Integr8 Fuels

TRADING INTELLIGENCE PRESENTS

Bunker Quality Trends 2022

Marine fuel specifications, availability challenges and the need to buy smartly

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Marine fuel specifications, availabilty and the need to buy smartly

Bunkers remain a huge proportion of the day to day running costs of vessels across many sectors at this time given continued high flat prices combined with economic and geopolitical challenges in the world today.

This is the first Integr8 Fuels Bunker Quality Trends Report covering the last six months of supplies globally, where we dissect and compare the likelihood of off specification issues across all commercial grades of bunkers and key ports. Using data from approximately 35,000 deliveries, we will also assess fuel quality trends using our own Integr8 Quality Index which scores the proximity (or otherwise) of individual parameters within each sample to the relevant Table 1 or Table 2 specification limits within ISO 8217. We will also consider the availability of fuels in general, what specifications are being guaranteed, and the potential for hidden losses which must never be ignored when purchasing given the current commercial backdrop.

How likely are we to be faced with an off specification situation?

The last 180 days owners' analysis available to Integr8 Fuels has highlighted that you are most likely to have an off specification issue (Note 1) with High Sulphur Fuel Oil (HSFO) followed by Very Low Sulphur Fuel Oil (VLSFO) and then Marine Gas Oil (MGO). (Fig. 1)

Grade	%Off Spec	%Compliance Off Spec	% Critical Off Spec	%High Risk Off Spec	%Low Risk Off Spec
HSFO	3.6	0.3	0.9	1.2	2.4
VLSFO	2.7	0.8	0.9	1.7	1.0
MGO	2.3	1.0	<0.1	1.0	1.2

Source: Intergr8

Fig 1 Types and frequencies of off specification incident by grade

Note 1 - Beyond 95% confidence for a parameter listed in Table 1 or Table 2 of ISO 8217 : 2010

What is the likelihood of receiving non-compliant or critically off-spec bunkers?

It is important, however, to consider the context of the off-specification incidents. To do this it is essential to consider the likelihood of Marpol (Sulphur) or SOLAS (Flash Point) compliance and the likelihood of Critical Off Specification Incidents such as Cat-Fines, Total Sediment, Used Lubricating Oil, Sodium and Ash Content (High Risk) against routine and easily rectifiable off specification issues classified "low risk" such as high viscosity in HSFO.

Purely on likelihood of an off specification occurrence we are more likely to have one with HSFO than VLSFO or MGO however at least double these are considered low risk.

Turning our attention to compliance Low and Very Low Sulphur Fuels, these fare far worse with us being approximately three times more likely to have a Sulphur or Flash Point off Spec incident with VLSFO and MGO, than HSFO, which are only found to be non-compliant in three deliveries per thousand.

Critical off specification issues such as Metals and Sediment are seen to be just as likely in HSFO as VLSFO but are very unlikely in Marine Gas Oils.

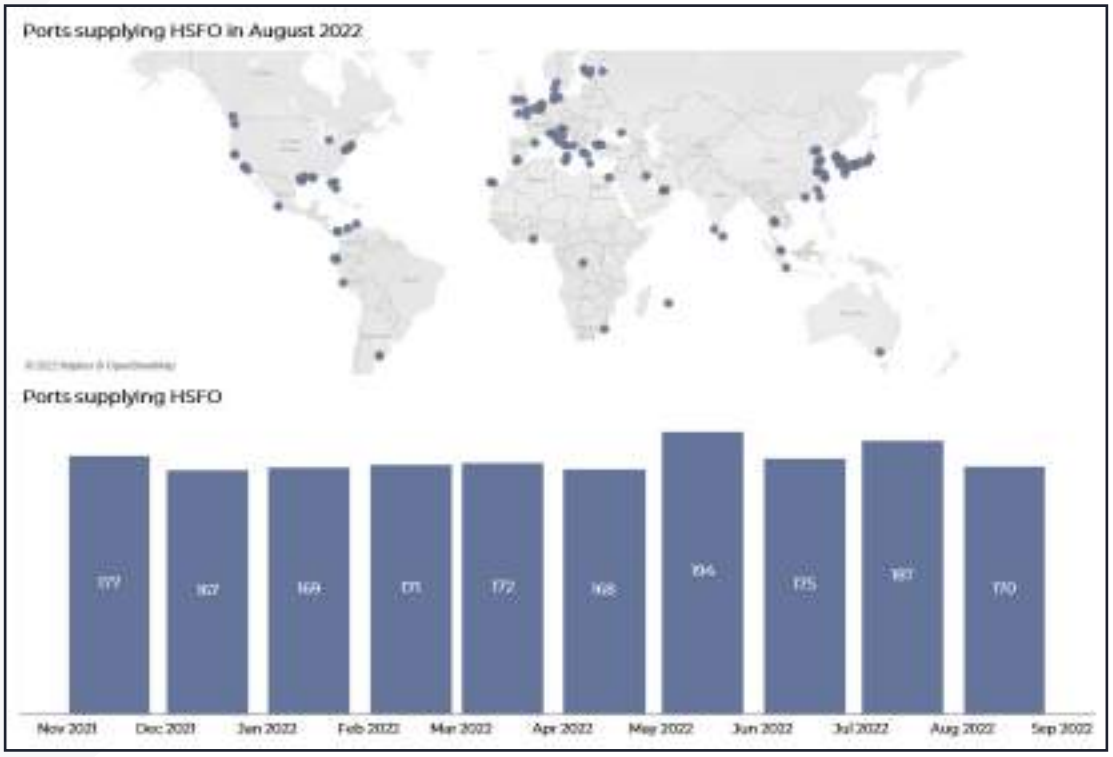
Finally, when we combine both compliance and high risk off specifications, the fuel with the highest incidence of off specification continues to be VLSFO at 1.7%, followed by HSFO at 1.2% and MGO at 1.0%. There are many nuances, from geographical to port-to-port and even supplier-to-supplier. It therefore remains essential to consider these when buying bunkers and we will address some of the challenges later in the paper.

