WG7 ‚Fuels‘

CIMAC Webinar - The Global Sulphur Cap 2020

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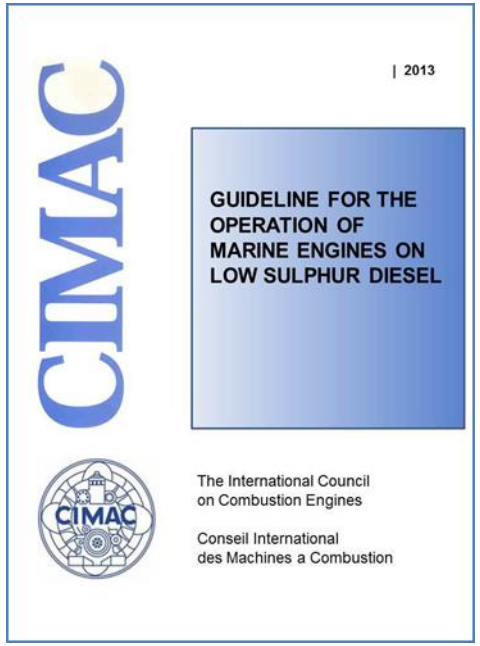
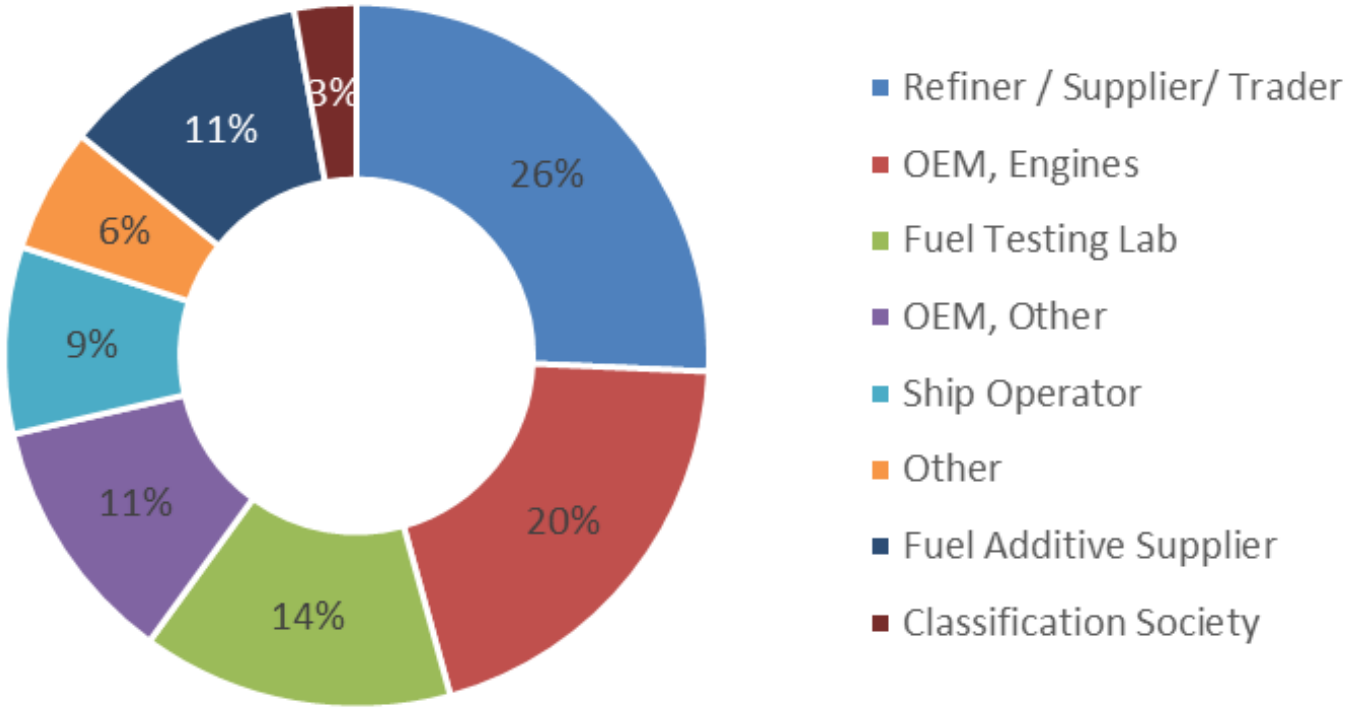
Member of WG ISO 8217 & Chairman CIMAC Fuels

WG7 ‚Fuels‘

- 35 members
  - 15 on waiting list
- Represented stakeholders
  - Refiners, Suppliers, OEMs, Ship Operators, Fuel Testing Labs, Classification Societies and others
- Co-operation with
  - All CIMAC WGs in case of common topics
  - ISO8217 fuels group (very close relationship)
- Latest Publications
  - Guideline providing answers to FAQ from ISO 8217:2017 (Mar 2017)
  - Guideline on the Interpretation of Marine Fuel Analysis Test Results (Feb 2016)
  - Guideline on Filter Treatment of Residual Fuel oil (Dec 2015)
  - Position paper: New 0.10% sulphur marine (ECA) fuels (June 2015)
  - Guideline: Cold flow properties of marine fuel oils (Jan 2015)



Representation in WG7 by sector



WG7 ‚Fuels‘

Recent and upcoming meetings

- No 76: Apr 2017, Switzerland
- No 77: Sep 2017, Frankfurt
- No 78: Apr 2018, Copenhagen
- No 79: Sep 2018, Philadelphia, US
- No 80: Mar 2019, Lisbon
- No 81: Oct. 2019, Oslo

