



Lloyd's  
Register

A special **IMO Sulphur 2020** supplement  
October 2019

# Horizons.

Connecting tomorrow's thinking to the challenges of today.

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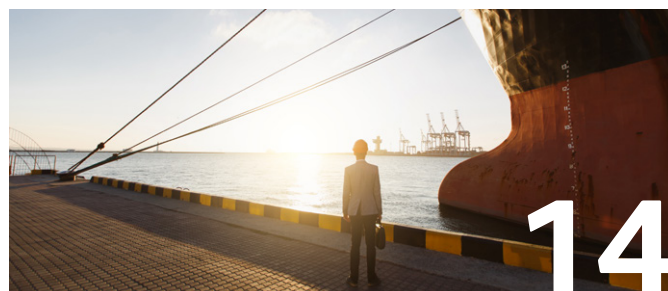
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## Meet the team

In this special IMO Sulphur 2020 supplement of Horizons the team hopes to answer all your questions about the regulation with just over two months to go until implementation. This issue outlines the key questions that should be the focus of charterer's concerns, the biggest challenges for all stakeholders within the industry – including an in-depth look at the fuel specification challenges. We also get views from shipowners and explain how they can best prepare themselves. Horizons Editor Paul Carrett worked with the LR Fuel Oil Bunker Analysis and Advisory Service (FOBAS) team to produce this issue. Design by Kapusniak Design.



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Tim Wilson



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Muhammad Usman

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# Sulphur 2020 checkpoint for charterers.

With the imminent 1 January 2020 deadline approaching, Tim Wilson and Muhammad Usman have produced the following guide to assist charterers in assessing a ship's readiness for compliance with the new regulation.

*With the clock ticking, some charterers and cargo interests are clearly seeking assurances that the right measures have been put in place to mitigate the risk of port detention due to non-compliance with MARPOL Annex VI Regulation 14.1.3. Regulation 14.3.1 of MARPOL Annex VI sets a 0.50% max limit of the sulphur content in respect of all fuel oils used by any type of combustion machinery outside Emission Control Areas (ECA-SOx) from 1 January 2020, down from 3.50% m/m currently. In emission control areas (ECAs) the limit remains, as it has been since 1 January 2015, 0.10% m/m.*

*In the post 2020 bunker era, it is important to ensure that the fuel supplied to the ship is within the operational quality boundaries of the ship and is compliant for sulphur emission control. Equally, the ship consuming the fuel must ensure that the ship capability and any constraints are duly communicated to the bunker purchaser.*

*The respective responsibilities and liabilities of the owner and charterer for complying with MARPOL 0.5% sulphur regulations are defined by the CharterParty, and it is important that existing, and new charterparty clauses are updated to reflect the new regulations. However, in this article, we will look beyond contractual obligations, at some of the critical questions a charterer, or equally a shipowner, may wish to address, to provide the them with greater confidence that the ship has put in place all the necessary mitigating measures to limit the risk of the ship being detained as well as ensuring safe operation.*

*It covers the period of switchover from high sulphur fuel oil (HSFO) to very-low sulphur*

*fuel oil (VLSFO) leading up to 31 December 2019 and into 2020. The questions focus on the onboard capability and management of fuels.*

### 1) Charter period and history

#### Does the charter period cover voyages outside the existing ECA?

Then 3.50% max S fuel oil would, from a statutory perspective, be OK.

#### Has the ship previously been detained or otherwise sanctioned by Port State Control (PSC) on MARPOL Annex VI issues?

If the ship has existing problems with compliance how will those impact on its ability to comply with the 0.50% max sulphur (S) requirements? Are those problems a result of external (i.e. poor fuel oil quality as supplied) or internal (i.e. inadequate fuel oil management onboard) factors?

### 2) Ship Implementation Plan status

#### Has the ship completed a Ship Implementation Plan (SIP) for switchover to 0.50% max S fuel oils, with consideration given to the guidance of IMO MEPC.1/ CIRC 878?

While not a statutory requirement such a plan is nevertheless essential in undertaking the switchover, plans may vary in detail and scope, but all need to have the same end point of the ship operating only on 0.50% max S fuel oil no later than 00:00 on 1 January 2020.

#### Has the ship included in its SIP a fuel tank 0.50% switchover capacity plan?



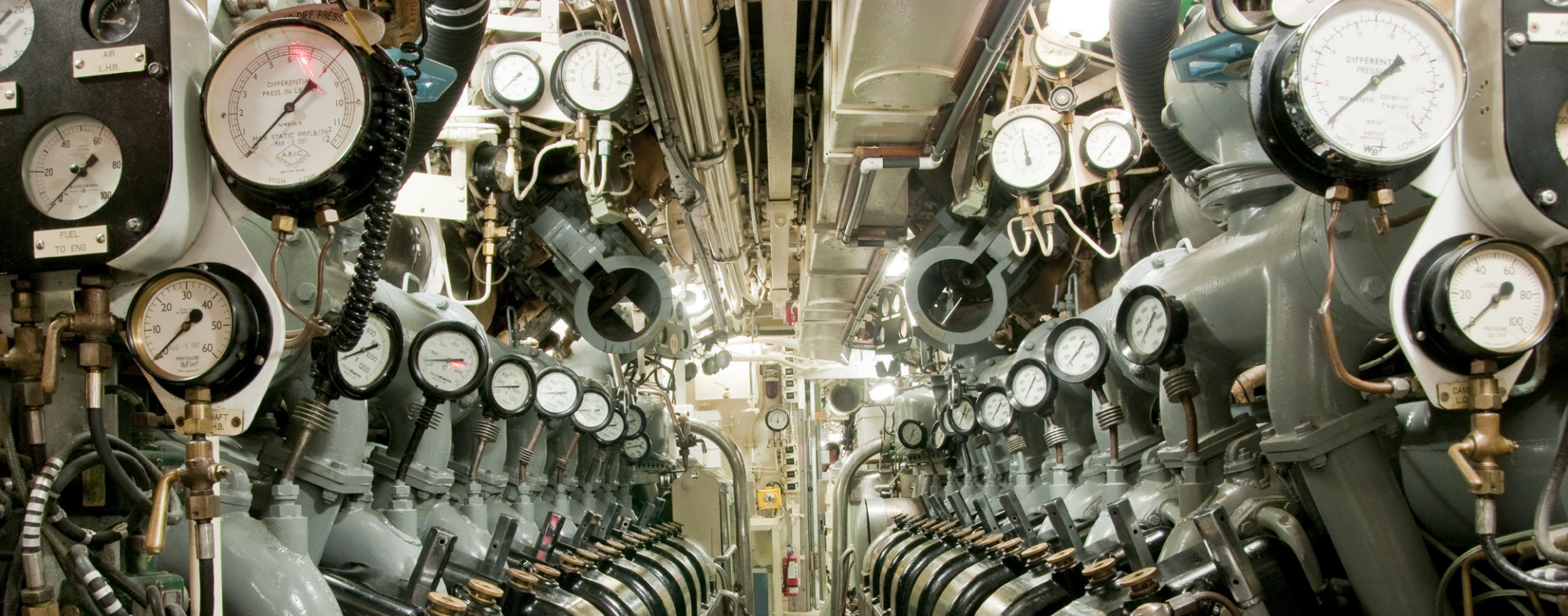
**Regulation 14.3.1 of MARPOL Annex VI sets a 0.50% max limit of the sulphur content in respect of all fuel oils used by any type of combustion machinery outside Emission Control Areas (ECA-SOx) from 1 January 2020.**

