



MARINE FUEL SPECIALTIES

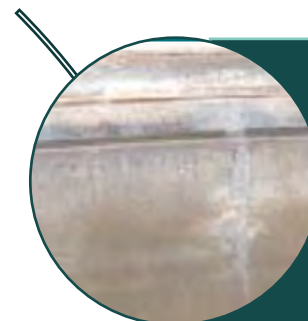
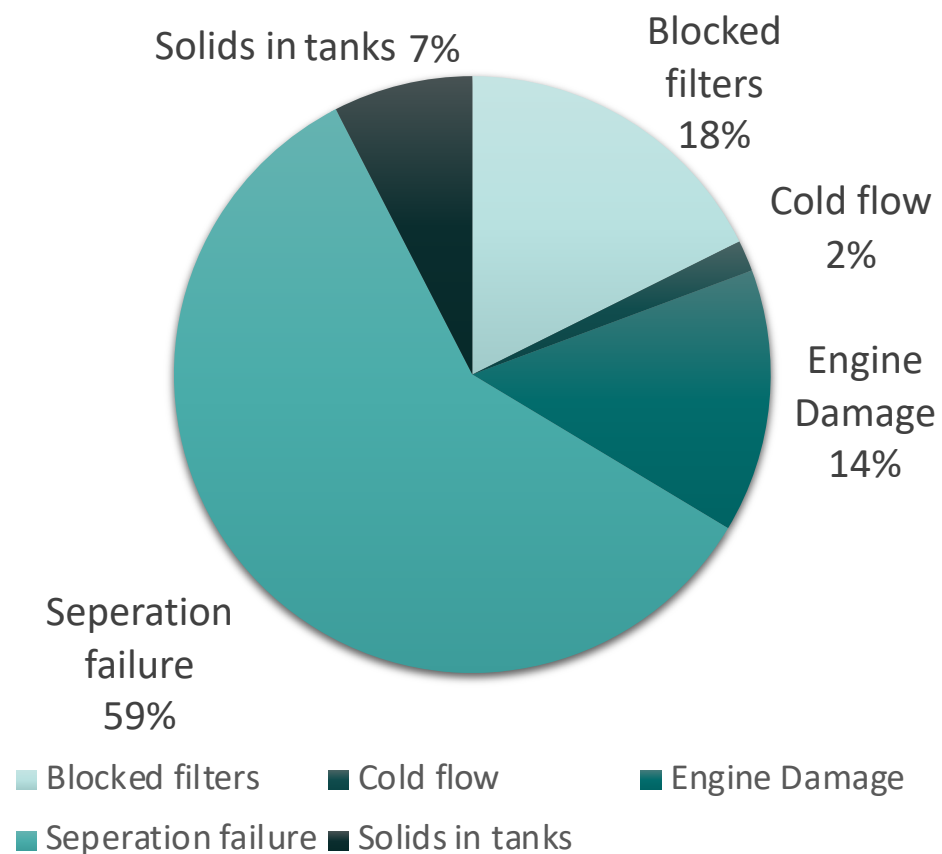
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VLSFO QUALITY IN PRACTICE