Current activities, subgroups

<u>High priority SGs</u>

SG 1-1 CFR (centrifuges and efficiency)
SG4 Guideline on stability/compatibility
SG5 LNG quality
SG6 Ignition/Combustion, 2020 fuels
SG9 “How to order and use 2020 fuels”

<u>Low priority SGs</u>

SG 1-2 Separators
SG 3 pH / Corrositivity
SG 7 Emulsion fuels
SG10 Niche fuels

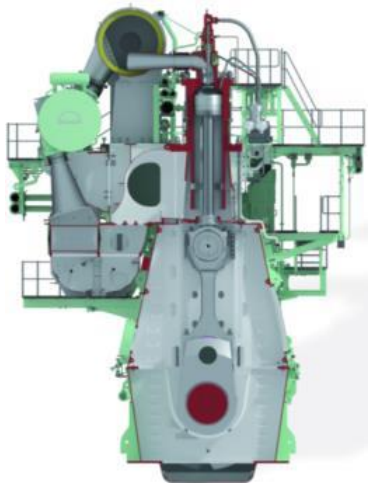
How is CIMAC WG7 ‚Fuels‘ preparing for 2020 ?

- Close cooperation with ISO 8217
- Assist ISO 8217 taking on some of the investigative work
- Prepare guidelines related to 2020 fuels. Currently two on the agenda:
  - Guideline: Stability / Compatibility . Done
  - Guideline: How to order and use 2020 fuels? Under preperation
- Investigate if there are other onboard and/or lab measurements available/needed to ensure safe operation on the VLSFO
- Represented in IMO “Joint Industry Guidance for 0.50%S Marine Fuel”

What Fuel will be used in 2020 and beyond?

Compliant fuel

MC/ME/-C engine
Single Fuel: 0.10%S fuel,
0.50%S fuel



ME-GI/ME-LGI engine
Dual Fuel: LNG, Ethane,
LPG, MeOH

High sulphur fuel

MC/ME/-C engine
0 – 5%S fuels:
HFO/MDO + Scrubber

ULSFO < 0.1% Sulphur but what about level of Cat fines for VLSFO < 0.5% ?

	Supplier A	Supplier B	Supplier C	Supplier D	Supplier E	Supplier F	Supplier G	Supplier H	Supplier I
Density (kg/m3 @ 15 C)	895-915	910	857	868	932	845	868	928	870-930
Viscosity (cSt @ 40 or 50 C)	40-75 (40ºC)	65 (50ºC)	17.6 (50ºC)	8.8	22.6 (50ºC)	8.8	8.5 (50ºC)	40C: 45-65. 50C 30-40	8-25 (50ºC)
Sulphur (% m/m)	0.1	0.095	0.08	0.05	0.1	0.03	0.09	0.1	<0.1
Pour Point (C)	15-30	20	<-12	-12	30	21	27	20-25	18-21
Flash Point (C)	>70	60	>200	72	90	>70	>70	70	60-80
Water (% v/v)	0.05	0.1	<0.2	0.004	<0.05	0.01	0.05	0.2	0.05-0.1
Acid Number (mg KOH/g)	<0.1	2.5	0.3	0.27	0.06	0.04		2.5	0.1-0.2
Al+Si (ppm m/m)	<0,3	17	<15	?	34	<1	<3	10-20	12-15
Lubricity (µm)	<320	520	-	410	-	326	-	-	-
CCAI	795-810	860	762	-	-	765	789	790-800	790-810

What may / will happen in 2020?

Key parameters for 0.50% Marine Fuel Oil blending will be:

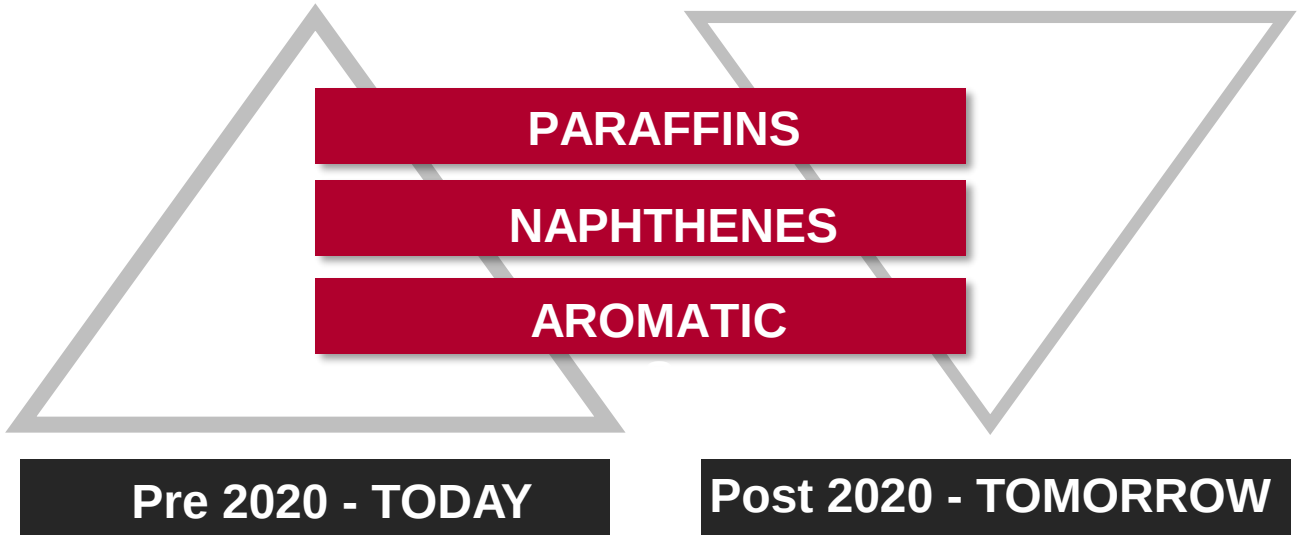
Stability (Total Sediment)
- Paraffinic vs Cracked blend components