This should include tank preparation/ cleaning as required and removal of remaining HSFO; all within an agreed timeline.

#### Has the fuel oil switchover process, as given by that SIP, commenced?

Even if not commenced at this time, or for the duration of the charter, it may nevertheless impact on the quantities





of 3.50% max S fuel oils that the ship will accept.

#### Have unforeseen problems arisen in implementing that SIP?

The nature of those problems would need to be considered as to their effect on the charter. How are those being resolved and how would that affect ability to meet charter requirements? If the problems are ongoing, then this could impact on the ability to meet charter requirements.

#### When is the ship scheduled to complete that SIP?

This gives the date at which the ship will be operating on 0.50% max S fuel oils – many ships are applying a phased process of consuming the HSFO from one tank to the next – the important two dates to verify are:

1. When the ship will be fully operating on 0.50 fuels
2. When will they be free of any HSFO remaining on board

#### On completion of that SIP switchover what quantities of greater than 0.50% max S fuel oil(s) will be onboard and what is the owners planned procedure and schedule to dispose of that fuel oil?

This may cover several different types of fuel oils – gas oils, diesel oils and residual grades. Such left-over fuels must be disposed of ashore – not bled into the day-to-day usage. How does this relate to the charterparty clause(s) on bunkers at redelivery?

### 3) Fuel oil specifications and bunkering

#### What fuel oil specification(s) – ISO 8217 / year and grade(s) - does the shipowner normally require to be supplied?

All 0.50% fuels must meet the ISO 8217 specification and ‘as ordered’.

#### For each of the grades to be supplied does the shipowner have additional parameters and/or limits over and above those given in the standard specification? This should include any operational constraints that might restrict fuel grades that can be bunkered.

If so that may limit fuel purchase options. The ship should define any operational constraints:

- Viscosity/ Density max and min
- Fuel type Residual (RM) and or Distillates (DM)
- Cold flow properties PPt, CFPP, CP.

#### Where bunker constraints have been identified – are these possible to address without modification or via other means?

Are these constraints due to physical limitations of the ship design, arrangement, equipment? Could the constraints be removed, or at least reduced by operational changes to build bunker grade flexibility?

#### Are charterer supplied fuel oils only to be loaded into essentially empty tanks

#### (i.e. only unpumpables remaining) thus addressing the risk of incompatible fuels being commingled at the bunkering stage?

This may limit the total uptake possible to less than that which has previously been the case. This may require additional internal movements to bulk remaining quantities of each previously delivery – hence extra work for the ship but which must be insisted on. Unless fuel compatibility has been verified, loading on-top should be avoided, not only from the perspective of residual fuel oil compatibility, but also possible variations in characteristics and the risk that if the sulphur content delivered fuel was above limit that would potentially degrade any existing fuel oils to over the limit therefore this applies to all fuel oils, distillates included.

#### Will this bunker loading constraint affect the frequency / quantities of bunkering?

This then is part of the cost of using 0.50% max S fuel oils.

#### Will bunker manifold fuel samples of the charterers fuel oil supplied be sent to one of the fuel testing services?

This then potentially pre-alerts to any issues with the fuel as supplied.

#### In instances where the charterer supplied fuel oil differs in some significant manner from the fuel oils used to date does the ship have an instruction to trial use that fuel oil in a safe location while it still has other fuel oils onboard?

This may require a short-period of testing during which the ship would not be

meeting charter party requirements in terms of speed.

#### Has the ship experienced and/or has the capability to use fuel oils of significantly different physical characteristics (i.e. viscosity, density, low temperature performance)?

The ability to manage the wider range of fuel oils expected to be supplied as 0.50% max S products will be largely dependent on the shipowner’s investment in:

- a) Engineer training and knowledge
- b) In the physical arrangement and equipment side.

For those ships which are to use an alternative fuel inside ECA have the changeover to/from instructions been updated to cover the possible differences between the existing 3.50% max S fuel oils and the 0.50% max S fuel oils.

This should be indicative of how robust the preparations for the ship’s changeover to 0.50% max S fuel have been.

#### Physical suppliers selected – in view of the variability of 0.50% fuels transparency of bunker characteristics being offered by the supplier should be requested. What are the ship requirements for pre-delivery?

Pre-knowledge of the typical Density, Viscosity, Pour Point, and for DM fuels CFPP and CP along with a more extended Certificate of Quality should be sought after – any reputable supplier should be able to provide this. A ship which has

recognised the value of this information will reflect on their understanding that the handling requirements may change between bunkers.

#### Has the supplier’s Bunker Delivery Note format been updated to the current style – as given by MEPC.286(71)?

Old format BDN – still in widespread use – could result in subsequent PSC inspection problems.

#### What information does the physical supplier have in respect of the 0.50% max S fuel oil(s) to be supplied?

If the supplier has no information, or that which is given is ‘typical’ or of such wide ranges, that should be viewed against that of other suppliers which offer a more detailed and narrow range product.

### 4) Exhaust Gas Cleaning Systems (EGCS) Considerations

#### Does the ship intend to use EGCS outside ECA?

The fuel oils used by combustion devices feeding into EGCS are outside this 0.50% max S review. However, for fuel oils to be used with EGCS it should be ensured that the suppliers Bunker Delivery Note format has been updated to the latest

version (MEPC.286(71)) which includes a tick-box as to whether the fuel oil supplied is for use in EGCS connected combustion devices – suppliers using older format could cause problems to the ship in case of PSC inspections.

#### Which combustion devices onboard will not be connected to an EGCS?

The fuel oils used by any item of combustion machinery are affected by this 0.50% max S requirement – that includes boilers, IG generators, remote small size diesel engines (all ratings) and emergency equipment – all these will need to be using only 0.50% max S fuel oils on 1 Jan 2020.