Availabilty of Products

Unsurprisingly, Marine Gas Oil is the most available product (567 ports) given the ability to substitute and supply higher quality inland or automotive grades and the ease of logistics to supply what are quite often small quantities.

VLSFO is also seen to be readily available across all continents but at 17% fewer ports (463). This is because of larger quantities being ordered and the storage and barges needed to support these supplies in general.

High Sulphur Fuel Oil is the only product which is not readily available with only 187 ports listed, as of August 2022 (Fig. 2). HSFO availability is concentrated around bunkering hubs and geographically key areas likely to receive passing trade from Very Large Crude Carriers (VLCC) and / or other scrubber fitted sectors. It is important, therefore, to plan bunkering carefully for HSFO and equally consider the type of scrubber fitted to the vessel and any local limitations in forthcoming voyages that may require a fuel switch to Low Sulphur Marine Gas Oil (LSMGO) for example.



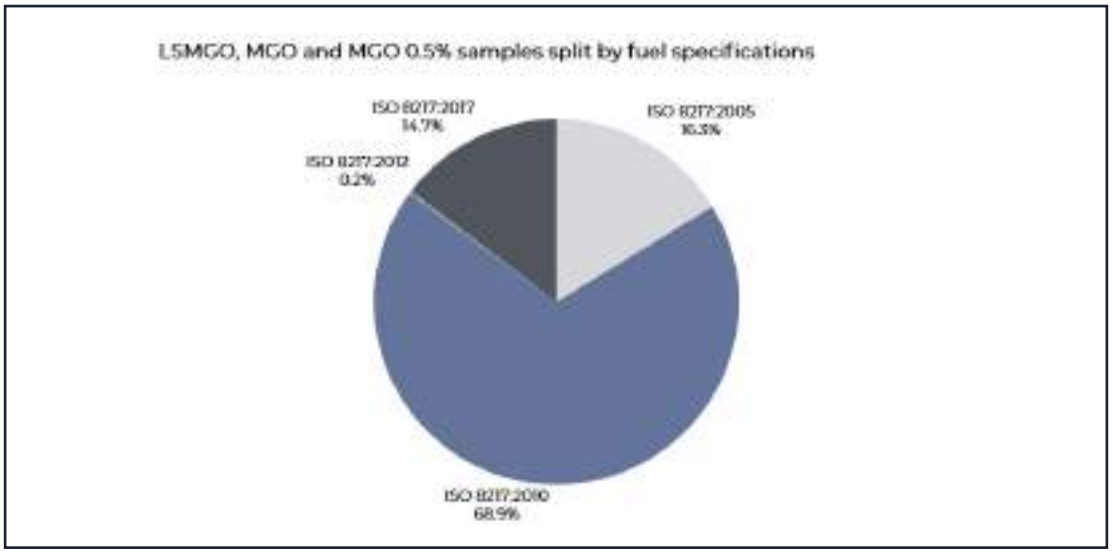
Source: Intergr8

Fig 2: Availability of HSFO 380 Aug 22

Availability of Grades

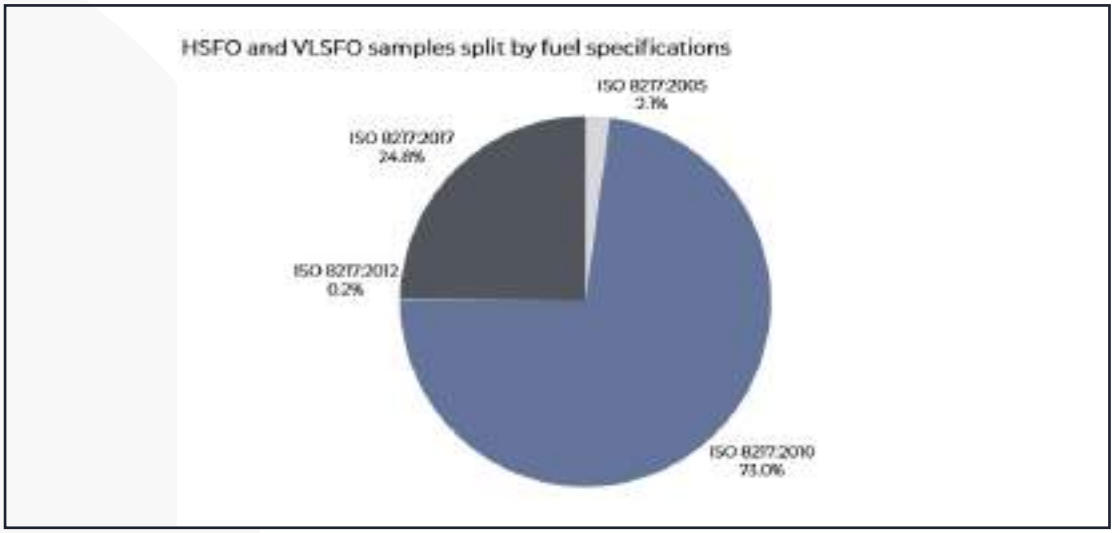
The fact that four ISO 8217 grades are still being requested remains one of the greatest challenges for the industry to address. Which other industry would even allow a fuel to be supplied using a specification that is obsolete, twice since revised, and 17 years old?

Indeed, during the period assessed for the report, 11.6% of all fuels supplied by Integr8 Fuels were still only guaranteed to 2005 specifications. Drilling into this further, it can be seen in the charts below that this is predominantly a distillate issue, with 16% of these fuels being still sold as 2005 (Fig 3) compared to only 2% of residual fuels. (Fig. 4)



Source: Intergr8

Fig 3 Guaranteed specifications last 180 days distillate fuels



Source: Intergr8

Fig 4 Guaranteed specifications last 180 days residual fuels

It is positive news that at least for residual fuels we are seeing 2005 specifications becoming virtually obsolete probably because of two main drivers. Firstly, fewer customers are now requesting 2005 specifications given the added protection afforded for critical parameters like Catalyst Fines (Aluminium and Silicon) and Sodium with 2010 (or later) specifications, and secondly, suppliers have in general moved away from 2005 specifications because of their position being more problematic when faced with the inevitable notice relating to Clause 5 or chemicals and added substances.

