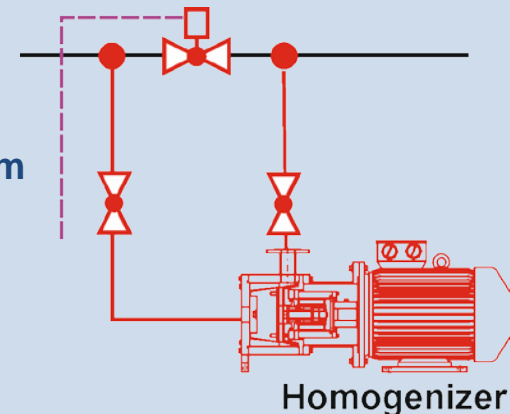
Extern control **HOMOGENIZER** in booster system

- FUEL HOMOGENIZER - dynamic milling machine
 - special rotor-stator milling gear with diffuser ring.
- Between the conical-shaped grinding surfaces the fuel is exposed to shearing forces, frictional forces and ultrasonic pressure waves.
- Magnetic coupling drive creates hermetic sealed homogenizing chamber.

milled fuel approx. $5\mu\text{m}$



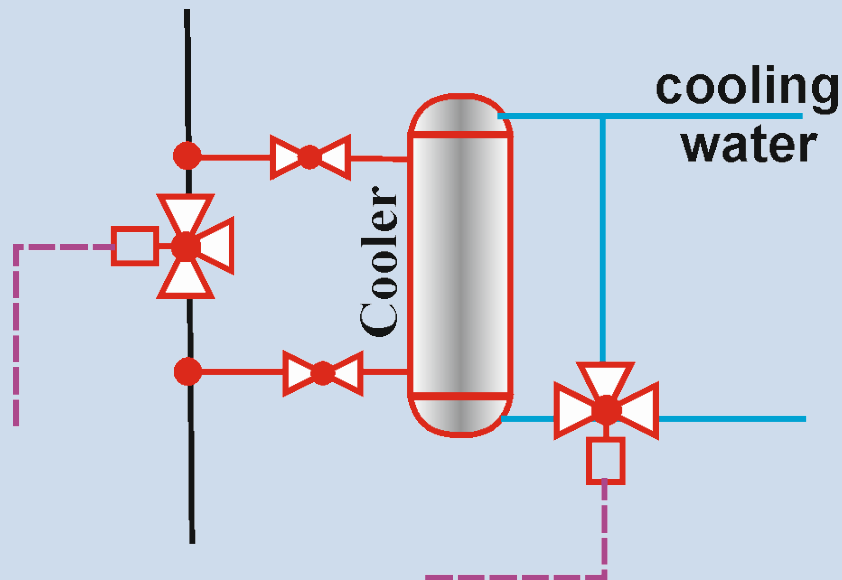
asphaltenes
approx. $120\mu\text{m}$



Fuel Management

Extern control **COOLER** in booster system






- FUEL MDO / MGO COOLER – controlled by DIESEL SWITCH
- Protection of engine and fuel system
- Automatic alarm control of
 - Fuel temperature
 - Fuel viscosity
 - Fuel temperature gradient on engine



OPTION Compatibility test kit acc. ASTM D 4740

- device to determine the stability and the compatibility of fuels onboard.
- enables the engineer to perform four tests at the same time
- heating system for quick drying of the spot test paper
- Test kit of objectiv sample analysis



Fig.3	Compatibility Reference Spot acc. ASTM D 4740-04			Stability & Compatibility
	N°1	Homogeneous spot (no inner ring)		OK
	N°2	Faint or poorly defined inner ring		Acceptable
	N°3	Well-defined thin inner ring, only slightly darker than the background		Limited
	N°4	Well-defined inner ring, thicker than the ring in reference spot N°3 and somewhat darker than the background		Poor
	N°5	Very dark solid or nearly solid area in the inner center. The central area is much darker than the background.		Extremely Poor



GL Group

TYPE APPROVAL
CERTIFICATE

...thank you

Any questions?



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