#### In the event of EGCS instrumentation or main component failure – or where the monitoring equipment fails to indicate compliance mode – what measures have the ship put in place to mitigate the down time of EGCS compliance state?

Every provision should be considered by the ship as to the most likely components to fail and what spares can be carried to enable the crew to bring the EGCS back on line within the IMO MEPC.1/Circ.883 prescribed time of one hour before the ship must report its failure. Alternatively, considerations to carry so many days of compliant fuel to facilitate a longer period of repairs should be considered.

## Register to hear IMO 2020 expert views.

**PETROSPOT**

Three years on and with a few weeks to go until the switchover, is shipping ready?

In partnership with Petrosport, LR will be joining an expert panel with the following industry leading specialists:

- Lars-Robert Pederson, Deputy Secretary General of BIMCO
- Luca Volta, Marine Fuels Venture Manager, ExxonMobil
- Tim Wilson, Principal Specialist Engineer on Marine Fuels and Exhaust Emissions, LR
- Mads Bjornebye, Manager Bunker Services, Teekay Shipping
- Kristine Petrosyan, Oil Market Analyst, IEA
- Beth Bradley, Partner, Hill Dickinson

The discussion will be moderated by Lesley Bankes-Hughes, Director of Publishing/Executive Editor of Bunkerspot and Petrosport and the panel will discuss a range of topics including:

- Availability of compliant fuels
- The role of ports in the switchover
- Fuel oil non-availability reports (FONARs) and the importance of proactive fuel management and training

Register now to receive an email with a link to watch the panel discussion, once it is available on 5 November: [info.lr.org/imo-2020-panel-discussion-registration](mailto:info.lr.org/imo-2020-panel-discussion-registration)



# Countdown to the switchover.

Tim Wilson on why a structured approach is required for managing the 2020 sulphur limit on marine fuels.

**Tim Wilson**  
Principal Specialist Engineer on Marine Fuels  
and Exhaust Emissions



**All ships should have a fuel management protocol on board... shipowners and operators need to go beyond this and ensure their crew have a proactive mindset to comply with the sulphur 2020 limit.**

Sulphur 2020 is still dominating headlines and, as we draw closer to the 1 January 2020 deadline, it's clear that this is a big challenge for numerous players within the industry, from supplier to the end-user.

We're now seeing major fuel suppliers announcing their availability of 0.50% compliant fuel. Earlier this year, BP announced that they have successfully tested low sulphur fuel oil at sea and will be selling 0.50% before 2020. This came shortly after the International Energy Agency projected that almost half of the global fleet will use marine gas oil in 2020 and eventually, 40% will burn VLSFO. We are also now seeing a surge of ports already supplying 0.50% – based on the samples we have received from our clients, the number of ports supplying compliant fuel is currently around 70. Importantly, this gives shipowners and operators the ability to plan ahead – as they learn which suppliers have what fuel available and where – helping them to get their fleets and crews ready for this regulation.

#### The biggest challenge

For shipowners and operators, the biggest challenge is to prepare their ships for the switch from HSFO to LSFO. They will need to work out how much investment is needed to prepare the ship's fuel systems and tanks; this might involve cleaning

tanks, which takes time, effort and money as the ship will need to be off-hire. Owners and operators also have the option to leave their tanks and hope that this change of fuel will not damage them or affect operations. Or, they can consider the implications of the diversity of fuels that might come with this regulation. For example, will this require segregation? If so, does the owner or operator have spare tanks to segregate the fuel?

#### Test, prepare and plan

Our Fuel Oil Bunker Analysis and Advisory Service (FOBAS) team have been analysing 0.50% fuels to set a baseline understanding of composition and compatibility. From a technical perspective, we would recommend implementing a fuel segregation plan. Whether that's considering loading a light product compared to a heavy one, or making greater efforts to segregate and avoid co-mingling fuels, industry experts warn against mixing one bunker with another as there's a high risk of destabilising the fuels and in most situations, crews can't easily assess the degree of risk of this happening until the fuel is already onboard, so segregation of bunkers is important.

The next step is managing the diversity of the viscosities of the fuels and managing any incompatibility thus observed between the different bunkers onboard: if crews



must mix, then working out the ratio's involved and any potential resultant properties is key. These are all important considerations and decisions to be made now as part of the ship implementation plan, as recommended by the International Maritime Organization (IMO), allowing owners and operators the time to test, prepare and plan.

Some crews have had limited or no experience of using LSFO, so crews need to be prepared for this, particularly when it comes to fuel management onboard. All ships should have a fuel management protocol onboard, which is likely to be a procedure covered in the company's ship management system. However, shipowners and operators need to go beyond this and ensure their crew have a proactive mindset to comply with the sulphur 2020 limit. This should address an additional fuel change plan, for which the ship implementation plan will include key preparatory milestones, so considering

whether there is a need to update their fuel management strategies to include bunker segregation and fuel compatibility.

#### A word of caution

There is some speculation that, because we're going to have a diverse range of fuel blends, there will be quality issues, so owners and crew will need to make sure there are barriers in place to protect against contamination if it occurs. This might not necessarily happen because all residual fuels are for the most part blended and blending has been a common practice in the shipping industry for many decades, but it's right to be cautious. Reputable suppliers should meet the standards set out in ISO-8217, the marine fuel standard that gives the criteria of the core parameters which must be met by any fuel if it's to be used onboard a ship. We recommend purchasing against the latest revision of the international marine fuel standard

ISO-8217:2017. With this, the supplier knows the parameters and targets set out in ISO-8217 and understands that there are clauses in the standard that expect the supplier to have quality assurance within the supply chain and consequently their responsibilities to heed to that.

When it comes to Sulphur 2020, planning is critical. Approximately 50% of the world fleet have little or no experience operating in an ECA and having to switch to working with low sulphur fuel. Nor have they experienced this type of change before, so awareness for crews and preparing fuel systems and tanks is fundamental to get this change safely and effectively implemented. Yes, there are risks and safety concerns, however the industry can tackle these with a sense of confidence if sufficient planning, testing and stakeholder engagement is implemented.

If you have any questions or need support, please visit: [info.lr.org/fueltesting](http://info.lr.org/fueltesting)



# Into the final stretch.

Muhammad Usman discusses some key areas clients' need to consider before the implementation deadline.