Joshua Townley, Market Specialist Marine

VLSFO PROBLEM DISTRIBUTION

Fault Distribution



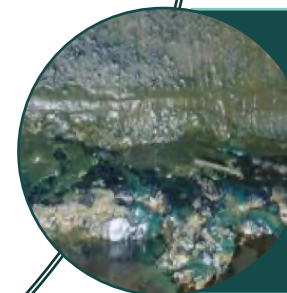
Engine Damage

- Liner wear
- Piston ring breakage
- Scavenge fire
- Injector failure



Handling

- Purifier breakdown
- Separation failure
- Filter blocking
- Fuel starvation



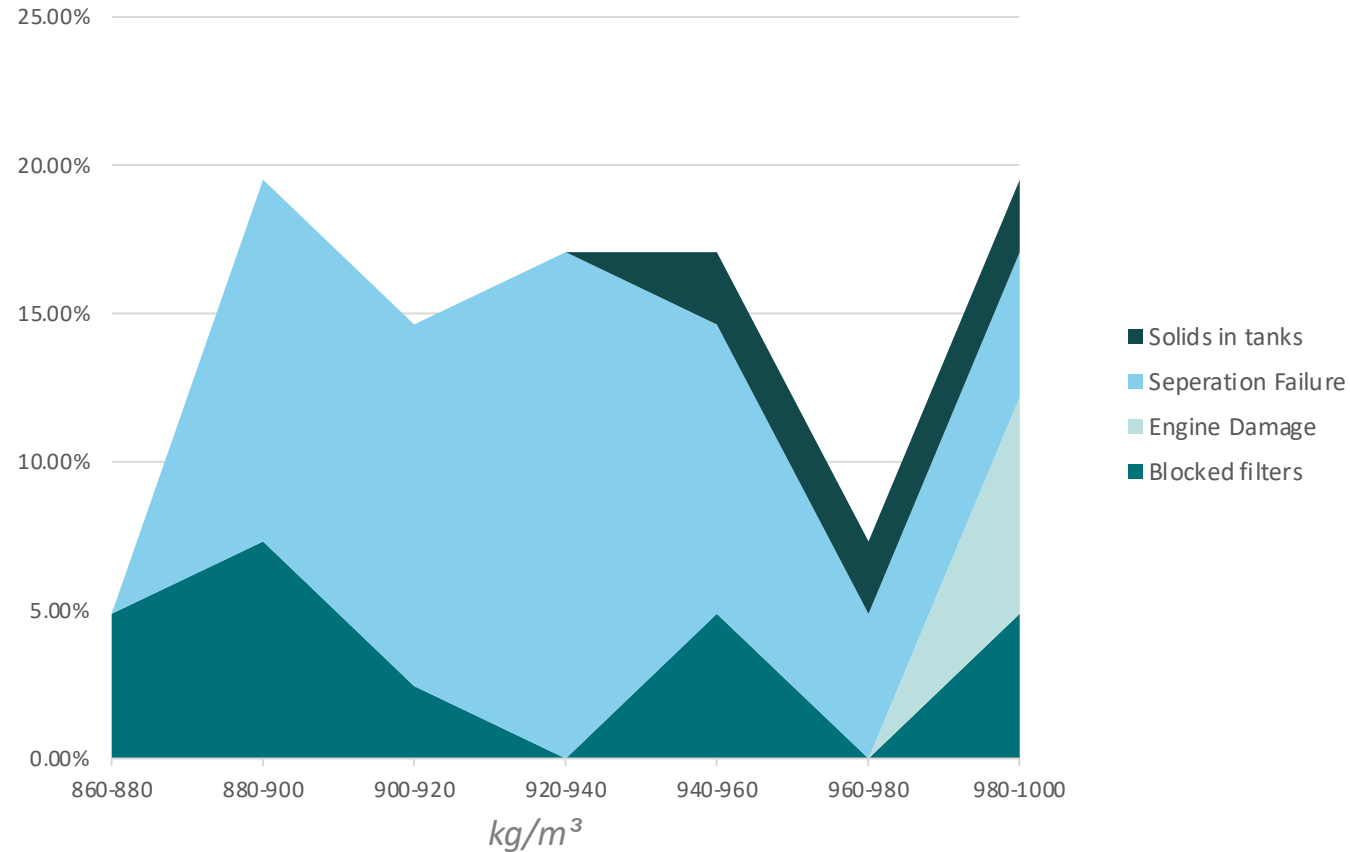
Storage

- Un-pumpable tanks
- Excessive sludge
- Wax formation
- Co-mingling

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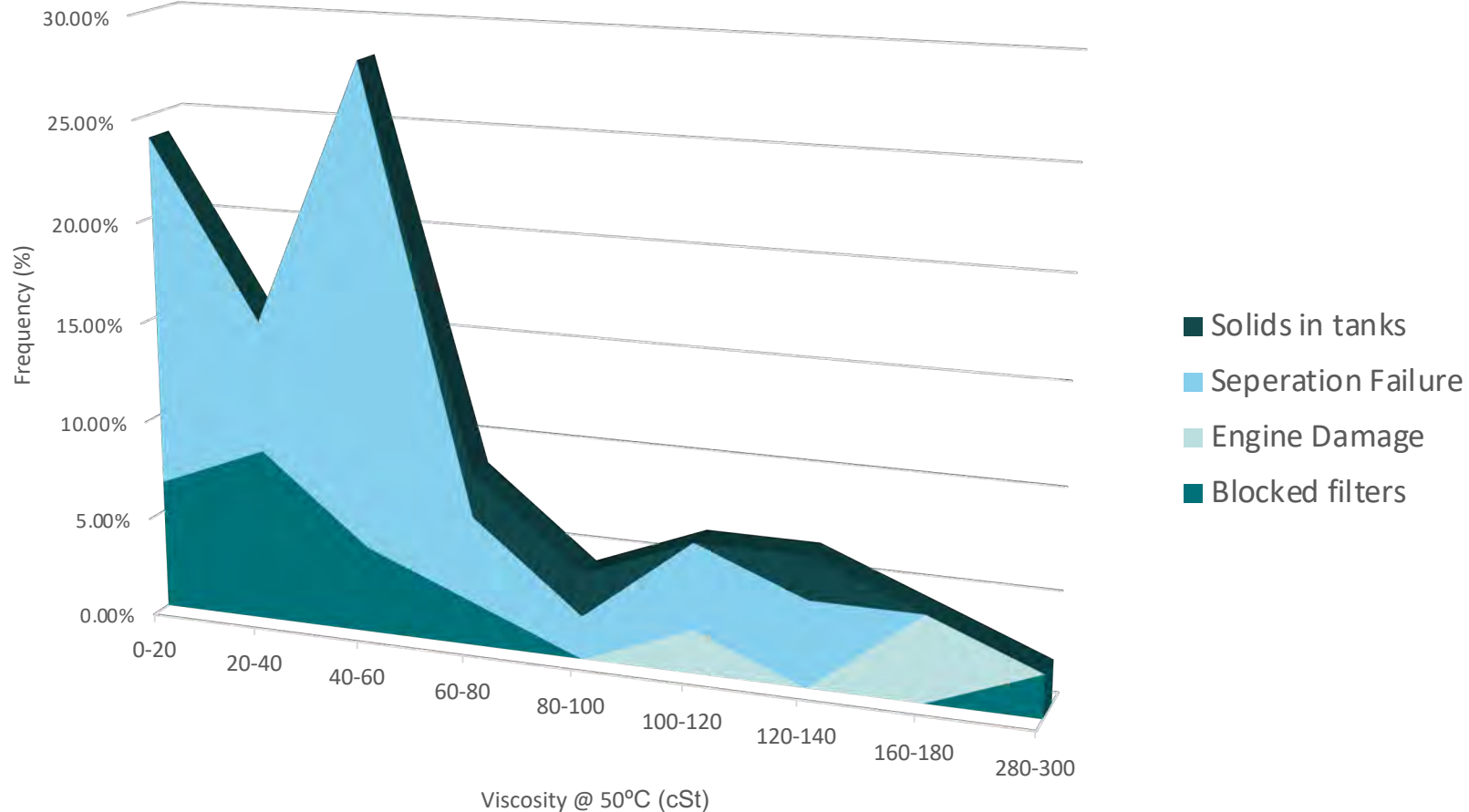
DENSITY VS. ISSUES



