

Customer Technical Service

18 MONTHS WITH VLSFO – FUEL INSIGHT

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Innospec believe knowledge is power and provide the marine industry with unique insights to better understand and tackle the problems that arise when using marine fuels. This bulletin contains the latest trends and analysis in VLSFO quality and characteristics, and uniquely maps out several hundred cases of fuel issues at sea against their characteristics, so you can take a proactive approach to fleet safety and performance.

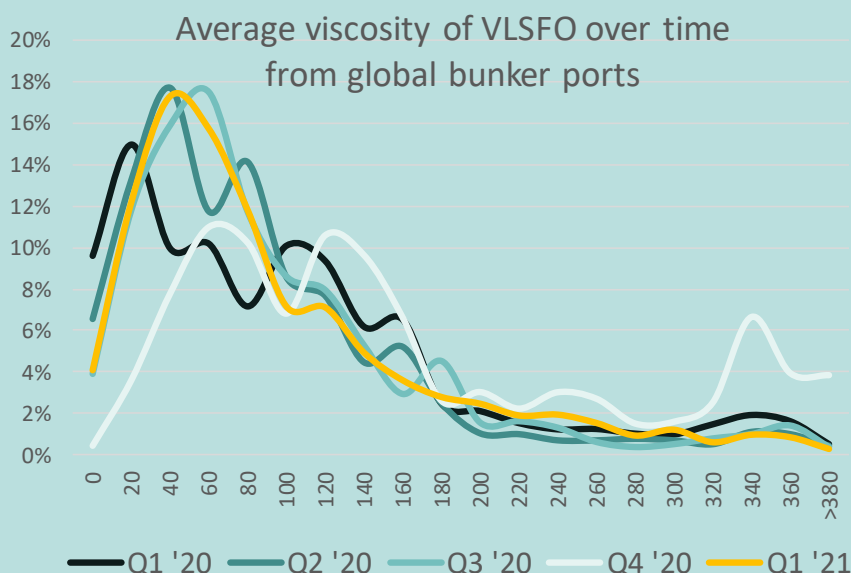
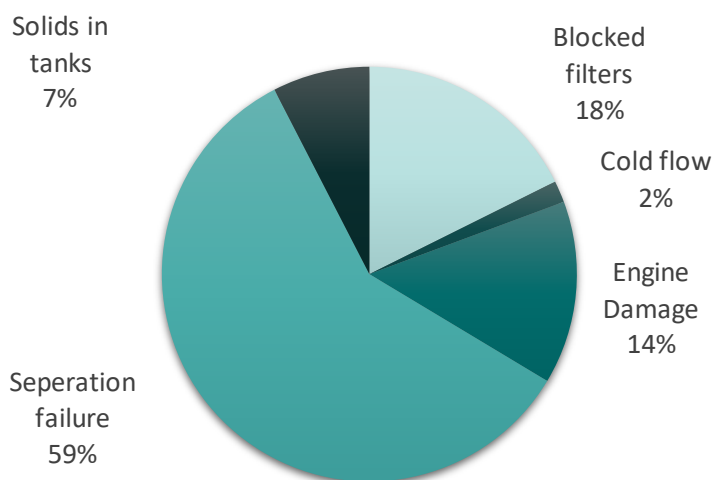
Operating with VLSFO

A breakdown of the overall problems seen onboard throughout the past 18 months when using VLSFO can be seen in figure 1. This chart covers several hundred VLSFO samples and illustrates the percentage of each major issue seen when using VLSFO, in effect highlighting which issues are most likely and how likely they are to occur.

The majority of problems on board are seen during handling (Separation failure: Purifier issues, and blocked filters: before and after service tank) which may indicate not only that there is an uncertainty around how to handle VLSFO, but that there is a deeper underlying issue with VLSFO stability.

Most concerning of all is the proportion of vessels experiencing engine damage. The stability and quality of fuel is critical to ensuring the efficient and safe usage of marine residuals.