Pour Point
- ULSFO /VLSFO close to PP limits

Acidity
- Sweet crude sources with high AN (e.g. DOBA)

Viscosity
- No minimum limit in ISO 8217, Table 2

CCAI
- Larger difference between viscosity and density



Ref: KBC/Mel Larson

VeriFuel
Understanding Marine Fuel

0.50% S VLSFO – First feedback from the field

List of observations - PRELIMINARY

If all our recommendations are followed = No problems
(Refer to MUN2019-09-11)

Several cases of scuffing and high wear

- **Cat fines** – from cleaning of the tanks
- **No cermet on the piston rings**
- **Lubrication feed rate too low**
- **High wear due to cold corrosion**

Fuel system

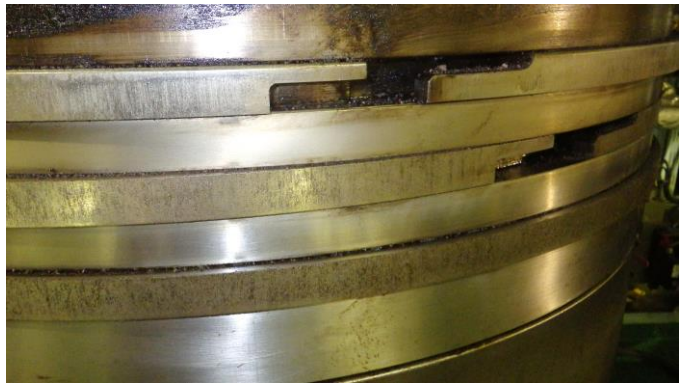
– Stuck high pressure fuel pumps

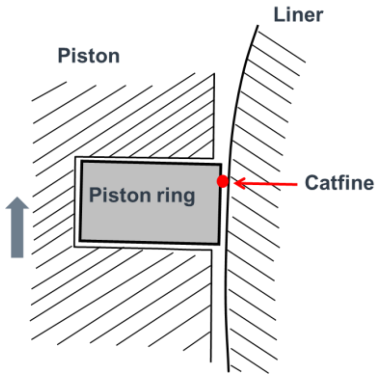
– Gasification of low viscosity fuel

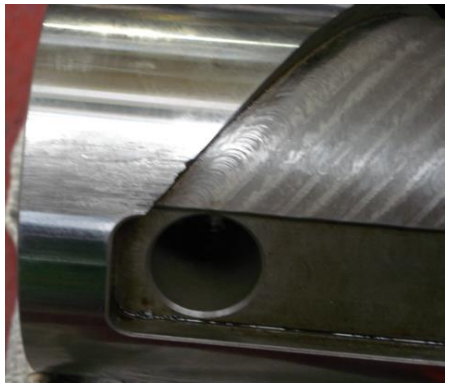
Cold flow properties of the fuel

– Temperature control

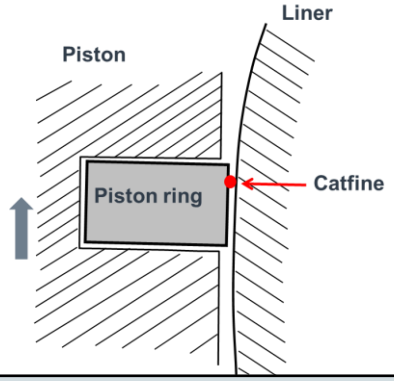
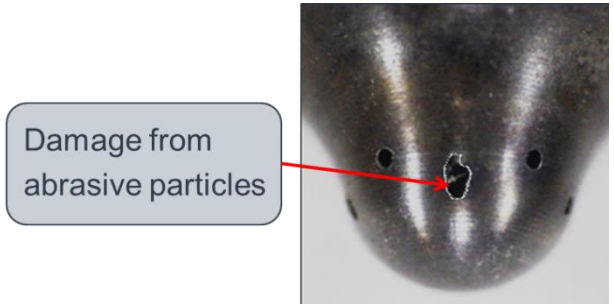
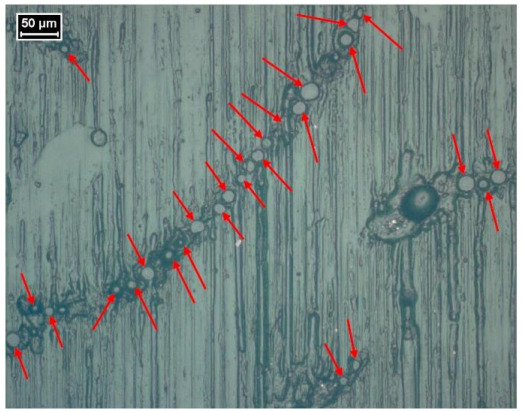
Incompatibility between fuels





