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Everything you want to know about IMO 2020 but are afraid to ask

IMO 2020 is posing big questions about significant issues, and clear answers are proving difficult to find. With fewer than 6 mos to go, a review of the key issues—availability and prices, scrubbers, compatibility and stability, ISO 8217 inadequacy and patents—is beneficial.

Briefly, the availability of 0.5% very-low-sulfur fuel oil (VLSFO) will not be an issue. Prices will hover anywhere from $30/metric t–$120/metric t over high-sulfur fuel oil (HSFO) prices. Scrubbers cannot be beat for price differentials above $80/metric t. Compatibility and stability of blends will be a big headache. Buying ISO 8217-compliant fuel will not guarantee fitness for use and, finally, formulation patents guarantee expensive litigations.

Availability and prices of 0.5% sulfur-compliant fuels. Plenty of fuel will be available, but for a price. All major oil companies have built residue-destruction process units, such as delayed cokers and resid hydrocrackers, to flood the market with marine gasoil. They may be salivating at the prospect of charging customers $200/metric t or more vs. HSFO, which might not be the case.

In addition to competition and price manipulation, two factors exist that might keep a lid on prices. Approximately half of the world's crudes are low sulfur, suitable for production of VLSFO in the form of straight-run fuel oil, vacuum tower bottoms and low-sulfur gasoils (both atmospheric and vacuum). This does not account for US shale crudes. LSFO blend components will flood the market.

Based on December 2017 Gulf Coast data, the internal cost of production is between $30/metric t and $120/metric t for HSFO above 3.5% sulfur.[1] Even with the addition of profit margins of $30/metric t–$60/metric t, VLSFO will be much more competitive than marine gasoil (MGO).

Scrubbers. Shipowners that have waited until the last moment to get scrubbers are now kicking themselves, but they have only themselves to blame. The industry has popularized scrubber return on investment (ROI) calculations "ad nauseam."[2]

The ROI for given CAPEX and OPEX have been published in excruciating detail to no avail, with an internal rate of return (IRR) of 130%–140% and paybacks from 4 mos–7 mos, depending on the vessel size. For price differentials greater than $80/metric t above HSFO and a consumption of approximately 60 tpd, scrubbers are the way to go.

Suddenly, it seems that shipowners have seen the light. Unfortunately for them, scrubber vendors are fully booked for the next 2 yr.

FIG. 1. The cost of 340-cSt bunker fuel is about $75/metric t cheaper than the cost of 20-cSt bunker fuel.

Compatibility and stability. An enormous increase in the number of blends purportedly meeting specs will be seen in 2020. This is caused by desperation to achieve the cheapest possible blends, forcing the use of a large variety of blend components of dubious properties and quality, and skimping on meaningful tests.

Predicting the stability and compatibility of bunker blends is well established, and while step-by-step calculation "how-to" information is widely published by major oil companies,[3] it is rarely used. A terrible price will be paid for cutting corners; uneducated and lazy buyers will have only themselves to blame.

ISO 8217 inadequacies for 2020. Critical properties of a 2020 bunker blend are stability and compatibility.[3] These depend crucially on the blends' and blend components' asphaltene content and the aromaticity of the blend, which must be high enough to keep asphaltenes in solution.

These issues of including asphaltenes and aromaticity in specifications have been brought to the attention of an International Organization for Standardization (ISO) working group that is defining the new publicly available specs (PAS) to be issued in 3Q 2019. After the ISO working group "lost" the proposal, it is uncertain whether these will be included in PAS.

Managing tankage for the 0.5% sulfur bunkers. Everyone involved with 2020 bunkers must acknowledge the need to segregate bunker tanks by content:

- Paraffinic blends only
- Aromatic blends only.

For so-called "hybrid" blends, the rules are different:

- Keep aromaticity of the hybrid blend > 50%
- Always pour paraffinic blend components on top of aromatics.