Muhammad Usman  
FOBAS Product Manager



**Industry feedback suggests that most ship operators have prepared Ship Implementation Plans (SIPs) and have commenced the execution of these plans. However, it has been observed that level of preparedness and detail can be varied across the industry. There is no doubt, undertaking the SIP work for each vessel gives the ship staff and technical team confidence that they have considered all the key parameters, nevertheless IMO 2020 challenge should not be underestimated as there will be pitfalls along the way and effective responses would be necessary.**

In this section, we will attempt to address some of the frequently asked questions we have received in recent weeks, and how we are partnering with our key clients to address some of their challenges.

## Can I bunker distillate fuel into heavy fuel oil storage tank?

There is a real possibility that 0.50% fuels could be either residual or distillate fuels. So, storage tanks which are dedicated to bunkering and storing heavy fuel oils for years may have to be filled with low viscosity distillate fuels. Firstly, having a good control of the tank's heating system to avoid overheating is important. Secondly, there are other operational considerations downstream of storage tanks such as transfer pump capacity to pump low viscosity fuels and control of injection temperatures for which OEM guidelines needs to be consulted. Moreover, a risk assessment should be performed, including the identification of potential hazards related to tank design features, to be filled with distillate fuels such as generation of static charge.

## Should we contact our class society to approve our designated sampling points?

There is no requirement for class to approve the onboard sampling points. As per MEPC.1-Circ.864-Rev.1, it is the Administration (relevant flag State) who should confirm the number and location of the sampling points. So the flag Administration can either directly provide 'confirmation' to the vessel after a review/survey of the plan or they can delegate this to the classification society to act on behalf of the flag Administration as a Recognized Organization (RO). So

the vessel should contact their flag State in view of the MEPC.1-Circ.864-Rev.1 and if the flag Administration delegate the responsibility, then plans should be submitted to the classification society where their plan approval department should proceed as per formal processes.

## Should there be a comprehensive tank cleaning before 1 January 2020?

Each ship is different with regards to their machinery management procedures, bunker tank design, and the quality of heavy fuel oil (HFO) they have consumed. There is no single solution hence an assessment should be performed on the condition of each HFO bunker tank and a decision needs to be made on the appropriate course of action. There are a few options being employed such as:

- Flushing tanks with distillate ultra-low sulphur fuels to naturally flush the tanks, piping and fuel system components of HSFO and sediment
- Using one or more bunkerings of 0.50% fuels well before the enforcement date, again having a flushing effect
- Use of a specialist additive dosed over several bunker loads before the first 0.50% is loaded to clean the tanks. (Note: this approach may require at least six months, if not more, to be effective)
- Manual / physical cleaning
- A combination of any of the above

The effectiveness of these approaches would depend on the final condition of the tank and how well it is executed. When first using 0.50% fuels, crews are also recommended to carry out sulphur sample checks from the system periodically to provide indications of the tank's compliance condition.

## What are the major quality concerns with 0.50% fuels?

Some of the main challenges and risks with the new 0.50% fuels are:

- Compatibility between fuels from different sources
- Long-term stability of the blends

- Significant variability of certain physical parameters from different sources such as viscosity and density
- Compliance (sulphur – blending to the limit)
- Cold flow properties (high pour point fuels and/or waxy fuels potentially causing blocked filters/sludging if handled at inappropriate temperatures)
- Combustion performance of new blends

At FOBAS, we are keeping a close tab on 0.50% samples coming through our laboratories for analyses. In the last few weeks, we have seen a spike in the number of samples from the far-east specifically an increase in bunkering in Singapore. This will only gain momentum in the coming weeks in the run up to 1 January deadline. We are creating a quality matrix and intend to keep our clients informed through our new developed tool 'fuel finder'.

## What is the update from ISO?

The work on the ISO/PAS 23263:2019 is complete and it is available on [www.iso.org](http://www.iso.org) for download. The PAS provides general considerations that apply to all 0.50 % S fuels, including sulphur content, flash point and the technical aspects of kinematic viscosity, cold flow properties, ignition characteristics and catalyst fines that might apply to specific fuels. In addition, it provides considerations on commingling of fuels including information on pre-delivery compatibility testing and information on other test methods which can be used to evaluate stability and compatibility of fuels. The existing spot test and total sediment tests remain the primary tests for determining compatibility and stability of fuels. More detailed information on the use of test methods related to stability and compatibility will be included in a CIMAC guideline document entitled "General guidance in marine fuel handling in connection to stability and compatibility". These CIMAC guidelines are expected to be released in next few weeks.

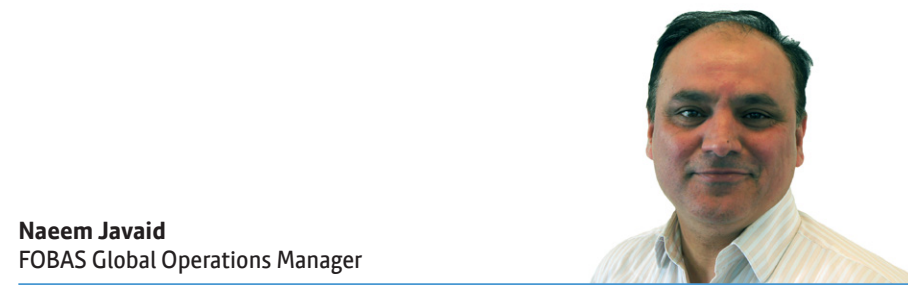
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# Fuel specifications and challenges.

Naeem Javaid explains what the industry can expect from ISO's 2020 marine fuel specifications, some of the challenges shipowners could face with the various fuel specifications, as well as the specifications LR has encountered when testing 0.50% sulphur marine fuel already sold in China and Singapore.



Naeem Javaid  
FOBAS Global Operations Manager

## What guidance can we expect from the industry marine fuel working groups and the International Organization for Standardization (ISO) to address the use of the max 0.50% sulphur fuel oils in 2020?

ISO considered that a revision of the existing specification guidance ISO 8217:2017 was not possible prior to 2020 because of the 0.50% sulphur marine fuels future implementation date and because these products were not widely available on the market at the time to obtain a full scope of the fuels that would be offered.

However, ISO initiated the process to develop a publicly available specification (PAS) 23263: 'Considerations for fuel suppliers and users regarding marine fuel quality in view of the implementation of maximum 0.50% sulphur in 2020'. PAS, which is expected to be published this month, is to be used in conjunction with

the existing marine fuel specifications last updated in 2017 or with earlier editions.

The PAS will provide general considerations for 0.50% sulphur fuels, including flash point, kinematic viscosity and cold flow properties. The PAS will also provide, through Annexes, further clarifications and considerations on fuel stability, composition of fuels, additional information on harmful materials, commingling of fuels including information on pre-delivery compatibility testing and on other test methods which can be used to evaluate stability and compatibility of fuels.