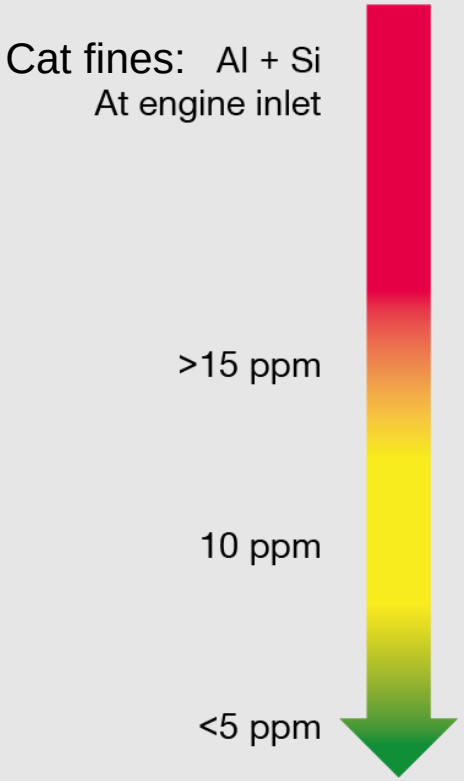


Overview of damages
Found in two-stroke engines and small four-stroke Gensets

Damages found in two-stroke engines	Damages found in small four-stroke Gensets
Wear in combustion chamber parts	Wear in fuel equipment
	