- Engine damage occurs when using higher density fuels
- Separation failure is seen across all density ranges, most commonly at lower densities
- Solids in tanks seen above 940 kg/m³
- Filter blocking seen across all density ranges

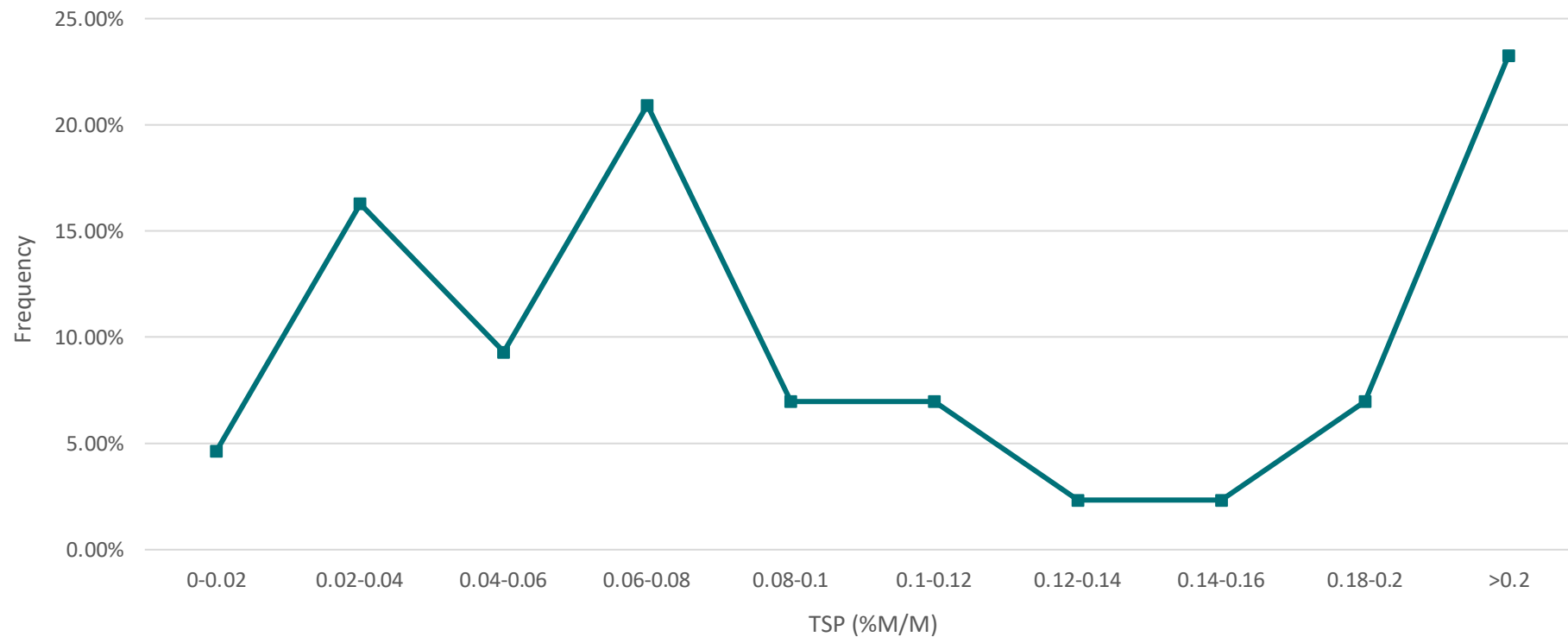
VISCOSITY VS. ISSUES

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- Lower viscosities see far more issues, mostly through blocked filters and separation failure
- High viscosities see more engine damage