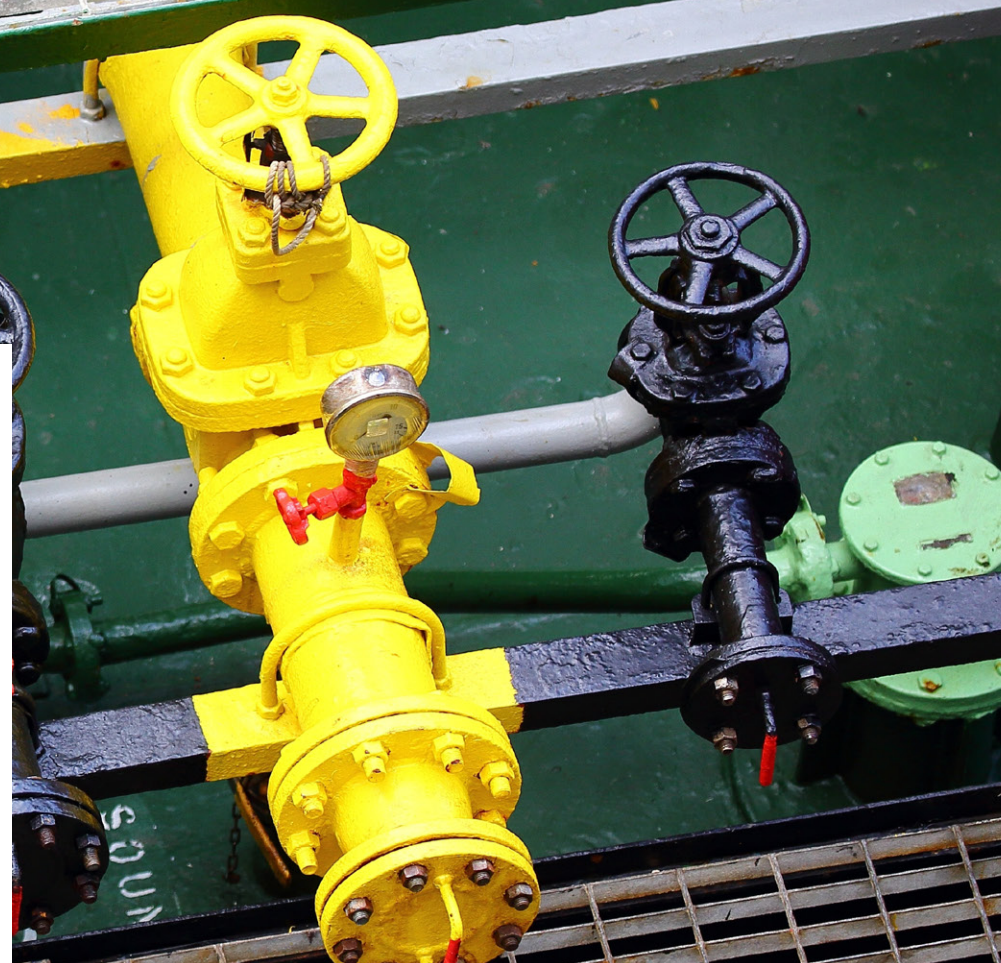
There will not be any additional tables for 0.50% sulphur fuels introduced into this PAS, because the current ISO 8217:2017 specification will provide the necessary coverage for all marine fuels going into 2020.

ISO has engaged the International Council on Combustion Engines (CIMAC) working group 7 (WG 7) which is comprised of cross industry

specialists within marine fuels, represented by engine manufacturers, shipowners, classification societies and fuel suppliers. Their goal is to prepare recommendations and make tools for the industry on how to operate on fuel and choose fuels that will ensure safe operation of the diesel engines. In support of the ISO PAS, CIMAC WG7 will be publishing two practical guides: 'Marine fuel handling in connection to stability and compatibility' and the 'How to order and Manage conventional fuel in the market towards and beyond 2020'.

## China has already implemented 0.50% sulphur emissions control zones. In addition, there are ships burning 0.50% sulphur fuel for sea trials. What stands out about their specifications, compared with conventional RMG 3.50% sulphur 380 centistokes (cst) viscosity bunkers?

Yes, we are seeing an increase in 0.50% sulphur fuel samples being tested at



our laboratories from around the globe, specifically China and Singapore. The one aspect of the fuel characteristics from a single ordering specification of RMG 380cst 0.50% sulphur maximum fuel is the marked variances in viscosity and density along with the associated tested elements. For viscosity, we are seeing from China 10cst to 420cst (at 50°C) and from Singapore the fuels tested so far have viscosity ranging from 100cst to 380cst. Densities also vary considerably, ranging from 0.840 kg/l to 0.991 kg/l at 15°C. We also found that the average pour point has increased and now 0.50% sulphur fuel oils have pour points closer to the maximum allowable limit of 30°C and sometimes higher. Ignition characteristics which are denoted by calculated carbon aromaticity index (CCAI) have also been very variable throughout the 0.50% sulphur fuel oils supplied, so far ranging from 780 to 870.

## Fuel oils with 3.50% sulphur and 0.50% sulphur have different consistencies. Do you foresee problems such as low viscosity causing pump failures and leakages due to low viscosity and low lubricity?

The variance in viscosities could be a challenge if ships have not made the necessary preparations, for example checking the ship's adaptability to such anticipated variances of the 0.50% sulphur fuel oil characteristics. Full adaptability will require the maximum

range of capability from the high heat to the low cooling of a 0.50% sulphur fuel oil. This is not much different to today for ships operating in the ECAs, which require switching from residual marine to distillate marine fuels.

The question that needs to be answered by all ships operating on residual marine fuels: how adaptable is my ship to the variability of 0.50% sulphur fuel oil? Either ship constraints should be highlighted, or the fuel system arrangements duly modified to accommodate. We would expect ships to have considered the 0.50% sulphur fuel oil bunkering scenarios as part of the IMO recommended SIP to ready their fuel system and machinery plants accordingly.

## ISO 8217:2017 has maximum viscosity for residual fuel oil bunker grades, but not minimum viscosity. Should ships be considering a minimum viscosity requirement?

The quick answer is yes, ships should identify for each combustion plant and fuel system component arrangement what the minimum viscosity for safe operation is and for the most part this is 2cst.

However, general recommendations are to keep it above 3cst as a safer margin accommodating for higher ambient temperatures. Each system should be

assessed individually, for example some main boiler residual marine systems set a minimum limit of 180cst. Any constraints in this area should be considered when making the fuel ordering specification.