Resulting in high wear	Resulting in poor combustion
	

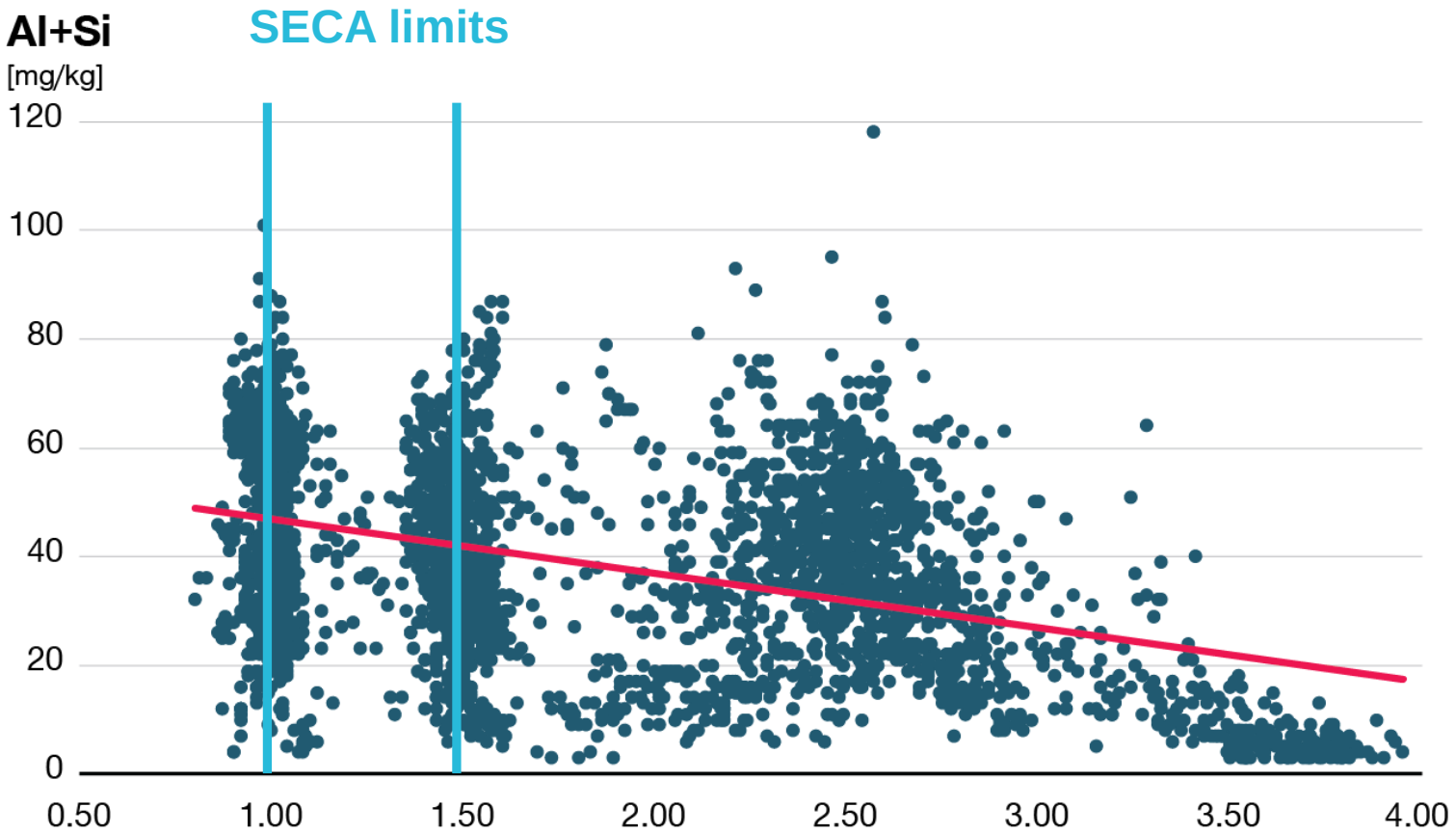
Cat fines

Cat fines cause wear in the engines



Limits for cat fines content at engine inlet

Cat fines in fuel bunker samples from 2010

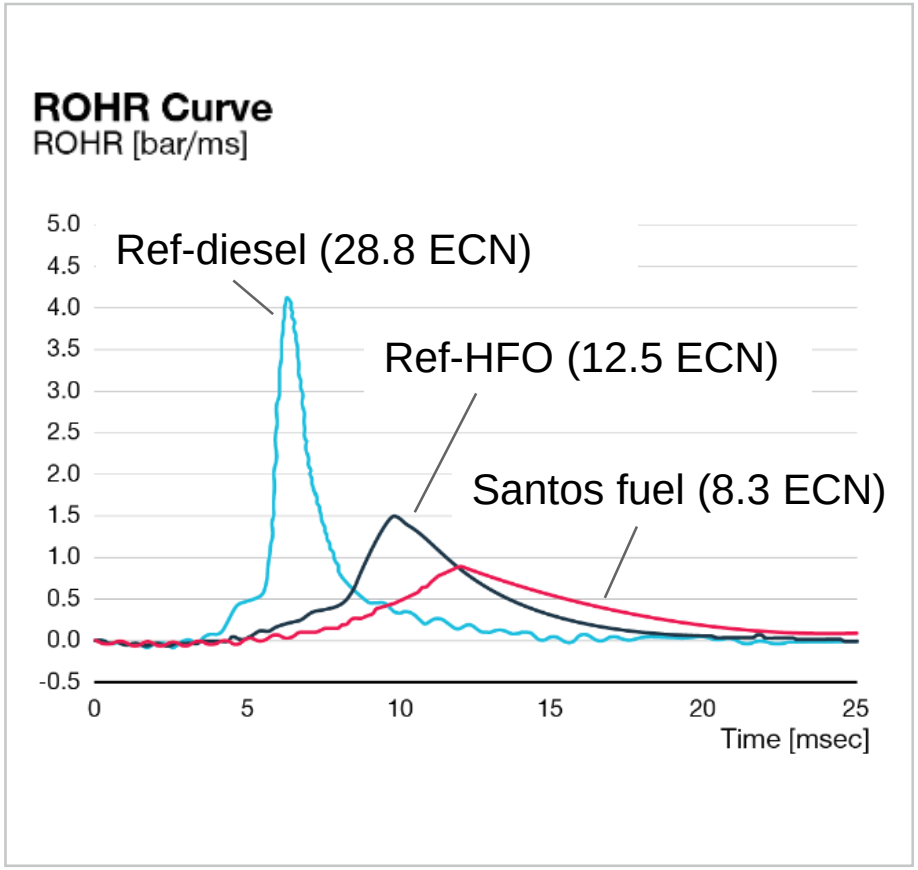


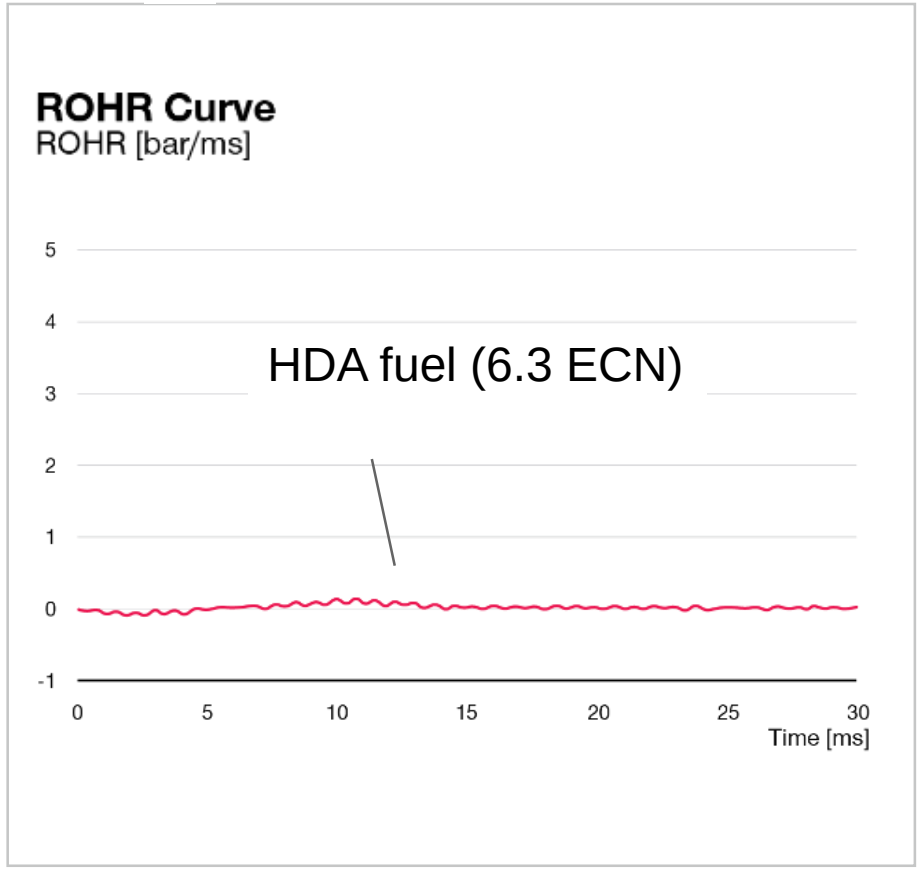
Sample data: Courtesy: VPS
Data analysis: MAN ES