TSP VS. ISSUES



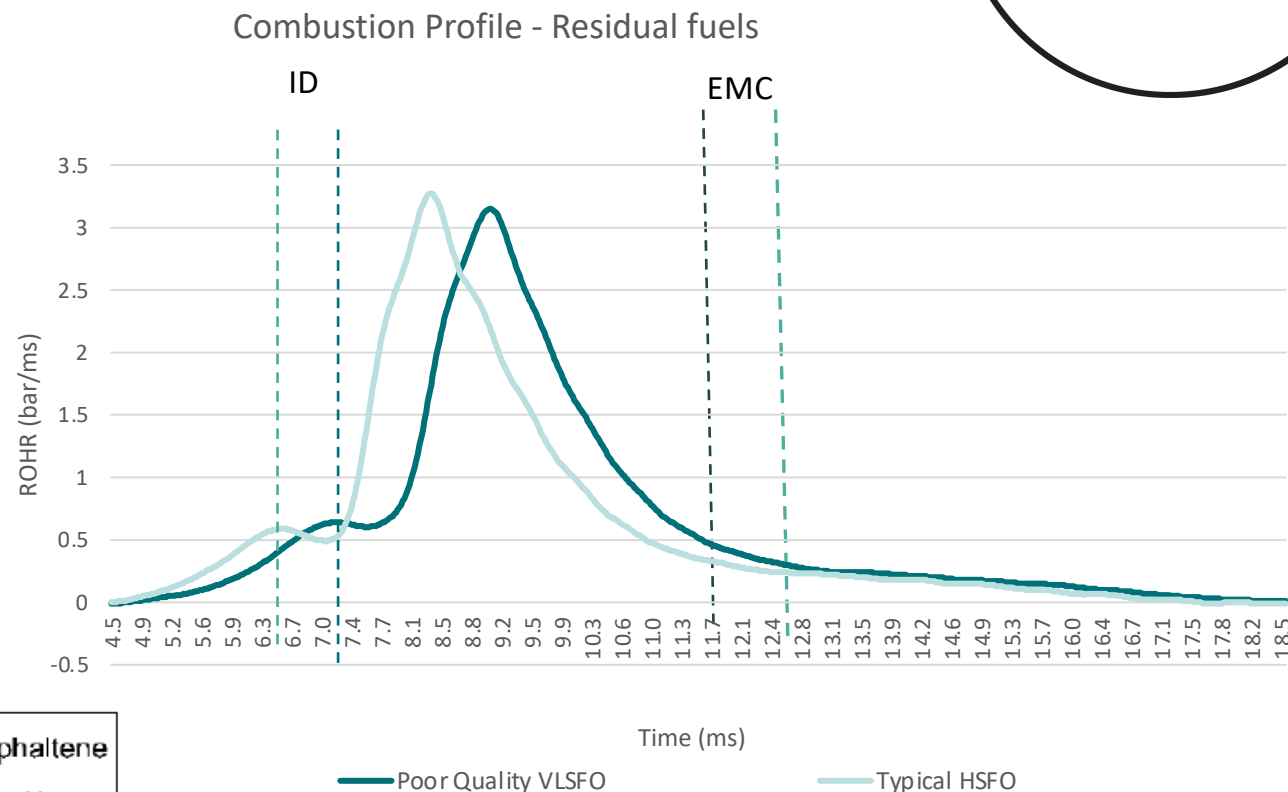
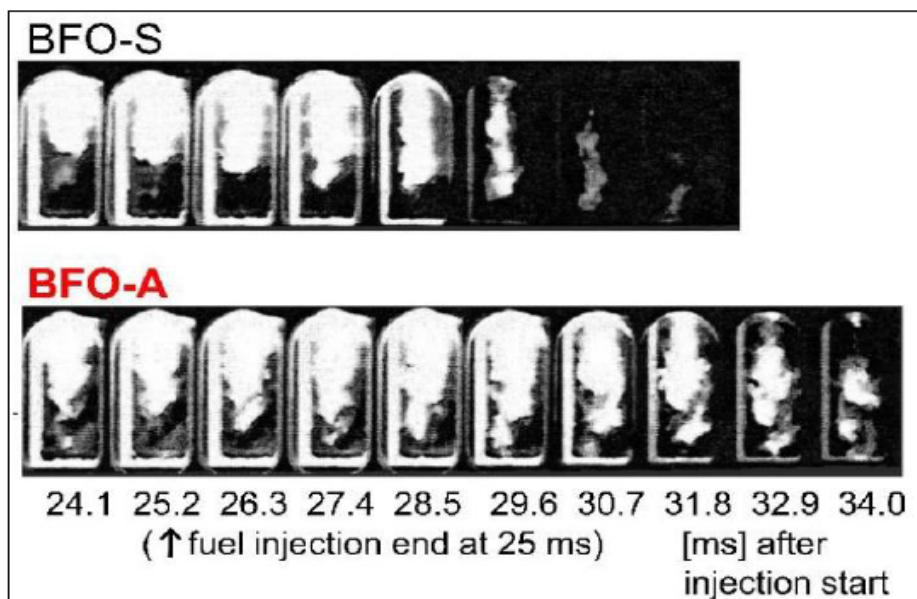
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FUEL QUALITY: VLSFO VS TYPICAL HSFO