There are two issues: storage and handling, and if viscosity is low and heating cannot be stopped completely, some older fuel transfer pumps may not be able to transfer the fuels effectively. Similarly, the purifier temperatures will require fuel temperatures to be set according to the manufacturer's recommendations.

The viscosity controller should be checked and maintained to ensure injection viscosities are maintained to specified engine requirements. Attention should be given to lower viscosity fuels to ensure that they are not overheated.

In some scenarios, the higher temperature requirement the purifiers bring may require some cooling of the fuel to achieve the optimum injection viscosity.

## There is high probability of paraffinic fuel oils making their way into the marine bunker market, which will not only increase the need to address higher pour points but also the general cold flow properties of fuels. What can the shipowners do to protect themselves?

It is important to carry out a 0.50% sulphur fuel oil scenarios risk assessment of the fuel system against the specific core operational parameters of a fuel, these being the viscosity, density and cold flow properties of the fuel delivered. The outcome of which should include: knowledge of the specific characteristics of the fuel as loaded will therefore be critical to ensure correct management for storage handling and use.

The outcome of the risk assessment should ensure that: all residual marine fuel storage tanks can maintain 45°C to cover pour points that might reach the ISO 8217 limit of 30°C and require a check on steam capacity during slow steaming conditions. The distillate marine fuel storage and supply system may be heated to address when wax crystals may form as high as 30°C in some cases but for the most part around 17°C, requiring fuel temperatures to be able to be maintained at 20°C and in some cases 30°C.

If there is no heating capability for the distillate marine system, then the bunker order clause should reflect a request for



## FUEL SPECIFICATIONS

information from the typical cold flow properties of a fuel to be supplied as per ISO 8217:2017.

We suggest planning for bunkers ahead of time as it gives the flexibility in choosing bunkering ports/stems and suppliers.

**Should shipowners consider changing their bunkering and fuel testing procedures to better protect themselves from 0.50% sulphur fuel oil-caused engine problems? If so, what procedures would you advise? Should shipowners run additional specification tests to the standard specifications test they already run? If so what are they and how long does it take to get the results? Should shipowners be testing for catfines? If so is this a standard test?**

The IMO has recommended that ships should have a specific SIP in place to cover all aspects of the switchover from high-sulphur to low-sulphur fuel oil. This covers bunkering through to using on machinery fitted on board to ensure compliance by 1 January 2020.

For testing, existing tests as per ISO 8217 is sufficient for most ship's requirements, but if there are any specific operational limitations or concerns about a product or even a supplier, additional and investigative testing/screening may be

requested to be carried out. It should be noted that switchover to 0.50% sulphur fuel oil is more of an operational challenge than fuel quality one. The point to note about fuel quality and that its expected variance of the known parameters and therefore, safe use of these fuels, depends on the readiness of ships.

**If a shipowner is planning to mix 0.50% sulphur fuel oil from two different suppliers in the vessel's bunker tank, what is the lowest level of fuel compatibility they could tolerate without jeopardising their vessel? How long does it take to run a compatibility test?**

The first policy widely recommended is to avoid mixing fuels, in other words, segregate fuels. Plan to load into empty storage tanks only. In the event this cannot happen, and the operator has no choice, then it very much depends on the make-up of the two fuels to be mixed.

The outcome is difficult to predict without physically testing. If the two fuels are incompatible, then mixing such fuels can create an unstable blend causing heavy sludging in the tank bottoms leading to other critical operational problems. In some extreme cases, the only solution is to manually dig the fuel out of the storage tanks. It is therefore not worth taking the risk of mixing fuels

without having the compatibility between the two fuels determined.

The compatibility spot test ASTM D4740, which can be carried out on board, takes no longer than an hour and the result must not exceed a rating of two. A result from three to five will indicate the two fuels are incompatible. For any intended mixing we suggest that mixing of fuels should not take place in excess of 5:95 ratio without determining the compatibility of the two fuels. This can be done through analysis and considering both ratios of such as 10:90 and 90:10. A fuel filled on top of another fuel could make a difference to the outcome of the spot test analysis. In addition, a 50:50 ratio should be tested to add a more complete understanding of the behaviours of the two fuels.

**For vessels that cannot procure 0.50% sulphur fuel oil at the port they are bunkering, and they are offered only a distillate marine product to burn in their main engines, what problems do you foresee? What are the lessons learned from 2015, when the ECAs switched to 0.10% sulphur from 1% sulphur fuel?**

Ships should be prepared to fill their 0.50% sulphur fuel tanks with a distillate marine maximum 0.50% sulphur fuel oil. This

should have been considered in their ship implementation planning, which would result in assessing the adaptability of the ship for such a scenario.

The key concern here is to understand the significance of storing, handling and operation on a low viscosity distillate marine fuel requiring little or no heating in a residual marine heated fuel system, designed for higher viscosity fuels. It all depends on the readiness of ships and whether they have been sailing in and out of ECAs. Those ships which have been sailing in an ECA for extended time periods with experience of using distillate marine grades on their main engines are not expected to face problems as those ships are usually prepared and their fuel system and machinery configuration already allows them to operate on gas oils for extended periods.

The ships without this experience should consider steps, for example having a good control on their tanks heating system to avoid overheating where such fuels are loaded into residual marine tanks. Any limitation on transfer pump capacity to pump low viscosity fuels should be evaluated. Similarly, the injection temperature needs to be controlled to ensure fuel viscosity remains within the original equipment manufacturer guidelines.

Diesel marine fuel oils will generally have a cleaning, searching action when used in systems which generally operate on residual fuel oils. This will have the effect of potentially mobilising accumulated sludge materials with consequent increased loading on the fuel treatment equipment or sticking of fuel injection components.

Additionally, due to the "searching" nature of these fuels, seals and joints may exhibit a tendency for leakage, an effect which would be compounded by component temperature variations resulting from switching between fuel types. There would also be an increased tendency to dribble from fuel injectors.

For engines, it is important to ensure the maintenance condition is good to avoid excessive leakage of gas oil from fuel injection equipment which could lead to the reduced or complete loss of power, impacting the safe navigation of the vessel. Similarly, boiler manufacturers should be contacted for guidance on regular use of low viscosity fuels and the implications of a distillate fuel oil passing through residual marine heated fuel system, with a focus on the boiler fuel supply circuits for both auxiliary and main engines as applicable.

