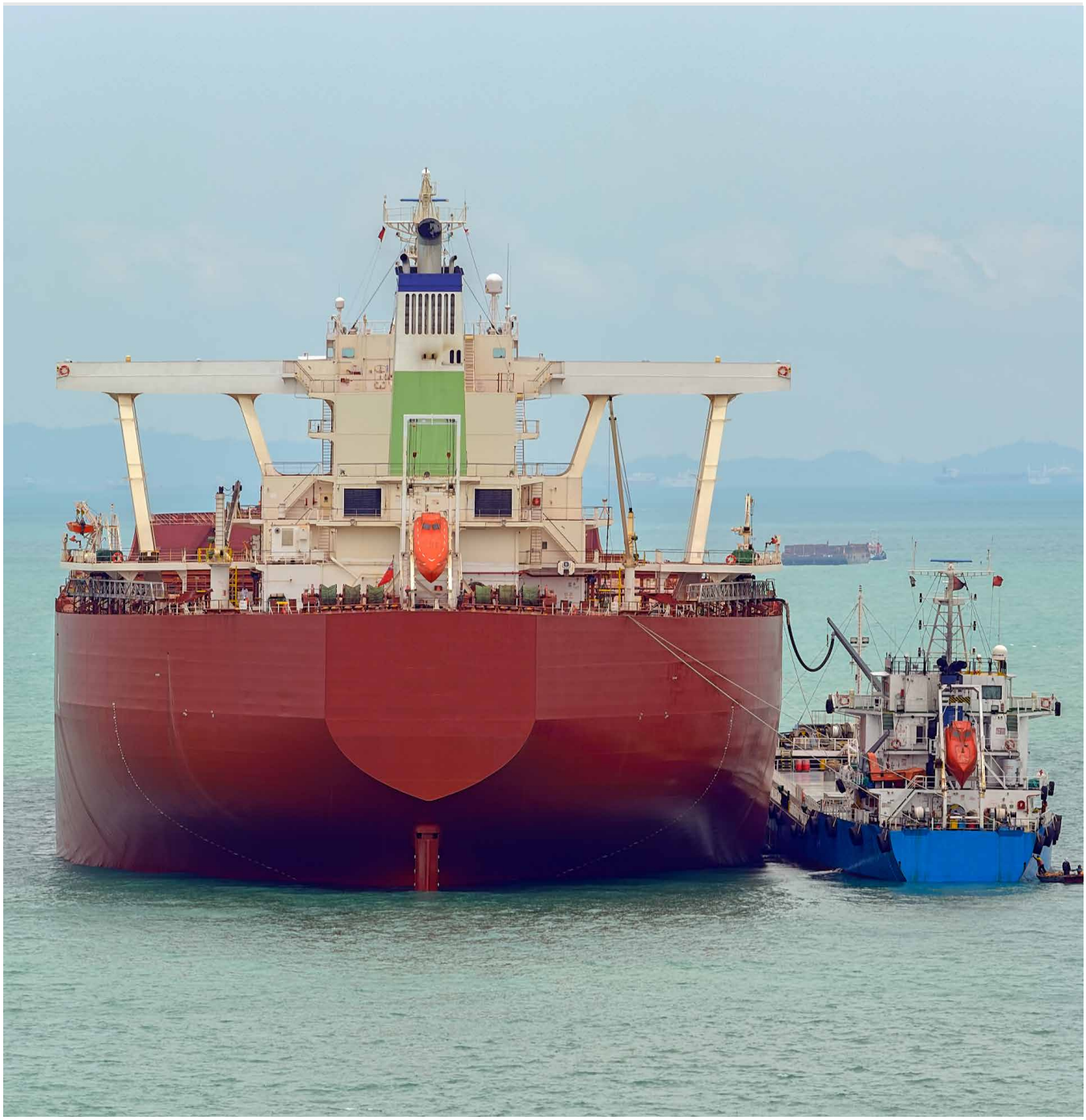
Wilhelmsen Ships Service

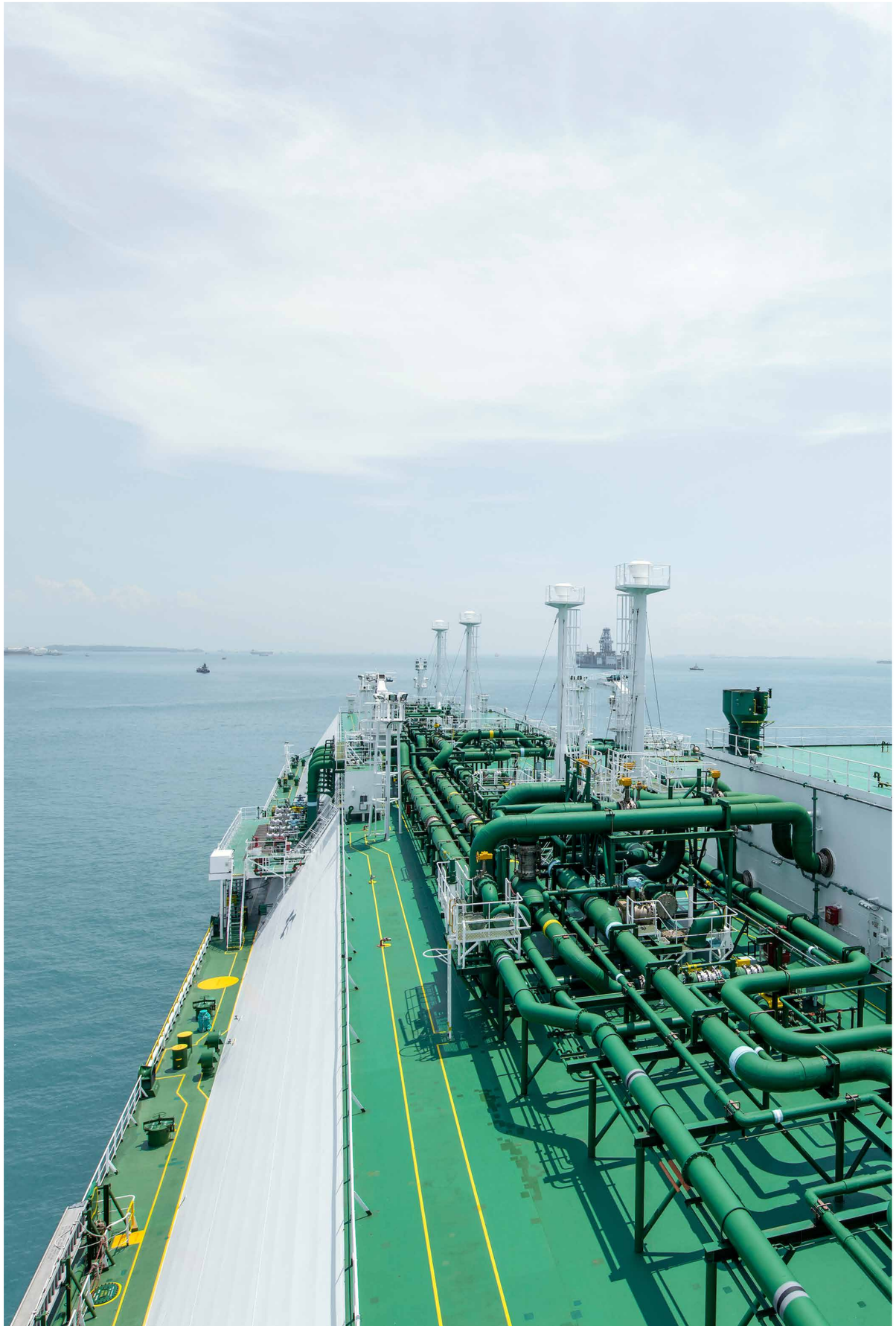
The Waxy Issues with VLSFOs

Whitepaper



CONTENT

Forward thinking operators have been utilising wax management additives onboard to optimise Very Low Sulphur Fuel Oils (VLSFOs) from the get-go. But large parts of the industry are still unaware of the value of fuel additives, or outright dismissive. You can probably guess where we stand on the subject of additives, but it is still worthwhile summarising the reasons why they are an absolute must if your vessels are running on VLSFO.