The same, however, cannot be said for distillate fuels with almost a fifth of fuels still being sold to this 17-year-old specification, the supply of which is particularly prevalent in the Indian subcontinent with pockets noted elsewhere, one such area being the eastern seaboard of the United States.

Port	2005	2010	2012	2017
New York	5%	31%	2%	62%
Baltimore	15%	80%	0%	5%
Marcus Hook	0%	40%	0%	60%
Norfolk (Vi)	100%	0%	0%	0%
Newport	100%	0%	0%	0%

Source: Intergr8

Fig 5 DMA Specifications available in USA Eastern Seaboard

It is therefore important to consider what issues may arise because of only obtaining 2005 specification and where you may face this issue.

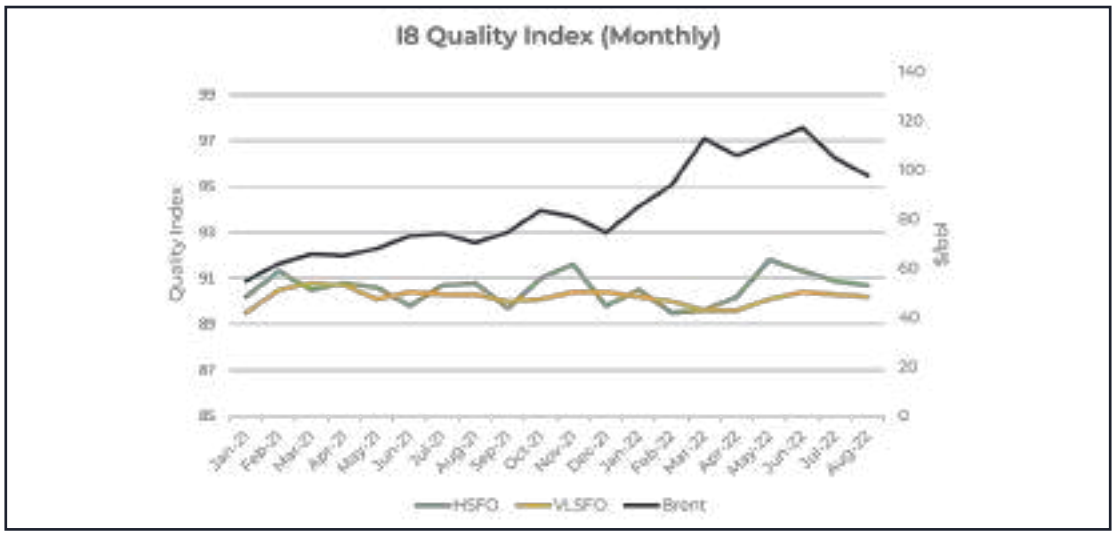
Firstly, 2005 specifications offer no guarantee for Lubricity, Oxidation Stability, Acid number or Hydrogen Sulphide and whilst it is rare that issues arise, the added cover for a fuel which may have aged afforded by the Oxidation stability parameter is an important one.

Of greater concern is the fact that a supplier is afforded more scope with regard minimum Viscosity guarantees which allows a minimum level of 1.5cSt rather than 2.0cSt for 2005 compared to 2010 specs and beyond. Such low levels can be particularly problematic to vessels which do not have the ability to cool the fuel given the need to inject the fuel at a minimum of 2cSt stipulated by most engine manufacturers and the possibility of fuel pump issues or even loss of propulsion as a result.

Cross referencing back to the eastern seaboard we note that around 25 percent of all samples testing below 2.0cSt in the last 180 days, this in a location where we may have no guarantee to protect us from this issue (Fig 5). Indeed in the port of Norfolk (Vi.) where only 2005 specifications are available, 65% of all samples have recently tested under 2cSt for Viscosity. Therefore, if bunkering in the USA and particularly the eastern seaboard it is highly recommended to purchase 2010 specification or higher.

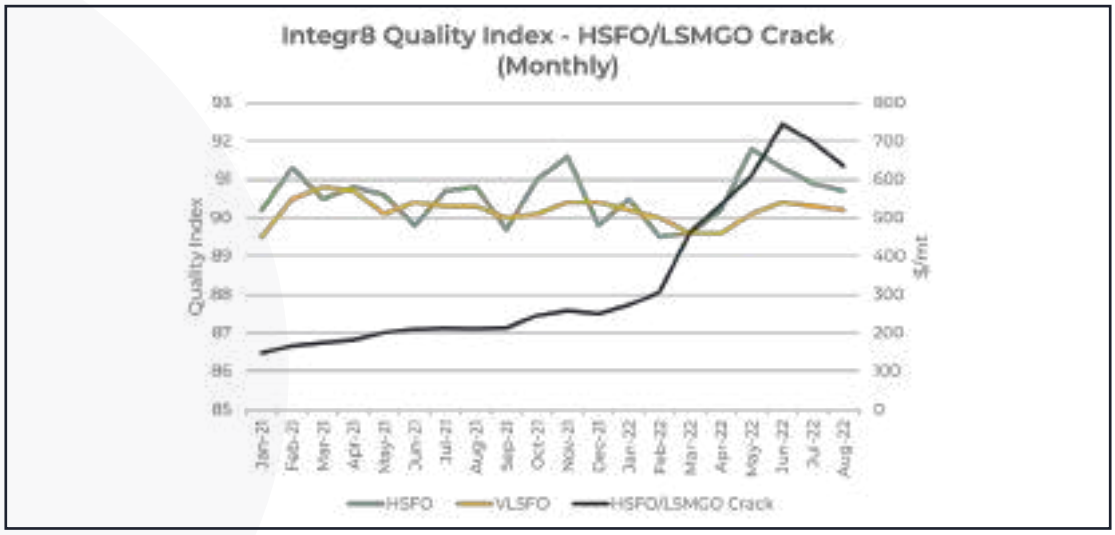
Integr8 Quality Index

The last 6 months have identified a generally improving picture for both VLSFO and HSFO, however, the back story is that the improvement is from historic lows of the Integr8 Fuels Quality Index in Q1 of 2022, a period that coincided with the start of the war in Ukraine, Russian sanctions and the spike in oil prices as can be seen from Figure 6 below which compares Brent crude against Quality Index.