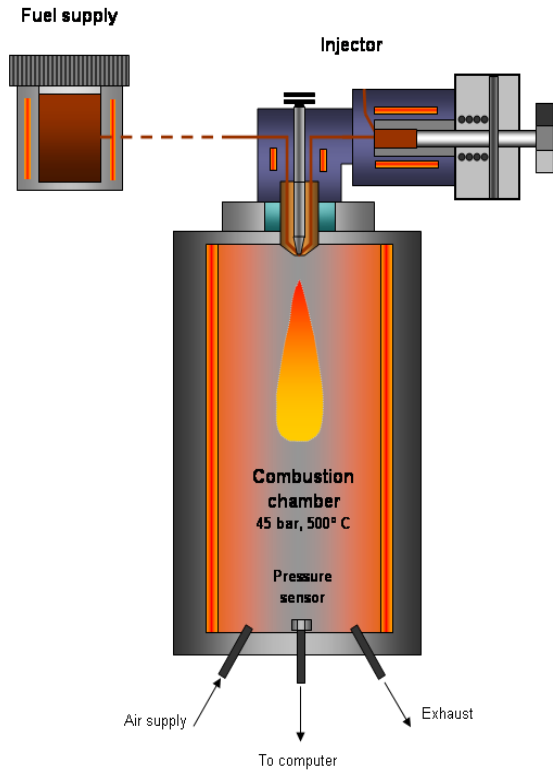
Cold flow properties - wax

Combustion test – Lab test

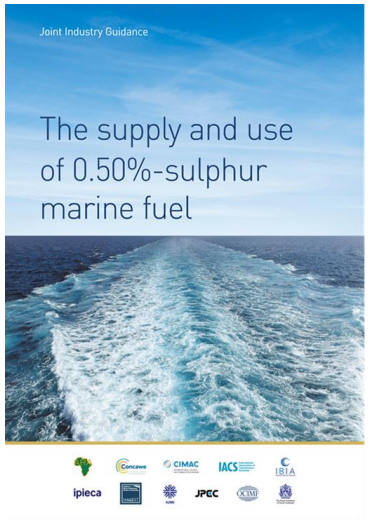
FIA test IP 541: Constant volume combustion chamber method







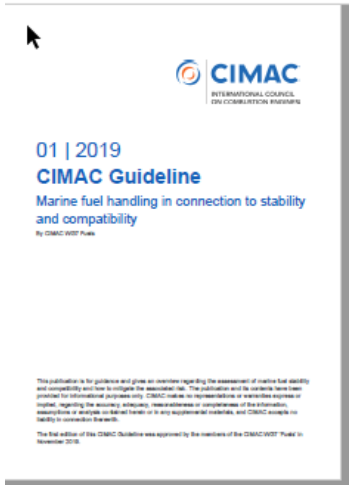
Latest Publications about the coming fuels 2020



Joint Industry Project

ISO 8217 PAS

Concawe



CIMAC WG 7

CIMAC Guideline

Several test methods to evaluate fuel stability exist have been highlighted in this paper, however, their applicability and accuracy varies.

Only one method (ASTM D4740) is available as providing a useful onboard screening tool for compatibility between two fuels of which one must be of a residual (RM) nature. Fuels which are actually compatible may be deemed less compatible or incompatible by the method.

The most effective way to determine a fuel's stability or compatibility between two or more fuels, is using test methods that can only be applied in a controlled laboratory setting.

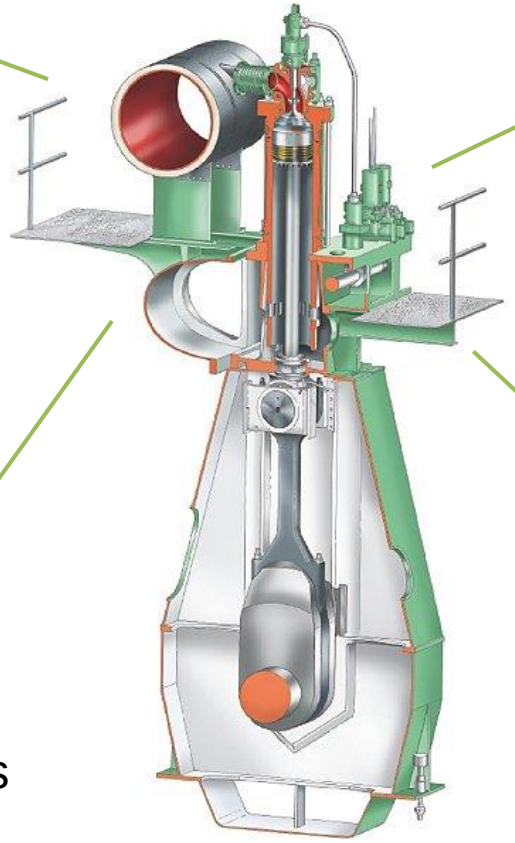
The test method ISO 10307-2 Potential Total Sediment (TSP) is used as the definition for a stable fuel in ISO 8217:2017 when the TSP is below 0.10% m/m.

The three test methods: ASTM D7157, D7112 and D7060 with the prediction model offer a tool to evaluate the degree of compatibility of fuels without the need to test the fuels mixed together.

Engine updates – for 0.50% S Fuel

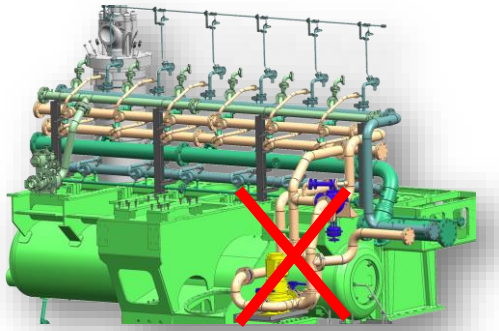
- What to consider?