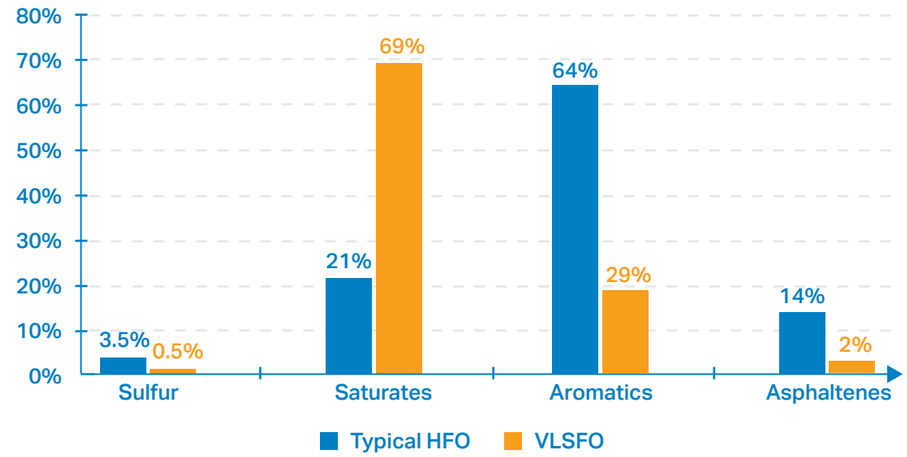
3 is not the magic number

The fuel of choice for the majority of owners and operators since 1st January 2020, aside from sulphur content Very Low Sulphur Fuel Oils have many other distinct characteristics not found in High Sulphur fuels. Unfortunately, they're not all quite as positive.

Naturally rich in saturates, VLSFO is particularly susceptible to wax formation.

Indeed, that potential seems to already be realized onboard as according to the BIMCO survey 1 in 3 or 32% of the respondents have wax appearance in fuel oil systems, e.g. fuel oil tanks and filters, and we all know the consequences of wax formation can be severe.

So, what's the solution? Testing? An obvious and in many ways right choice, but as we are quickly learning when it comes to a VLSFOs, it isn't quite that easy.



> "The saturates content has largely changed from an average of 21% in a typical HFO to almost 70% in VLSFO. Saturates are paraffinic in nature and they naturally induce wax formation. Having three times the level of saturates indicates that the VLSFO has a far greater potential for wax precipitation as compared to the HFO."

April Teo
Business Manager for Oil and Water Solutions

1 in 3 has experienced wax appearing in fuel

2020 Fuel Oil Quality and Safety Survey by BIMCO, ICS, INTERCARGO AND INTERTANKO

A test is...

For a transparent or distillate fuel, there are three distinct test methods for evaluating its waxiness - which are (1) Cloud Point, (2) Cold Filter Plugging Point and (3) Pour Point.

1	**Cloud Point**	Marks the appearance of waxes in the fuel and can be seen by the clear fuel turning hazy
2	**Cold Filter Plugging Point**	This is a test where the fuel is slowly cooled while being pumped through a system with a certain mesh size of a filter. The pressure difference is measured over the filter to see at what temperature the fuel stops flowing through.
3	**Pour Point**	The temperature at which the fuel becomes solid. The test is relatively simple and looks at the movement of the fuel as the fuel is cooled and the test vessel containing the fuel is tilted horizontally. If the fuel is not flowing, then the Pour Point has been reached

However, for VLSFOs, only the Pour Point is applicable, as there is currently no accepted, standardized test for either Cloud Point or Cold Filter Plugging Point. Applicable and ideal are two very different things though.

Firstly, for ship operators relying on the Pour Point method is well, pointless, if the fuels are showing signs of solidifying, it is already too late. Secondly, heating the fuel 10-15°C above the Pour Point, as typically recommended by class and fuel suppliers for high sulphur fuel oil, will prematurely degrade the fuel and actually speed up fuel instabilities, leading to operational issues.