Source: Intergr8

Fig 6. Integr8 Fuels Quality Index for HSFO and VLSFO against Brent crude (monthly av)



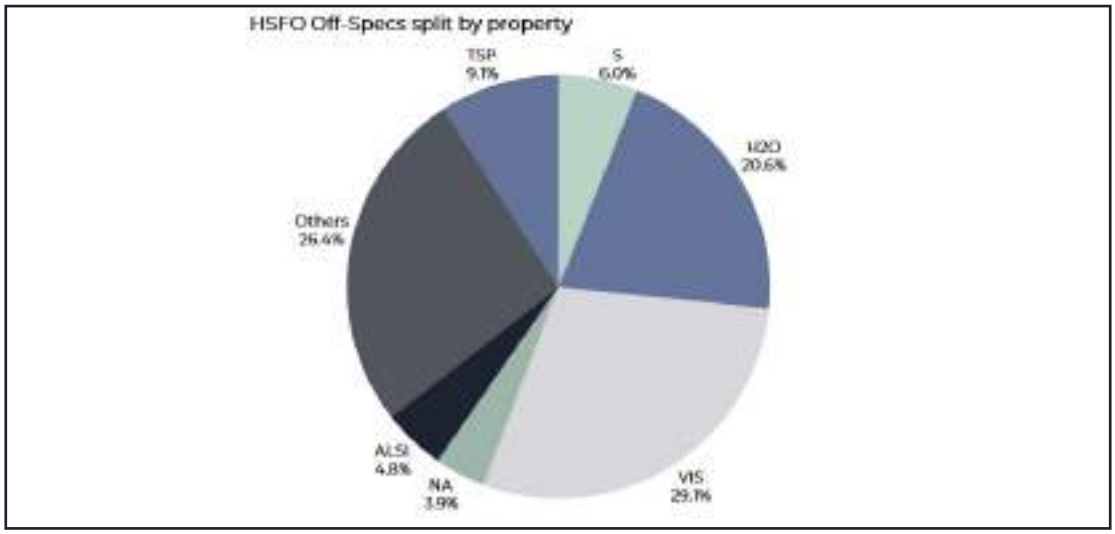
Source: Intergr8

Fig 7 Integr8 Fuels Quality Index for VLSFO & HSFO versus Platts HSFO/LSMGO crack

At the time of writing and given the crack has narrowed only slightly and remains more than $600/MT, these challenges show no real sign of abatement so in the short to medium term we do not expect to see significant improvement in fuel quality or compliance.

Focus on HSFO

In the last 180 days, 3.6% of all HSFO supplies tested outside of specification (and beyond 95% confidence limits) for ISO 8217 Table 2 parameters. The data identifies that the risk of either Marpol or Solas compliance is low. Based on the cross section of off specifications we can identify the hit-rates of high risk off specification matters such as Aluminium and Silicon and TSP at 0.2% and 0.3%, or two or three supplies per thousand. (Fig 8)

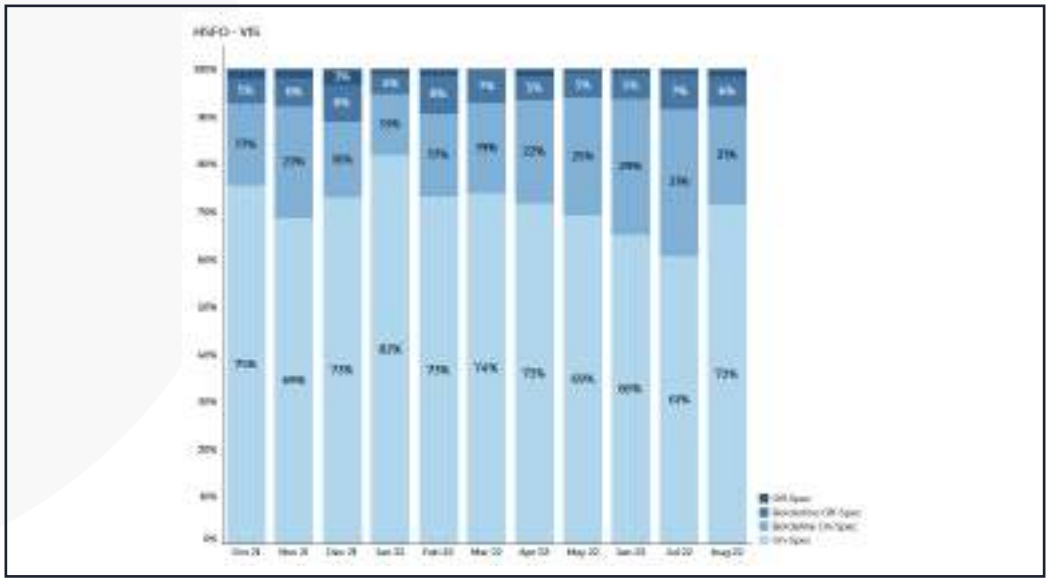


Source: Intergr8

Fig 8 HSFO Off Specification distribution by property

In the last 180 days, almost one third of all off specification incidents are because of Viscosity infractions above 380cSt, invariably due to minimizing the cutter stock in blends as described earlier.