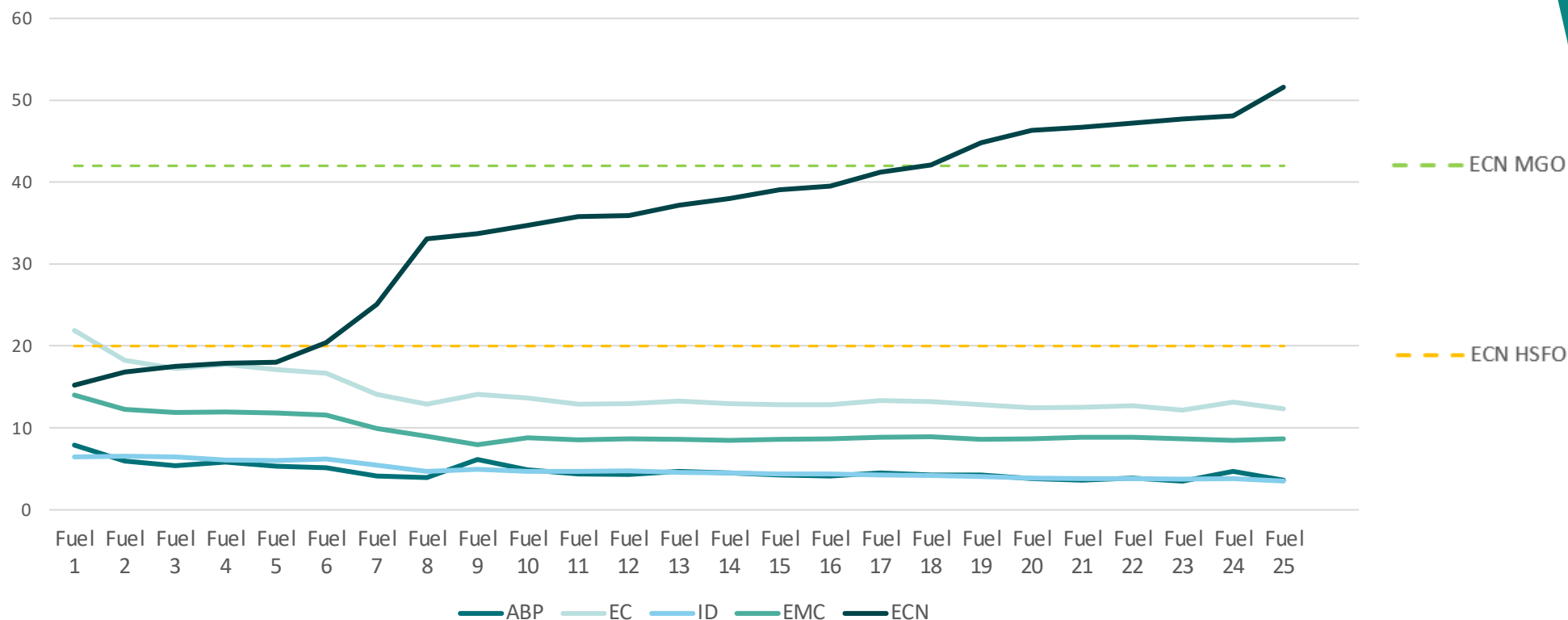
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Sample	Bunkering Port	Comment	Sulfur %	CCAI -	Al+Si ppm	Asphaltene %
BFO-S	Singapore	☺ non-trouble	3.5	852	< 20	9.5
BFO-A	Los Angeles	☠ scuffing for (2-stroke) container ships	1.3	849	< 20	4.6