Distribution of Problems on-board when operating with VLSFO



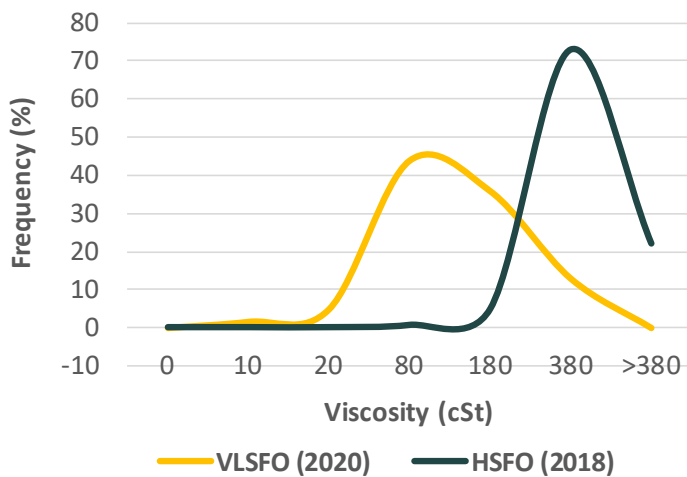
VLSFO viscosity varied significantly throughout 2020, Figure 2 illustrates the distribution of VLSFO over the past 18 months.

Viscosity trends in the first three (3) months of 2020 show a much lower viscosity than HSFO with a relatively flat distribution 20-140 cSt. Viscosities remained low throughout 2020 however a significant peak appears between 20-80 cSt, indicating a new 'normal' for VLSFO.

There was a slight shift in Q4 2020 as viscosities increased once more and the peak shifted before quickly returning to the 20-80 cSt range in the first quarter of 2021. Perhaps this shift reflects the change in demand to other fuel streams as pandemic lock-down measures are changing with time.

VLSFO vs HSFO

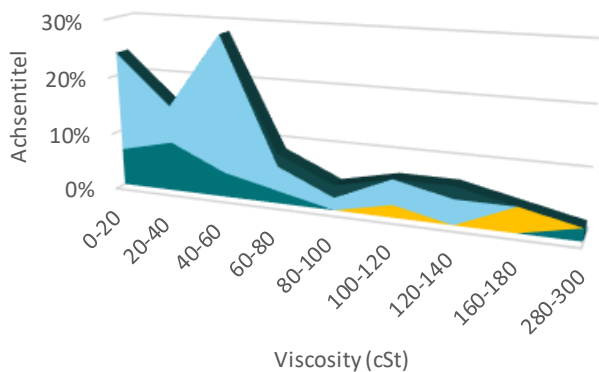
Viscosity distribution: VLSFO vs HSFO



A sample of over 100,000 fuels which compares the distribution in viscosity of HSFO in 2018 with those of VLSFO in 2020 illustrated the true extent of the change. The lowering and broadening of the viscosities available is a real indication of the change in composition, as suppliers must balance costs of blend stocks with a reduction in Sulphur. But how has this impacted fuel quality and the reality of using these fuels on-board?

Viscosity overview

Viscosity vs Problem on-board



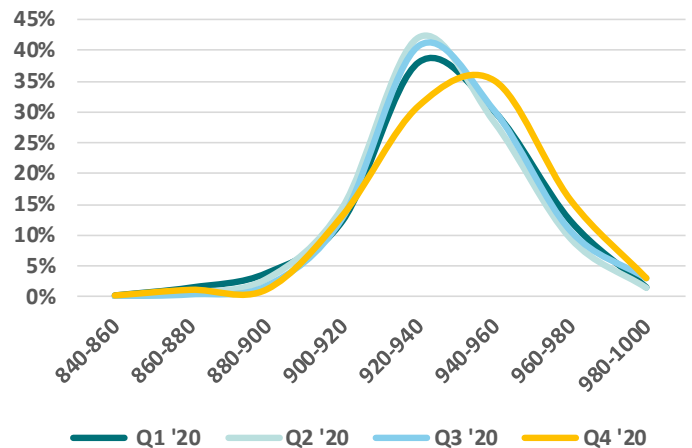
■ Blocked filters ■ Engine Damage ■ Separation Failure ■ Solids in tanks

The majority of issues when using VLSFO on-board occur in the lower range of viscosities (0-80 cSt). The most common of which is Separation failure and filter blocking. This has caused undue stress to crew and maintenance budgets as vessels struggle to predict and fight against unstable fuel. The change in composition has also impacted the storage stability of VLSFO, with most suppliers and fuel testing laboratories recommending VLSFO should be stored for no more than 3 months at a time, a serious practical challenge for operators.