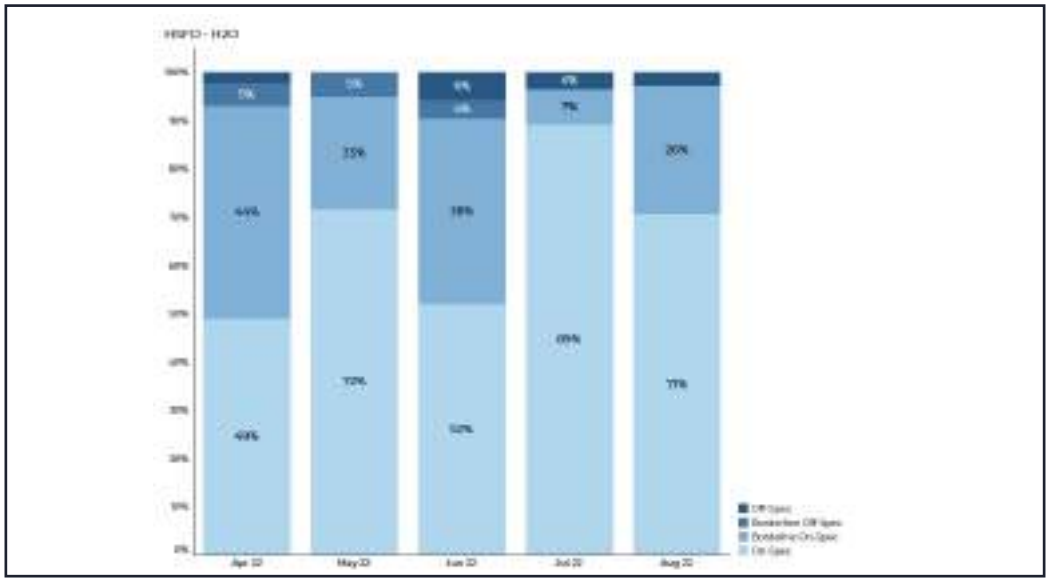
These challenges are noticeable in Bunker Hubs globally (Fig 9) which indicate that the number of fuels with Viscosity above 360cSt have increased by from 27% in Q1 to 34% in Q3 to date**.**



Source: Intergr8

Fig 9 HSFO Viscosity distribution in bunker hubs

Water infractions also make up one fifth of all off specification issues for HSFO, however, this is more hit and miss in nature and is, in general, batch based. China (Fig 10), and the ports of Zhoushan and Ningbo had issues in June 2022 with as many as one in two samples testing at 0.4% or higher and 6% of all samples testing above 0.6%. Indeed, even if a fuel tests on or just below the 0.5% volume water limit and is within specification, water has no commercial value and can result in significant hidden losses which can quickly mount up (over a significant fleet) to the tune of hundreds of thousands of dollars per annum.



Source: Intergr8

Fig 10 HSFO Water distribution in China ports

The biggest story for the year with regard HSFO has of course been the chlorinated compounds incident in Singapore towards the end of Q1 which was the first such outbreak since the Houston problem in 2018. These incidents are outside of the normal table 2 requirements for residual fuels and therefore more difficult to predict or trend. That said, it is not unsurprising that different cutter stocks may be making their way back into supply chains given significant and ongoing commercial pressures.

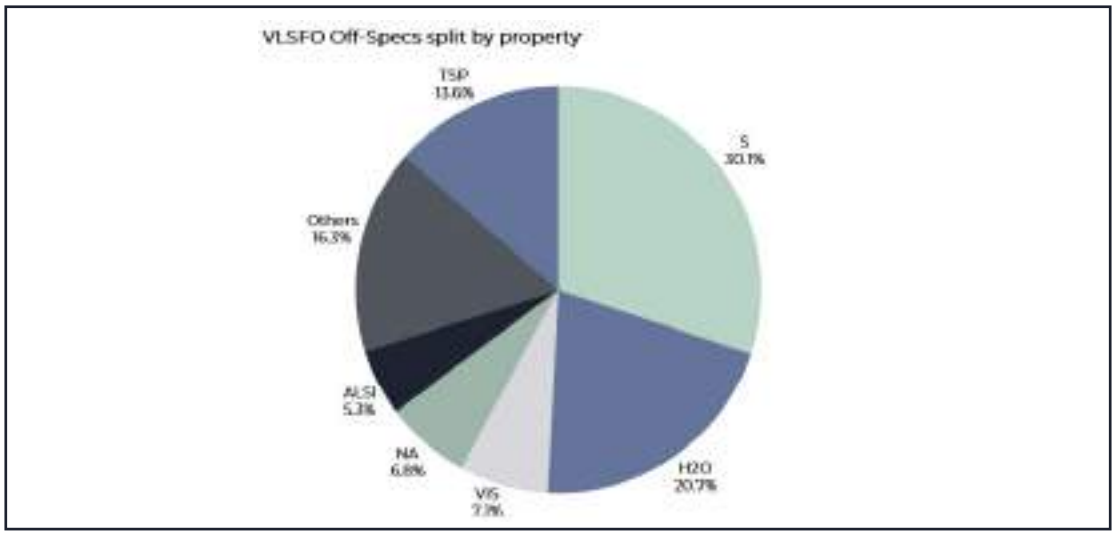
The Houston and Singapore incidents are completely unrelated, however, they again bring to the table the challenges that continue to muddy the waters as far as Clause 5 compliance is concerned.

For example, what methodology should be used?. The only technique with reference to an international standard is ASTM D7845 however this only lists 29 components and has led to many laboratories either extending the scope of this method or developing their own in-house techniques which sometimes do not even detect the same compound let alone correlate on its concentration.

Therefore, we call for all parties to proceed with the abundance of caution in the event an alert being raised by a testing laboratory, cutting through some of the hysteria we see at present, always asking ourselves questions to put the issue into context. Questions such as, whether the compound alleged is present in problem fuels, whether it is also present in fuels burned without incident (just like styrene in the case of thousands of historic examples), and if damage has been alleged, what was the condition of the engine (or vessels equipment) for example, in the first place.