Piston rings:
Full cermet coated ring-pack



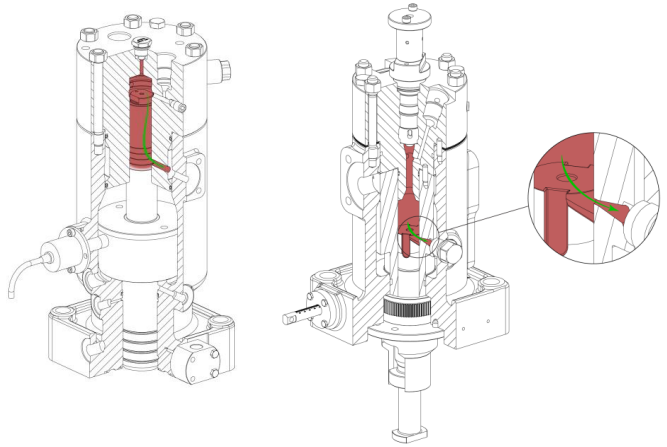
Liner cooling:
- Reduced temp.: 80 C
- No LDCL
- No RDL

LDCL



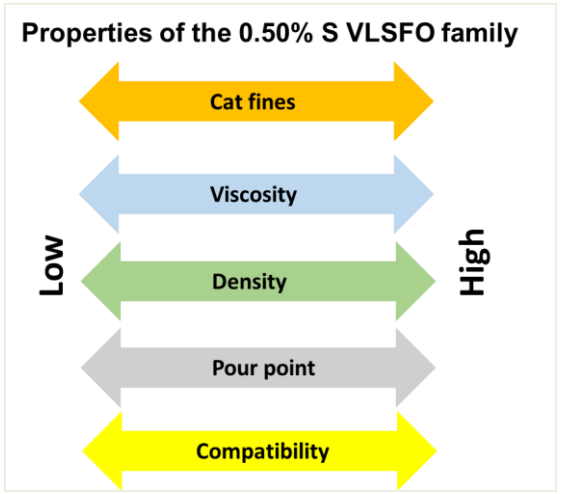
Cylinder oil:
- 40 BN
- No deposits

High-pressure fuel pumps:
- Low viscosity fuel
- High viscosity fuel
- Change-over

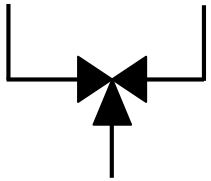


Summary: 0.50% S fuels

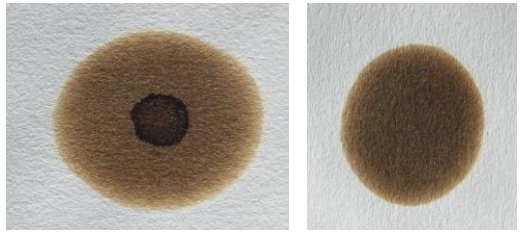
What to consider – for the ship?