Fliter Blocked Due to Wax Deposit

Blocked Fuel Filters and Pipes

Wax Accumulation in Purifier

> “According to ship operators, operational problems such as frequent filters and fuel pipes clogging, wax sediment formation in purifiers has become more frequent with VLSFO. In the worst-case scenario, if the situation is not rectified promptly, the machinery and engines will practically be stopped due to fuel starvation.”

Jonas Ostlund
Product Marketing Manager for Oil Solutions

Wax formations are essentially sludge masses which accumulate in fuel tanks – potentially blocking and damaging fuel filters; choking fuel pipes and fuel tanks.

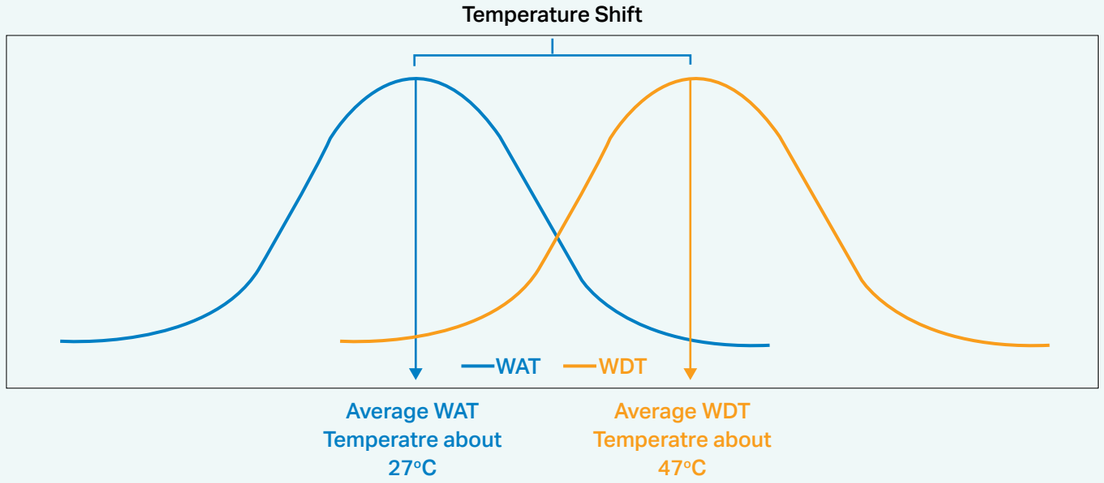
WATs up?

Attempting to fill in the gaps when it comes to testing, are the Cold Finger test (CF test) and Wax Appearance Temperature (WAT). Gaining in popularity, generally these tests aim to understand when the waxes are formed in a non-transparent fuel such as VLSFO.

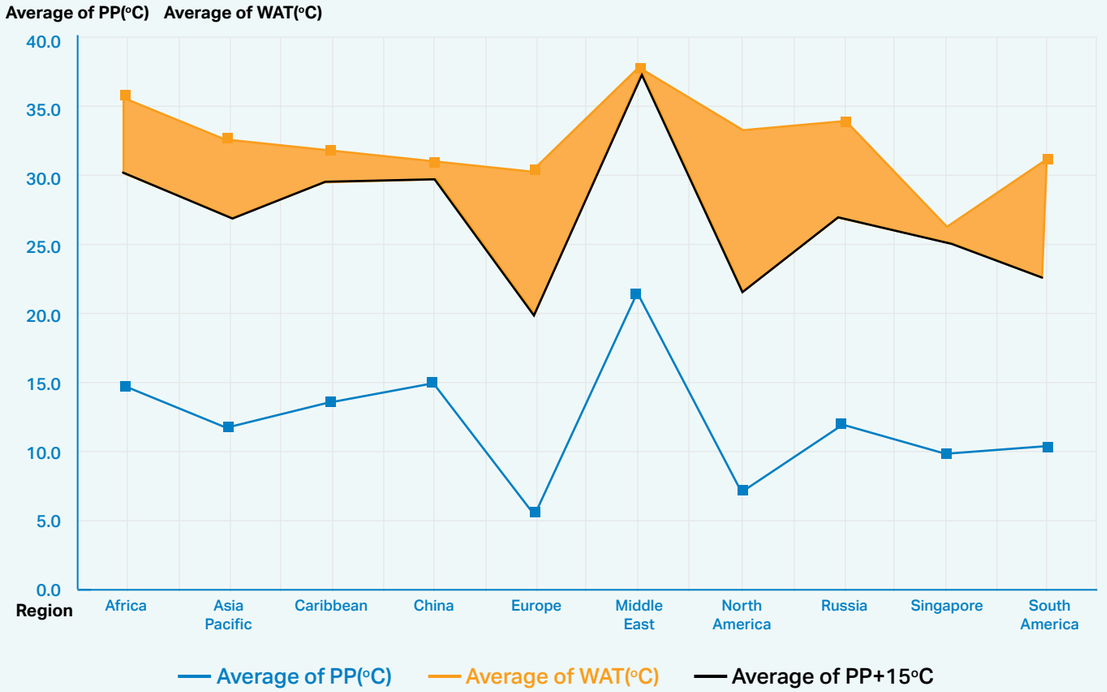
Fuel testing experts, Veritas Petroleum Services have written an in-depth whitepaper *An Automatic Test Method for Wax Appearance Temperature for VLSFO,* outlining the merits of the WAT for VLSFOs.