Focus on VLSFO

In the last 180 days, 2.7 % of all VLSFO supplies tested outside of specification (and beyond 95% confidence limits) forlimits) for ISO 8217 table 2 parameters. The data identifies that the risk of Marpol compliance is significantly higher globally than HSFO at 0.8%, however, this does not tell the full story given the elevated risk of non-compliance noted around blending hubs.



Source: Intergr8

Fig 11 VLSFO Off Spec Distribution by property

Based on the cross section of off specifications, we can identify the hit-rates of high risk off specification matters such as Aluminium and Silicon and TSP 0.1% and 0.4% or between one and four supplies per thousand. Again, these risks are magnified in blending hubs rather than those areas with either simpler blending models or refined products available. Delving a little deeper, and more concerningly in the last 180 days, approximately two thirds of all off specification VLSFO occurrences are because of Sulphur, Water or TSP Issues with Sulphur alone accounting for almost one third of all off specs (Fig 11) and virtually all compliance matters.

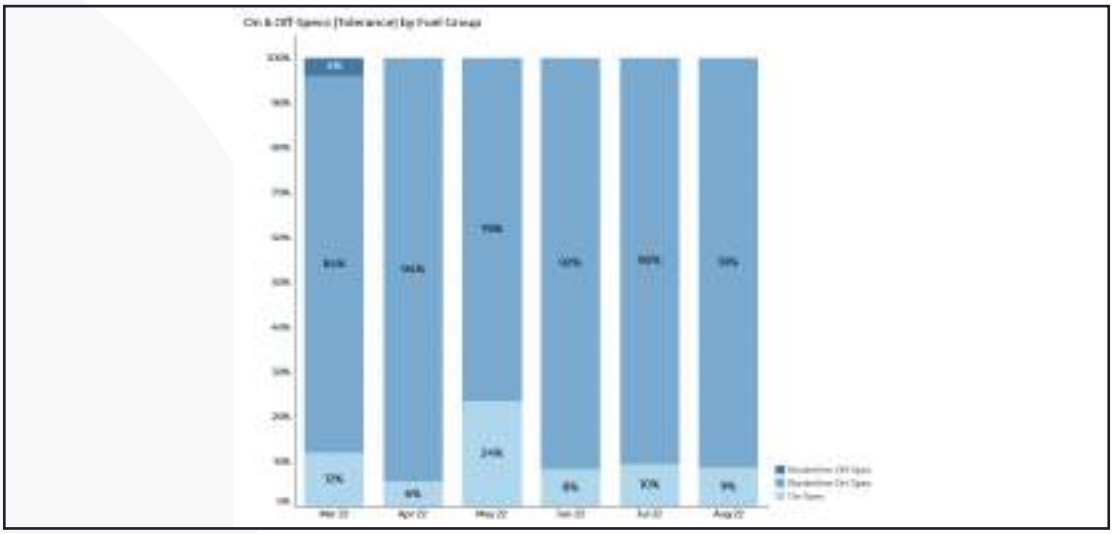
From a global standpoint, VLSFO quality is seen to be good, however, significant regional variances can be noted, none more so than for Belgian and Dutch ports (or ARA) where receivers are at least 10 times more likely to receive a notification of a VLSFO above 0.50% than in Singapore, and more than five times more likely than the rest of the world. (Fig 12)

Country	Sulphur %Wt Avg	Tolerance S%	Off Spec S%
Belgium & Netherlands (ARA)	0.49	10.0%	2.7%
Rest of the World	0.46	1.6%	0.9%
Singapore	0.48	0.8%	0.3%

Source: Intergr8

Fig 12: % of deliveries last 180 days with Sulphur tested in categories Spec + 95% confidence or off specification for VLSFO

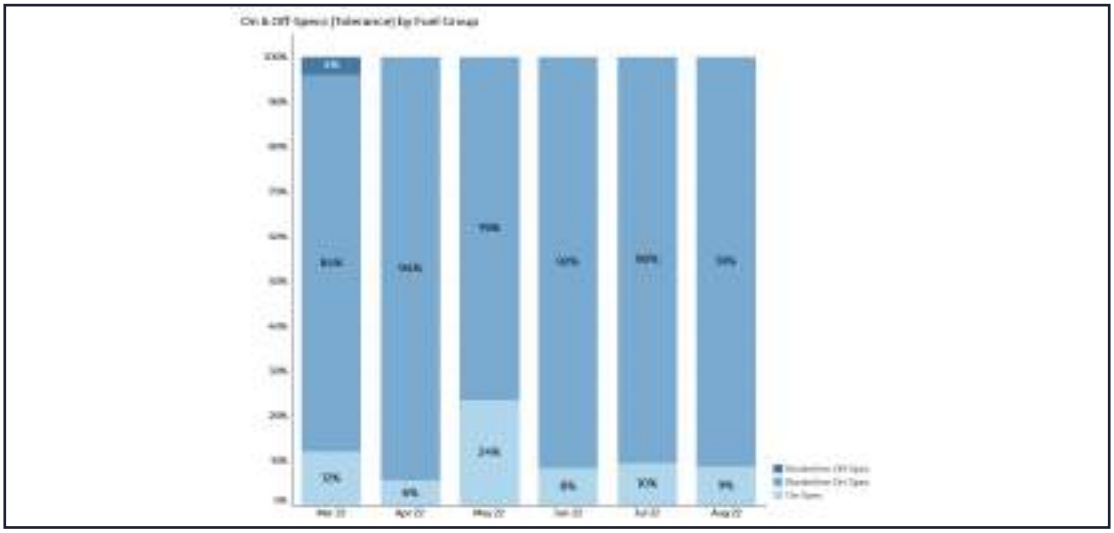
More worryingly, we notice trends within trends in the case of ARA when we drill down to individual supplier performance and, referring to one anonymized example below, we note that in the case of August 22 to date we have strong grounds to believe over 10% of all deliveries were non-compliant and over 30% of all samples potentially non-compliant. To conclude, four out of ten of all VLSFO deliveries may result in non-compliance when considering data related to this anonymous supplier in ARA. (Fig 13, next page)