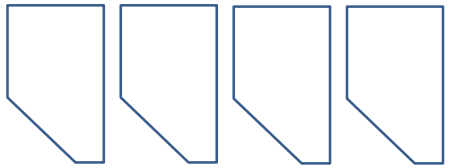
Fuel change-over



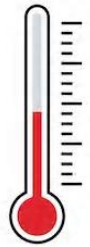
Compatibility of mixed fuels



Fuel tank system considerations

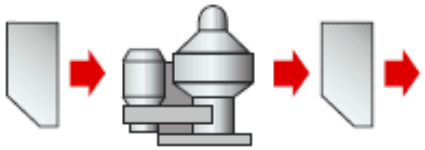


Temperature

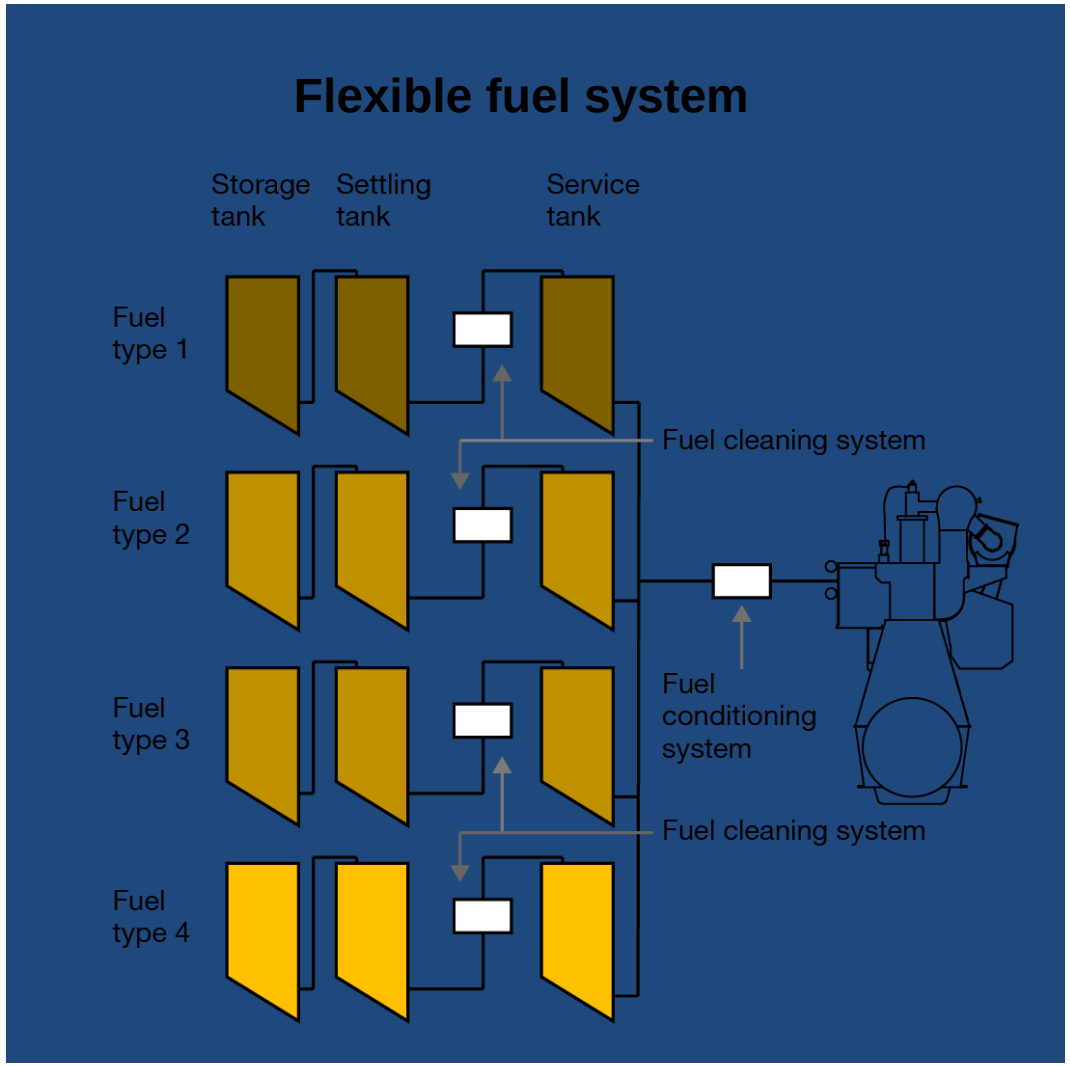


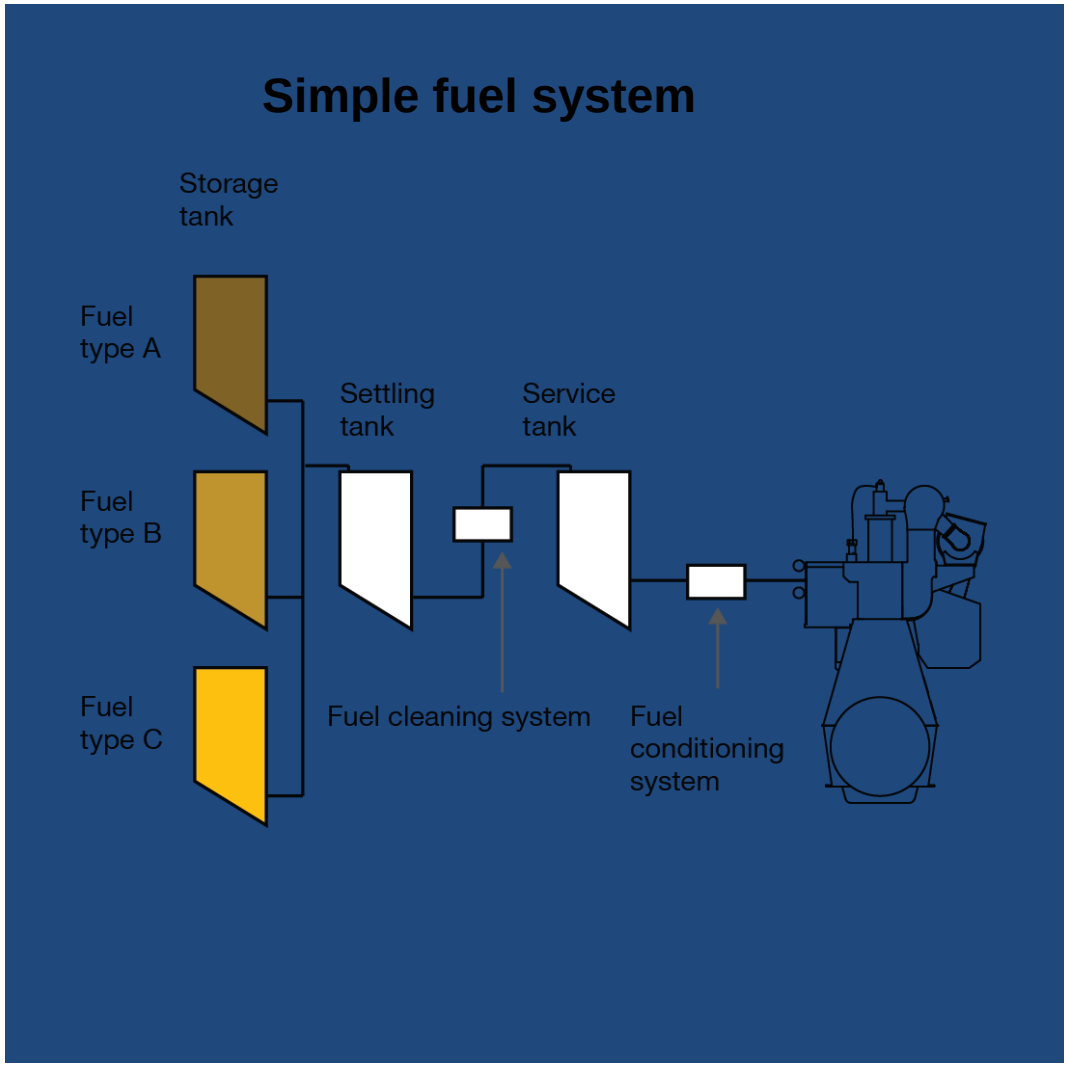
Viscosity

Clean the fuel



Fuel system – schematic examples





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This data serves informational purposes only and is especially not guaranteed in any way.
Depending on the subsequent specific individual projects, the relevant data may be subject to changes and will be assessed and determined individually for each project. This will depend on the particular characteristics of each individual project, especially specific site and operational conditions.

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Thank you very much!

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