FUEL QUALITY: VLSFO VS. TYPICAL HSFO



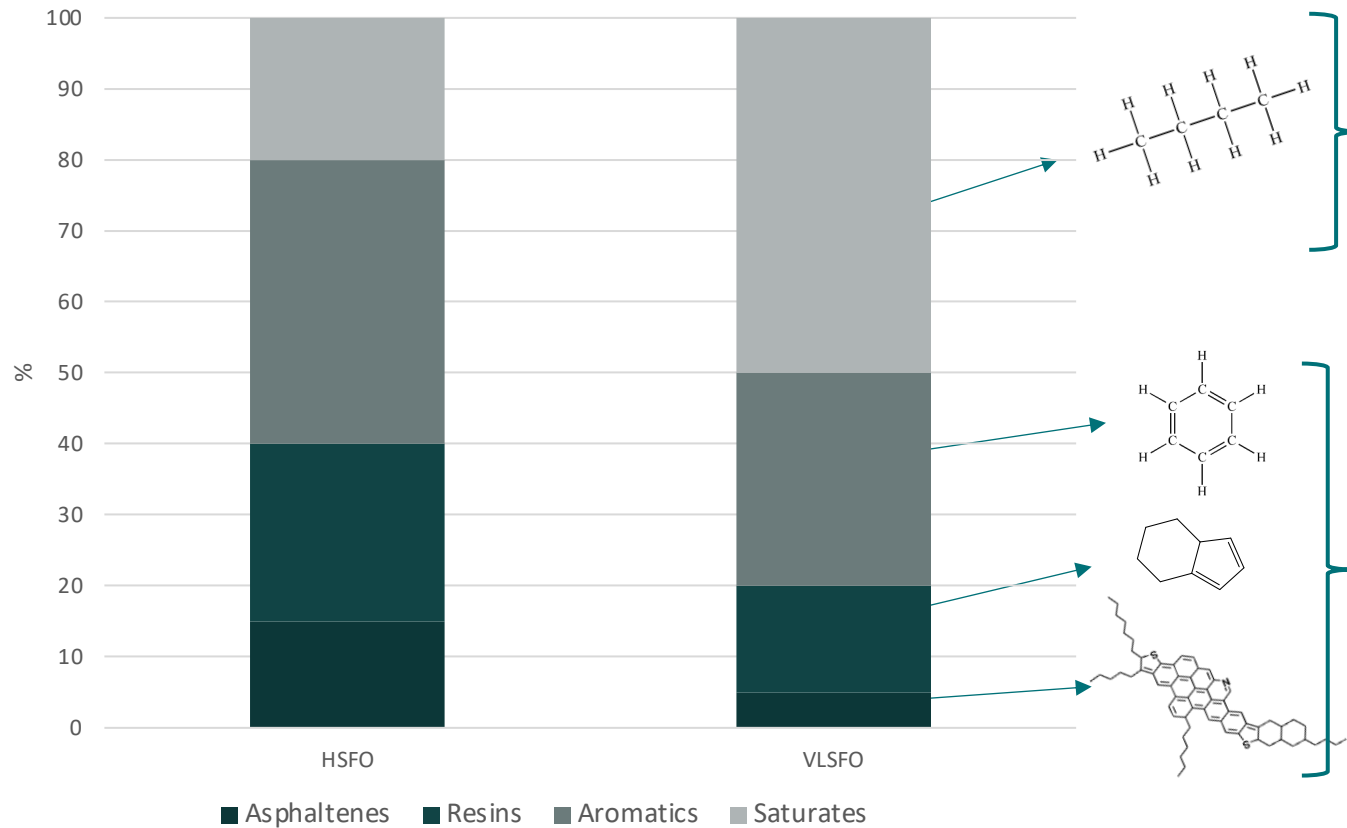
The distribution of key combustion characteristics of (25) ISO 8217 compliant VLSFOs from around the world. The Y-axis represents units in Milliseconds (ms) except ECN, which is an index figure.

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A DIFFERENT MAKEUP

Residual Marine Fuel - Composition



Paraffinic – straight chain hydrocarbons, often from secondary refinery streams. Paraffins are prone to rapid oxidation when heated, or drop out as wax in low temperatures. Octamar™ Ultra HF prevents oxidation and stabilises these components for a more homogenous fuel

Aromatics – Similar benzene ring structures. Asphaltenes can remain stable when surrounded by an aromatic portion (Resins, Aromatics) over extended time periods however, in the presence of a significant paraffin mixture, the Asphaltenes begin to ‘agglomerate’; growing larger to form sludge in tanks, or attributing to poor combustion. Octamar™ Ultra HF targets and protects vulnerable Asphaltenes

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Typical blend ratios of modern residual marine fuels show a much higher proportion of the saturate (paraffinic) component in combination with aromatics, which are structurally dissimilar, causing separation and instability.