Source: Intergr8

Fig 13 ARA supplier VLSFO Sulphur content: Poor performance – last 180 days

At the other end of the spectrum, we can identify examples of suppliers with excellent sulphur compliance who, in the last three months do not have a single sample that exceeded 0.50%Wt. (Fig 14)



Source: Intergr8

Fig 14 ARA supplier VLSFO Sulphur content: Good performance – last 180 days

Many theories exist as to why some ARA suppliers have such poor quality data when we consider Sulphur, not least the difficulties of buying ex-wharf and the challenges of the fuel even arriving onto the barge with a Sulphur level of 0.50% or lower, given the reduction in Sulphur give-away from a blending perspective in recent months. It is entirely possible this may be due to cross contamination in jetty lines (with HSFO), but this may also be due to other practices onboard the barge.

Indeed upon investigation of the anonymous poor performing supplier referred to earlier, it was identified that several of their barges were moving storage in-between HSFO and VLSFO with the first delivery post a HSFO movement inevitably testing above 0.5%, no doubt due to the common deck lines (and /or sampling points) onboard the barge.

Example (Fig 15) – A Barge line contains 3 MT of HSFO clingage and a barge tank 200MT of VLSFO at 0.50% Sulphur. 200MT of VLSFO is then supplied

Source	Quantity MT	Sulphur %Wt
Barge Tank	197	0.50
Barge Line	3	2.50
Vessel	200	0.53 (theoretical)

Source: Intergr8

Fig 15 Linear Sulphur blend

It is also entirely possible that the fuel is compliant in such cases given the possibility of cross contamination within sample points, therefore it is essential to ensure that the sample is representative of the fuel supplied and that there is no cross contamination in the continuous drip sampler. However, best practice remains that unless double valve segregation and separate manifolds are available on board the delivering facility, supplying HSFO and VLSFO from the same barge would be considered a substantial risk to quality if identified.

Expanding on these trends but now considering other parameters, we can also identify similar trends also exist for TSP across ARA when compared to Singapore and other bunkering hubs when considering the likelihood of results testing within tolerance (95% confidence limits 0.11%Wt to 0.15%Wt Incl) or beyond 95% confidence (0.16Wt or higher) in the last 180 days.

Country / Port	Tolerance TSP%	Off Spec TSP%
Belgium/ Netherlands (ARA)	1.4	31%
Houston	2.7	0.7
Panama	2.1	0.5
Gibraltar	0.9	0.4
UAE (Fujairah)	0.1	0.3
Singapore	0.3	0.1
Korea	0.0	0.0

Source: Intergr8

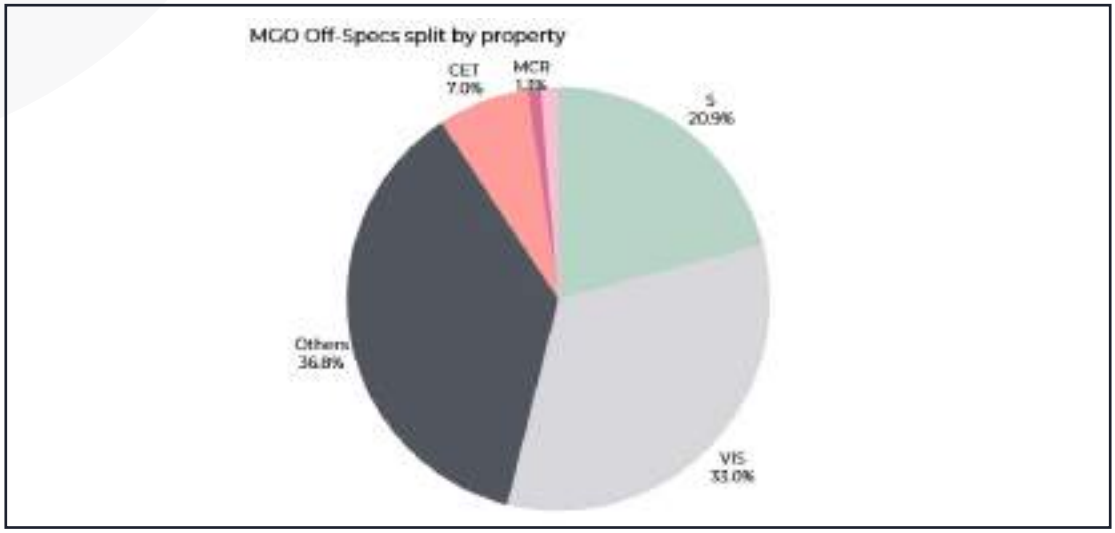
Fig 16 TSP result distribution in bunker hubs

The variance across bunker hubs is eye opening. In the case of Fig 16 we can see that we are as much as 26 times more likely to have an off specification incident in ARA compared to Singapore and still almost four times more likely than the second worse hub statistically in Houston.

Interestingly however, the selection of a supplier identified with less risk (based on data available) in ARA would virtually remove this risk entirely and drop the likelihood of a result testing at 0.16%wt or above to the same as Singapore and consequently better than many of the other bunkering hubs worldwide.

Focus on MGO

2.3% of all MGO supplies tested outside of specification (and beyond 95% confidence limits), for ISO 8217 table 2 parameters in the last 180 days. The data identifies that the risk of either Marpol non-compliance is 0.5% or five supplies per thousand, and SOLAS non-compliance due to low flash point is even rarer at <0.1% on average.



Source: Intergr8

Fig 17 MGO off spec distribution by property

The risks of SOLAS non-compliance are noted to be magnified in certain parts of the world; Italy for example had a 2.6% chance of a MGO testing below 60 deg C for Flash Point, with Naples in particular looking a substantial risk with 12% of all supplies testing as potentially non-compliant. It is important to note that SOLAS regulations do not allow tolerances and that a result obtained of 59.5 deg C would be non-compliant if proven.