**Do you foresee engine problems when shipowners switch from burning 0.50% sulphur fuel oil in the open seas to burning 0.10% sulphur marine gas oil at the ports or in the ECAs?**

In general, assuming a consistent fuel quality, we do not expect many issues when switching over from 0.50% sulphur to 0.10% sulphur fuel oil. However, the real issue will be the variability of 0.50% sulphur fuel oil which will make switchover to gas oil more complex. But if ships are otherwise using gas oils in the ECA we do not expect any additional issues arising out of switchover from 0.50% sulphur to 0.10% sulphur fuel oil, when compared to switchover from 3.50% sulphur to 0.10% sulphur fuel oil.

**What is the stability test method you would recommend to shipowners bunkering 0.50% sulphur fuel oil? How long does it take to run it?**

A Potential Total Sediment Test (ISO 10307-1) is included in the ISO 8217 specifications and we will continue to do this for 0.50% sulphur fuel oil. If shipowners want additional understanding of the stability and potential compatibility of fuels, then there are further testing options available.

The CIMAC guidance document on stability and compatibility is being worked on and should be available in September. It will detail the shipowner's options in supplement ISO/PAS 23263:2019.

**Has the bunker contamination problem from the spring and summer of 2018 in the US Gulf, Singapore and Panama changed the way shipowners bunker fuel and test the fuel?**

The widespread fuel related operational issues originating from US Gulf and then to Panama and Singapore, have heightened the awareness of these issues among shipowners, in way of the risk of abnormal chemical species, its testing and its impact on machinery and vessel operations.

Owners have taken multiple approaches in reviewing their bunkering strategies which includes: being more specific about the selection of suppliers, additional checks on quality testing, setting tighter bunker quality requirements, additions to the bunker requisition clause and seeking further assurances from suppliers.

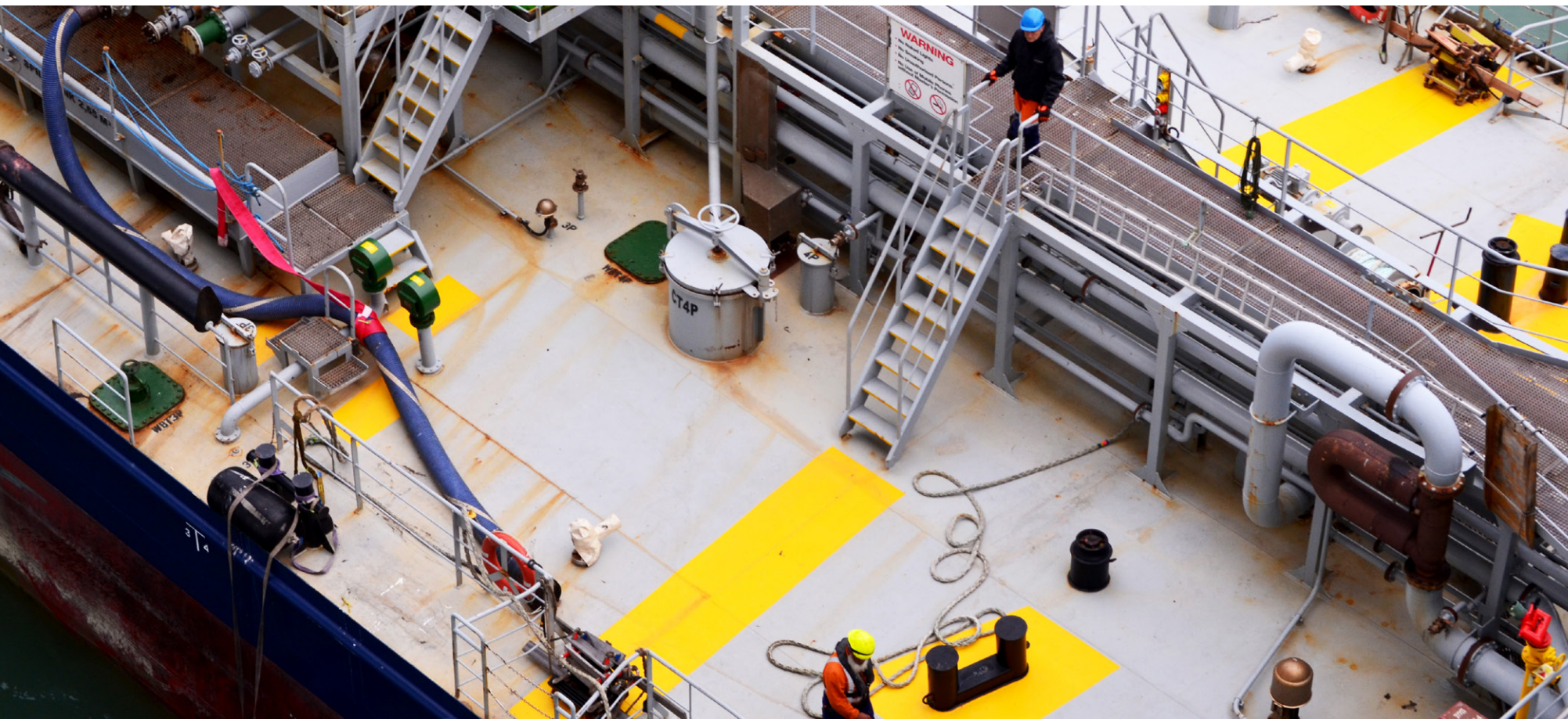
Testing all fuels for extended analysis is generally not a financially practical option and does not necessarily provide the result from which the performance of the fuel can easily be predicted. But there is an increasing trend of ship operators interested in quick screening to check whether the fuel is free from some of the more abnormal presence of chemical species not anticipated to be found in the petroleum hydrocarbon stream.

**What is a key point to remember with regards to 2020 regulation compliant marine fuels?**

Ensure that your residual marine fuel system and the combustion plants are adaptable to operating on diesel marine fuels, in way of the likely variabilities between each bunker on viscosity density and cold flow properties.

Vessel crew awareness and preparation through SIPs is fundamental.

This article was originally published by Argus Media – [www.argusmedia.com](http://www.argusmedia.com) – on 16 September 2019. For information on the latest developments, please contact us at [fobas@lr.org](mailto:fobas@lr.org).





# What do shipowners think?

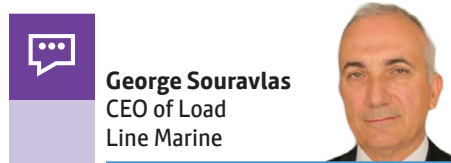
Shipowners can take many steps to prepare themselves, the crew and the fleet for 1 January 2020. But not all scenarios can be prepared for, or even controlled, and having to debunker tonnes of non-compliant fuel is something everyone fears. BIMCO Bulletin spoke to BW Group's Kapil Berry and Load Line Marine's George Souravlas about what they believe could disrupt even the best laid plans.