Chemical treatment in low viscosity fuel has proven highly effective in preventing handling issues onboard, effectively mitigating the problems associated with VLSFO.

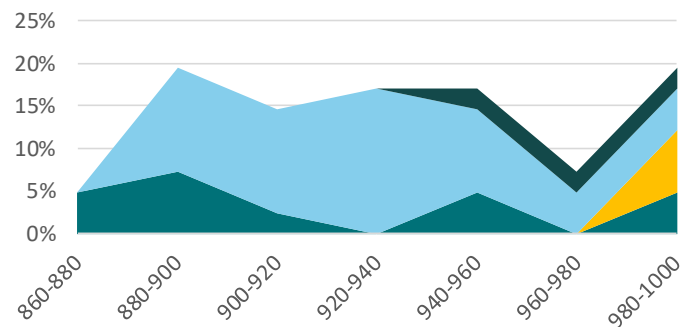
Density Overview

VLSFO Density distribution



Density has shown a much more stable pattern over the previous 18 months, however much like viscosity, we started to see patterns emerging throughout the year. There is a defined peak between 920 and 960 kg/m³ through the whole of 2020. However, as we enter 2021 there is a notable shift towards higher density VLSFO, a trend that may generate concern as can be seen below.

Density (kg/m³) vs Problems on-board



■ Blocked filters ■ Engine Damage ■ Separation Failure ■ Solids in tanks

Just as with low viscosity, lower density fuels have seen more operational issues. However, the most concerning trend is seen in connection with higher density VLSFO and cases of engine damage (liner wear, broken piston rings and exhaust valves, excessive deposition and scavenge fire). In this sample of several hundred global VLSFO fuels known to cause issues, engine damage occurred in fuels with densities above 960 kg/m³. This can be caused by a number of factors including poor stability, poor ignition and after burn characteristics (dumbbell ignition) as well as increased deposition and fouling due to poor combustion.

Unstable fuels require more time and oxygen to burn completely. Using Octamar™ Ultra HF in high density marine residual fuels improves stability and combustion to prevent engine damage and improve fleet performance.

Conclusion

Innospec have been treating a wide range of fuels for decades, providing technical service and customer support to our global marine customers. They rely on our specialist fuel knowledge to enhance their fleet performance.

When using Octamar™ Ultra HF as part of your fleet performance strategy, you will benefit from the ultimate protection and performance when using VLSFO. Protect valuable assets when handling high density fuels and stabilise low viscosity fuels to ensure less unplanned maintenance.

- **Avoid engine damage.** Octamar™ Ultra HF contains our patented combustion catalyst. Improved combustion efficiency reduces after-burn, unburnt fuel and fouling, acting to prevent premature liner wear and engine damage when using high density VLSFO.
- Improve crew safety and handling reliability with a **70 % reduction in sludge** produced when using Octamar™ with residual fuels.
- **> 60 % reduction in Exhaust Particulates** for less fouling, cleaner scrubber wash water and better performance.
- **7 % Boost** in Estimated Cetane Number (ECN) giving a **2.2 %** reduction in SFOC and a cleaner combustion to reduce products of combustion.



Summary

Innospec is at the forefront of developing fuel additive technology for a changing world. Our focus is on supporting the fuel industry as it adapts to major environmental challenges, new legislation and the more demanding performance targets set by OEMs. While we operate at the cutting edge of technology, our goal as market leader is always to create reliable and highly functional products. We build global supply chain solutions by understanding the important differences within regional and national markets. Our worldwide network spans 23 countries. **We can work with you to create the next generation of fuels, today.**



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