The supply of MGO remains lowest risk of all marine fuels with respect the chances of an off specification occurrence, however, it is important that we do not forget other important handling issues onboard vessels, not least in respect to cold flow properties.

Most vessels will of course trade globally, potentially in climates far colder than northwest Europe, therefore, it is essential for buyers to understand the risks and consider where they are heading and whether the situation may make the fuel prone to increased sensitivity to temperature, such as the example of the geared bulker or dredger.

For this reason, unless confident the vessel is heading to warmer climates (and will burn the fuel out in that timeframe) it is recommended to purchase ISO 8217 2017 Winter Grade in ARA which provides for the reporting of cold flow properties.

Focus on "Cold Flow" Properties

It is that time of year again where the focus in northwest Europe again shifts to the annual issue relating to cold flow properties of MGO. These properties, Cloud Point and Cold Filter Plugging Point (CFPP) have no limits specified in any version of ISO 8217 table 1 but are relevant when considering the ability to handle fuels onboard a vessel.

Cloud Point is defined as the temperature where a distillate fuel first forms wax crystals (manifesting as a cloud) when cooled under laboratory conditions.

CFPP is defined as the temperature at which a fuel last flows through a 45-micron filter under laboratory conditions when cooled down prior to it plugging due to the buildup of waxes, in other words to estimate the lowest temperature where it will give trouble free flow through a system.

However, given that filters onboard vessels are finer than the 45 micron filters in the CFPP test, operability onboard the vessel will become a challenge at a temperature in-between the Cloud Point and the Cold Filter Plugging Point, far earlier than the point at which the fuel sets or stops to Pour, the Pour Point – which is the only cold flow guarantee available at present.

Tellingly, suppliers or manufacturers expressly exclude any liability relating to fit for purpose guarantees, but charterers are often exposed given this requirement being routinely written into charter parties.

This perfect storm occurs every year like clockwork and 2022 is expected to be no different. Recent data available to Integr8 shows that up to 10% of fuels currently being supplied would become problematic in north west Europe by November (when considering sea temperature) and issues would become even more likely (20%) if we were to consider sectors which exhibit greater risk, such as where MGO is required for cranes on a geared bulker etc., given the exposure of fuel lines to air temperatures.

Rotterdam	Sea Temp Deg C	CFPP<= Sea %	Air Temp (Low) Deg C	CFPP <= Ambient%
August	19	1%	13.3	9%
September	18	2%	10.8	10%
October	15	7%	7.8	18%
November	**11**	**10%**	**4.4**	**20%**
December	8	18%	1.9	26%

Source: Intergr8

Fig 18 CFPP distribution ARA v avg climatic conditions Rotterdam

Most vessels will of course trade globally, potentially in climates far colder than northwest Europe, therefore, it is essential for buyers to understand the risks and consider where they are heading and whether the situation may make the fuel prone to increased sensitivity to temperature, such as the example of the geared bulker or dredger.

For this reason, unless confident the vessel is heading to warmer climates (and will burn the fuel out in that timeframe) it is recommended to purchase ISO 8217 2017 Winter Grade in ARA which provides for the reporting of cold flow properties.

Hidden Losses : Density Short Lifting

The relevance of variances between Density listed on the Bunker Delivery Note and that obtained when tested, known as a Density short lift, has rarely been more important given the very high prices being noted at this time and as a result the potential for financial losses to the end user.

Data available to Integr8 Fuels identifies several key locations in the world with endemic variances for both VLSFO and MGO. We would also mention that these variances are less common with HSFO due to the density often being blended near the maximum specification.

Port	VLSFO %Var	Avg $/MT (180 Days	Adjusted $/ MT (Var	MGO %Var	Avg $/MT (180 Days)	Adjusted $/ MT (Var)
Hong Kong	**-1.5%**	**$936**	**$950 (+14)**	**-2.6%**	**$1143**	**$1173 (+30)**
Sri Lanka	-1.1%	$1023	$1034 (+11)	-1.6%	$1370	$1391 (+21)
Khorfakkan	-0.6%	$928	$933 (+7)	-1.1%	$1348	$1362 (+14)
Zhoushan	-0.2%	$919	$921 (+4)	-0.7%	$1214	$1222(+8)
Singapore*MFM	**-**	**$915**	**$915 (Nil)**	**-**	**$1147**	**$1147(Nil)**

Source: Intergr8

Fig 19 Impact of Density variances by port

Singapore variance not applicable due to mass flow meter being used for custody transfer

The picture told in Fig 19 lays bare the need to always consider port data and price in tandem when it comes to the accuracy of Bunker Delivery Notes and even when comparing and adjusting prices from port to port or supplier to supplier.

For instance, if you used average prices for Singapore and Hong Kong for MGO in the last 180 days, Hong Kong would be $4 per ton cheaper than Singapore. However, when you apply the average 2.6% loss this flips the calculation back into the favour of Singapore's MFM supply (which is not impacted by Density variance) to the tune of $26 per ton.

Conclusion

A data-driven approach to buying bunkers has never been more relevant given the commercial headwinds affecting many stakeholders across the industry at this time. Bunker quality is generally very good indeed, with issues being more batch based than endemic, although certain areas of the world are magnitudes of risk higher than others. The key is to select the right supplier and the right fuel for the job in hand and to consider the full picture, including hidden losses when assessing value rather than simply being drawn to the lowest price available in the market.

Thankfully, trends can be identified and buying adjusted accordingly in most cases which should allow us all to sleep a little easier.

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During his career spanning over 30 years in Oil & Shipping Industries, Chris has a vast amount of experience including Laboratory Management, Physical Supply, Bunker Broking, Trading and more recently providing Technical supervision of the exclusive buying for Owners, Charterers and Operators including development and design on online bunker resources.

Chris is also a member of the IBIA technical working group and a regular speaker and panel member at many global bunkering conferences worldwide.