The basics are the wax appearance temperature (WAT) is the temperature where wax starts to form in the fuel. While the Wax Dissolution Temperature (WDT) indicates the temperature where the wax begins to dissolve as the fuel is heated.

Rich in saturates, VLSFOs tend to have a high pour point and in general, the higher the pour point, the higher the WAT.



Graph 1 shows the temperature difference between the WAT and the WDT. It is important to understand that once the wax particles have been formed, more heat is required to dissolve the waxes.



Graph 2 shows Pour Point (PP) and Wax Appearance Temperatures (WAT) tested by VPS during October and November 2020. A pre-heating temperature of 15°C and above the Pour Point has been plotted and the areas in orange indicate the difference in temperature between the (PP+15°C) and the WAT. To put it simply, the zone shaded in orange is an indication of the greater risk of wax deposition in tanks.

Old before its time

However, as mentioned, ‘just’ using heat as the control element to prevent wax precipitation is neither practical, nor advisable. The long-term stability of a fuel is reduced by an increase in temperature, therefore the increase in pour point and wax appearance temperature of the VLSFO is a double-edged sword.

Indeed, prolonged heating can also reduce the shelf life of the VLSFO, with a high storage temperature having a significant effect on the storage stability of the fuel. Such prematurely aged ‘sludge like’ fuel is being observed more frequently by ship operators.

Untreated

Treated

An operating rig test is conducted using MGO as the fuel oil medium to replicate the potential issues of wax accumulating in distillate fuel tanks, especially those on board ships. The pictures above clearly show the benefits of using additives in the fuel so as to reduce wax formation.

Pushing back

So, faced with a fuel that has wax build-up issues inbuilt, inconsistent test methods and the established potential remedy likely to damage the fuel, just what are operators supposed to do?

First things first, it is vital to understand the parameters and inherent limitations of the fuel used on the vessel. Next, measuring both Pour Point (PP) and Wax Appearance Temperature (WAT) can help guide heating requirements. In scenarios where the heating requirement is high and there is a risk of accelerated ageing, there’s just one solution, reach for the additives.

For example, a Pour Point Depressant (PPD) additive treatment will reduce the Pour Point and Wax Appearance Temperature, which in turn, can minimise the heating required for the fuel and improve the storage stability of VLSFO.

Dr Stuart McTavish, Business Development Manager, Infineum Marine Fuel Additives outlines their value, “Increased wax content in VLSFO, coupled with the unpredictability of impact between pour point and WAT has led to some uncertainty in effective fuel management protocols onboard ship. Wax Management additives can play an important role in removing this uncertainty as well as removing the need for extra heating of the fuel which can in turn lead to subsequent problems associated with fuel stability and viscosity control.”