## BIMCO



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General Manager,  
Head of Regulations  
& Compliance at  
BW Group



**George Souravlas**  
CEO of Load  
Line Marine

## How can you prepare for authorities telling you that you are not compliant at the port of arrival?

**Berry:** “Looking at it from a legal standpoint, the only document that has legal validity is a BDN. In addition, fuel samples are taken during bunkering and sent for external testing. A challenge may arise if the test result shows the bunkered fuel is above the 0.50% sulphur limit. By the time this result is obtained, the vessel could be mid-sea, creating a very difficult situation.

It will now be up to the Port State Control of the country of arrival as to which approach is taken for such cases. A great deal will depend on how the case is presented to it, so proper records must be maintained onboard the ships to convince the authorities that sufficient due diligence had been carried out while procuring the fuel.

During the transition into the 1 January 2020 sulphur regulation, we are hoping that Port State Controls will be pragmatic when deciding whether a non-compliance case has taken place because of factors outside the control of the ship or the company.”

**Souravlas:** “The transition has to take place before 1 January 2020, during which time you must prepare the tanks of each

ship and consume or remove all high sulphur products. This is to make sure that the new low-sulphur fuel is not in any way mixed with parts of the old fuel.

After this, we suggest that an independent surveyor is engaged to confirm the tanks are clean. If you are found to be consuming products with a sulphur content higher than 0.50%, there will be a very heavy fine. Then, you will have to prove that this was not your fault. To help you prove this, you need to have a confirmation that the tanks were clean and free of high sulphur fuel before the new fuel came on board. If retesting at the next port shows the bunkers are non-compliant, you will be able to demonstrate that this is because of the bunkers that were delivered to you. The retesting compliance level is at 0.53% sulphur content.

This is how we, as owners, can prepare ourselves. Certifying the cleanliness of our tanks by independent and reputable surveyors before receiving the new bunkers, will be the most important way of getting prepared.”

## Can you prepare for - or avoid - having to debunker non-compliant fuel, even if you have done what you could to be compliant?

**Berry:** “This will depend entirely on the merits of the case presented to the

Port State Control, and how strictly or pragmatically the Port State Control enforces this regulation. If the Port State Control insists on debunkering such non-compliant fuel, one has to comply.

If we are talking about a Very Large Crude Carrier (VLCC), which has perhaps taken 3,000 tonnes of fuel on board, debunkering such a large quantity of fuel using shipboard pumps will be a challenge and may take several days. Arranging for barges for this job - especially in remote locations - will not be easy. Debankering will bring many challenges that will be difficult to plan for.”

**Souravlas:** “No. After 1 March, when the carriage ban comes into effect, non-compliant fuel must not be consumed under any circumstances and must be taken off the ship.

Debankering is costly and, in some parts of the world, such as Singapore, is only allowed if your vessel has been bunkered there. If a test establishes that the fuel you have bunkered is not compliant, it must not be consumed. It must be removed from the vessel as soon as you have the chance, and definitely before 1 March. Even with a FONAR, you will have to debunker the non-compliant fuel. Once the analysis results show that the bunkers received are not compliant, you should consume whatever compliant fuel you have on board to proceed to a safe port where you can get

the right quality of bunkers. You will still have to debunker the non-compliant fuel and never consume it.”

## What is your view of the fuel oil non-availability report (FONAR)?

**Berry:** “Using a FONAR will be a very complex affair and, in my view, should be avoided if at all possible.

If FONAR has been filled out, the flag state may grant permission to carry non-compliant fuel oil to the next bunkering port. However, the problem with using the FONAR is that high sulphur fuel will have to be taken in the tanks that were cleaned for carrying compliant fuel and will have to be cleaned again once the vessel bunkers compliant fuel at the next suitable port.

Furthermore, extra reserve fuel will likely be taken as stated in a company's safe practices to account for bad weather or sudden deviations. So, when the vessel arrives at the next bunkering port, it is likely to have some quantity of non-compliant fuel on board that will also have to be debunkered. In this case, it is likely that the value of the debunkered fuel will be lost.”

**Souravlas:** “Using the FONAR is a very bad idea. It should only be employed in a total and absolute emergency.

If you bunker high sulphur fuel because you have no other option, you will have to place this fuel in a tank that was originally clean. That tank will then become dirty. You might have to take, for example, 200 Metric Tonnes (MT) of non-compliant fuel to cover a distance, plus the extra fuel you usually take to cover for unforeseen weather, and so on; we usually allow a further 25%. If you do not consume the full amount, you might find yourself with, for example, 50 MT of excess fuel upon arrival at the next port - fuel that cannot be consumed. You are stuck with that, and will then have to go through the very expensive exercise of debunkering and tank cleaning. I would advise always carrying extra compliant fuel on board to avoid using the FONAR.”

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<http://portfolio.cpl.co.uk/BIMCO/201909/cover/>

## How can LR help?

We are actively participating in sulphur 2020 discussions at various industry forums to highlight ship operator concerns and provide guidance and technical input where possible. Apart from fuel oil testing, which will be increasingly important moving forwards, our experts are here to help ship operators in their sulphur 2020 implementation planning. We offer technical support and advice at every stage, from supply and bunkering to fuel management and system performance. Our fuel database, LR fuel finder, is easily accessed online, enabling informed choices about fuel purchasing and management. We carry out accurate and independent fuel surveys ensuring you receive the quality and quantity required. To find out more, visit [info.lr.org/fueltesting](http://info.lr.org/fueltesting)

## Exhaust gas cleaning systems guidance

Exhaust gas cleaning systems (EGCS), commonly known as ‘scrubbers’, have proven a popular choice for ship owners and operators to retrofit to their existing vessels to ensure they comply with the global sulphur fuel oil limit. But what about managing the consumables and waste produced by these systems? There are currently no industry guidelines that focus on EGCS chemicals and waste, and this poses a potential risk for the safety of crew, ship and the environment. LR has produced the first set of guidelines to help owners and operators manage the by-products of their scrubber systems in a safe and responsible way. Download the guidance now at: [info.lr.org/egcsguidance](http://info.lr.org/egcsguidance)

## Training

The introduction of new sulphur 2020 compliant 0.5% fuels will present new challenges for the storage, handling and use of bunkers onboard. Crew awareness and proactive management of fuel incompatibility, cold flow, and lubrication issues will be essential to avoid problems. LR has developed a new e-learning course to make it easier for ships' engineers, superintendents, and technical staff to be ready for the change. Find out more at [info.lr.org/sulphur2020training](http://info.lr.org/sulphur2020training)





## Get in touch

Please visit [www.lr.org](http://www.lr.org) for more information



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