BIO FUELS

Medium to long term

- Biofuels (Predominantly **FAME**) are considered to be the drop in fuel solution, particularly for older tonnage
- It is not feasible to supply the whole market with Bio products, nor is it possible to supply bio to the marine market that meets EN14214 (spec for B100, FAME blend component in automotive fuel)
- ISO is evaluating current and future biofuels and considering allowing Biofuels into table 2 of 8217, this a separate discussion looking at technical aspects only not considering legislative challenges of Biofuels
- We have generations of experience treating Biofuels and overcoming their limitations, including
 - a tendency to **oxidise** leading to **long-term storage** issues
 - an affinity to water and risk of **microbial growth**
 - degraded low-temperature flow properties
 - FAME material **deposition** on exposed surfaces, including filter elements
- **Octamar™ HF-10 Plus** was developed for a lower sulphur future, and is **BIOFUEL ready**.

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LABORATORY TESTS - AGED VLSFO

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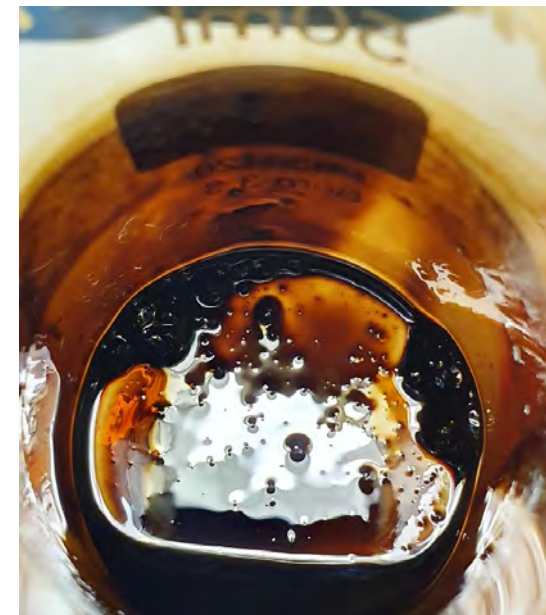
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- 30 ml samples of two VLSFO
- Heated at 100°C for 24 hours
- Significant Asphaltenes drop out after only 24 hours

VLSFO 1



VLSFO 2

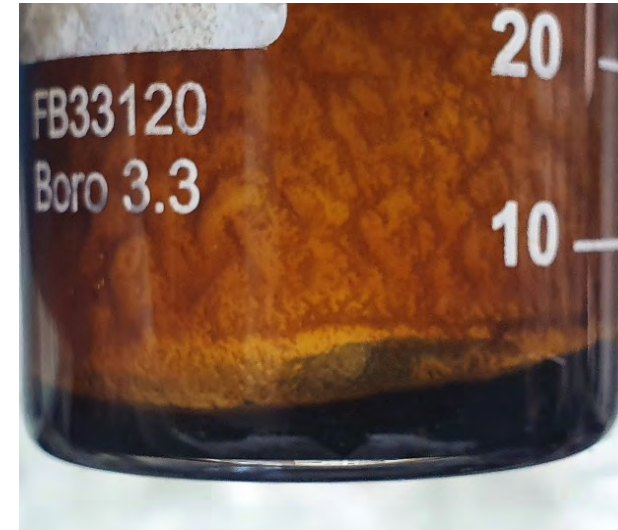


Fuel	Pre-treated	Treated	SARA			
	RSN	RSN	Saturates(%)	Aromatics(%)	Resins(%)	Asphaltenes(%)
VLSFO 1	10.8	2.4	81.53	7.10	6.96	4.41
VLSFO 2	3.95	0.4	28.56	44.36	17.97	9.10

LABORATORY TESTS – MIXED VLSFO - AGED

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- 50:50 blend of two VLSFO fuel
- Heated at 100°C for 24 hours
- 13 % of the fuel turned into a solid sludge at the bottom