Benefits of Fuel Oil Management Treatment Solutions

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IMO 2020 – Test and Treat to remove uncertainty around fuel quality issues at sea

With IMO 2020, a 0.5% sulphur cap has taken effect and many shipowners have changed fuels to remain compliant. But switching over to new fuel brings about various unforeseen challenges. Routine fuel testing and treating can mitigate the risks that come with your choice of fuel.

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With one of the most comprehensive maritime networks in the world, Wilhelmsen Ships Service has the ability to deliver to more than 2,200 ports in 125 countries worldwide.

The marine solutions we supply include the Unitor brand of products, Timm ropes, Unicool refrigerants, and Unitor and Nalfleet marine chemicals. Last year, we made product deliveries to over 27,500 vessels.

Take action, adopt our Test and Treat Programme today

With portable onboard testing now a reality, you can be informed on the health of your fuel – including compatibility and stability, on a more frequent, regular basis.

For more information, please get in touch with our team. Visit wilhelmsen.com/imo2020

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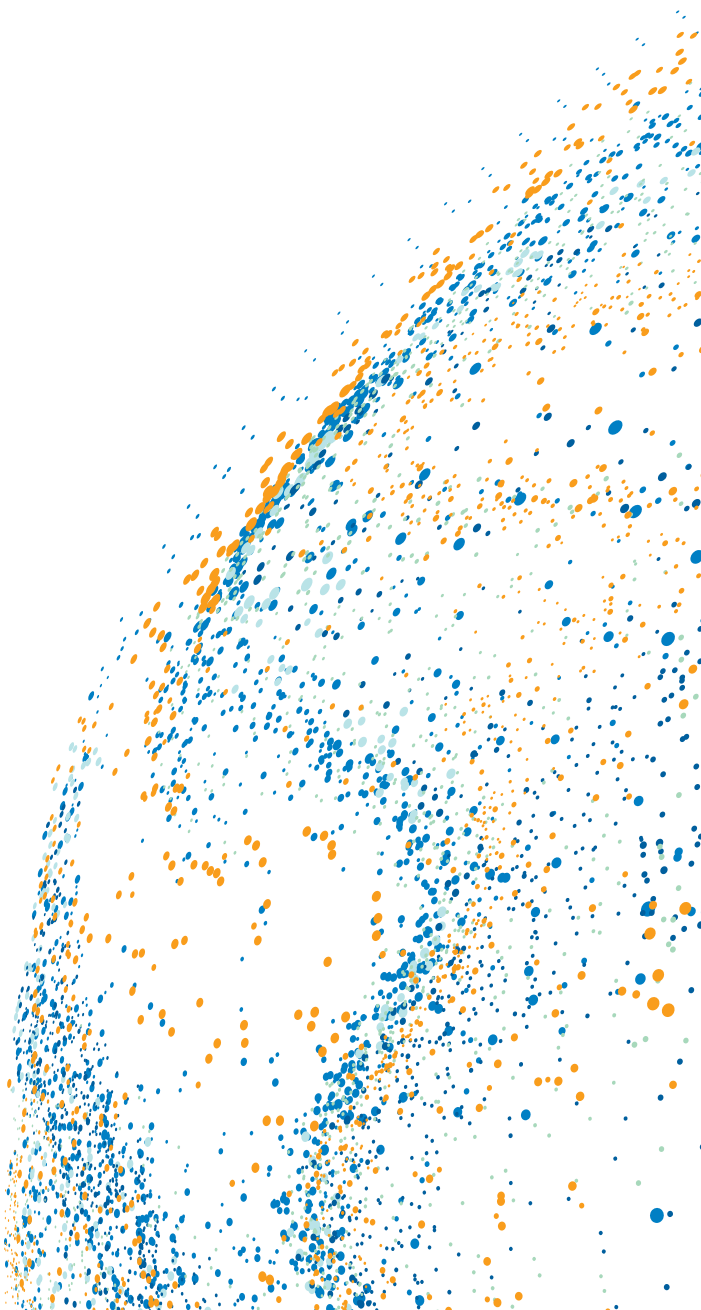

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