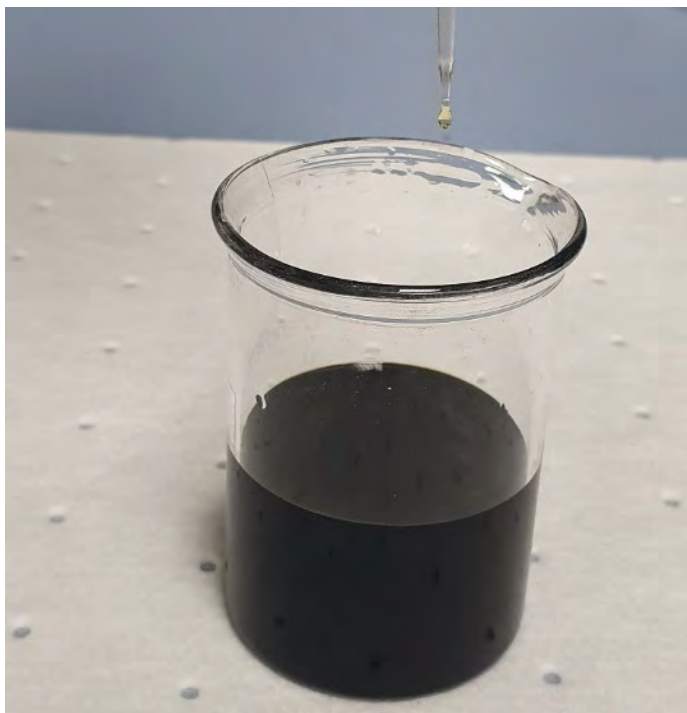


50:50 Blend of VLSFO 1 + 2 after 24 hours at 100°C

LABORATORY TESTS – TREATED WITH OCTAMAR™ HF-10 PLUS

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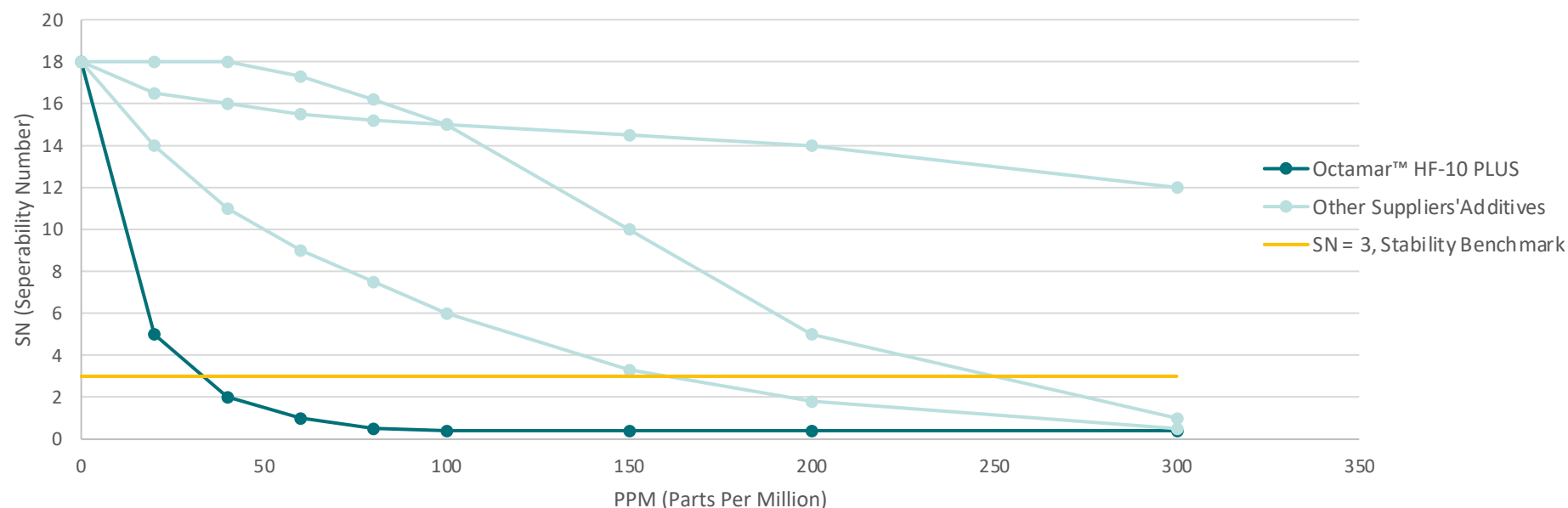
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50:50 blend treated with 66 ppm **OCTAMAR™ HF-10 PLUS** aged for 24 hours at 100°C

INNOSPEC

- The world's largest fuel specialists covering multiple industries
- 100+ fuel and fuel blends tested with >90 % improvement in SN
- Lowest reliable dose rate, for the best results at the lowest treat rate per tonne



	Concentration	Treat rate
Octamar™ HF-10 PLUS	66 ppm	1 litre doses 15,000 litres
Other additives	166 ppm and above	1 litre doses < 6,000 litres

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CONTACT DETAILS

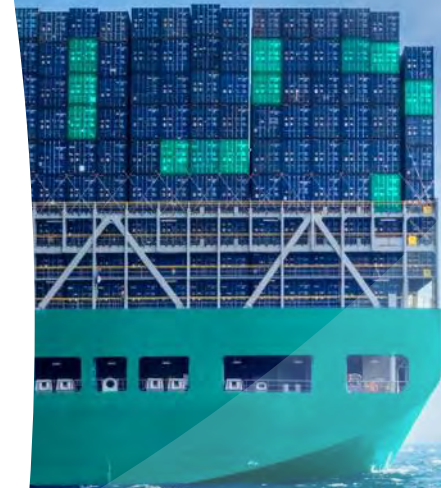
Joshua Townley, Market Specialist Marine

If you have got any questions or would like to further discuss any of the presentation content please get in touch:

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THANK YOU!