Patents for 2020 formulations. All major oil companies defensively patented 2020 bunker blend formulations to protect themselves from a repeat of the Union Oil Co. of California and Unocal Corp. (UNOCAL) patent fiasco.[4,5]

The patents themselves are extremely broad and hardly defensible in court. However, because they are extremely broad, it is impossible to avoid infringement. Are you going to pay royalty for every ton you sell, or can you afford a lengthy and costly litigation to take on Exxon, Shell, Total, etc.?

Now is the time to negotiate a friendly, royalty-free agreement, rather than potentially go to court.

LNG and IMO 2020. Without question, liquefied natural gas (LNG) is plentiful, cheap and burns far cleaner than distillate and residual fuels, and will meet the IMO 2020 0.5% sulfur cap.[6,7] Unfortunately, LNG is not plentiful everywhere, but mostly where the big gas fields and producers are, such as the US shale plays, the Netherlands, Russia, Qatar, etc.

While LNG bunkering infrastructure is growing steadily, it is woefully inadequate globally.

- There are now about nine LNG bunker vessels, with many more on order, compared with tens of thousands of conventional bunkering barges.
- Fewer than 300 LNG-fueled ships are in operation or on order as of 2019, compared with approximately 70,000 seagoing vessels plying the oceans.

The only way LNG will become widespread and compete with conventional distillates and residual fuels is through government mandates and subsidies, and that is not likely to happen anytime soon.

When bunker is not bunker. Ideally, customers would like to have an RMG 380 cSt grade with maximum of 0.5% sulfur and a viscosity of 320 cSt–380 cSt.

In the scramble to produce compliant 0.5%-sulfur bunkers (VLSFO), many companies have focused on stability and compatibility, and overlooked the importance of viscosity. ISO 8217-17 does not have minimum viscosity specs, only a maximum. Contrary to public claims, running low-viscosity 20-cSt "bunkers" rather than RMG 380 or RMG 180 will require special lubricating oil, in addition to potential thermal shocks and leaks.

It is important to remember that the IMO (CE Delft) study produced VLSFO regional recipes:

- US: 14.7 cSt
- Europe: 17.2 cSt
- Asia-Pacific: 110.7 cSt.

The first two recipes are essentially marine diesel; that is, gasoil with a couple of "drops" of residue, such as RMA 10 or RMB grades. The Asia-Pacific blend is between RMD 80 and RME 180—i.e., gasoil with "more" residue.

What are suppliers making? Most initial tests of 0.5% sulfur samples showed viscosities in three groups:[2,8]

- First group: In the range of 10 cSt–30 cSt
- Second group: In the range of 100 cSt–200 cSt
- A minority of suppliers are planning to provide 300 cSt–380 cSt blends.

Why is viscosity important? Sulfur is not the only property to be considered. Low viscosity could also be a significant issue because it affects:

- The fuel heating temperature with the potential for thermal shocks, and leakage around cylinder/piston clearances and lube oil contamination
- Lubricity is reduced with lower sulfur content and will require adding lubricity additives
- Shipowners will spend more money to buy more expensive lubricating oil and can potentially incur more frequent oil changes.

A clear difference can be observed between 20-cSt "bunker" and "real bunker" of around 340 cSt to 380 cSt made with readily available components on the US Gulf Coast. Not only is 340-cSt bunker (**FIG. 1**) cheaper than 20-cSt bunker by around $75/metric t, it also eliminates myriad issues, such as thermal shocks; stability and compatibility; the need for special lubrication oil; costly, frequent changes of oil due to seepage; and contamination. Additional recipes and their costs are described in Reference 1.[1]

Recommendations. Ensure long-term supply agreements with suppliers to ensure consistent quality.

- If purchasing low-viscosity fuel, since most of it will be gasoil, the costs savings vs. MGO will be minimal, so it may be better to stick with MGO. This is the most expensive solution.
- If purchasing medium-viscosity fuel, it will have the most unpredictable quality and price, and may include surprises regarding stability, compatibility and lubricity because suppliers will be engaged in a price race.
- If purchasing high-viscosity fuel, behavior and price should be close to today's HSFO.
  - Most of it will be residue—in the EU, LS visbroken resid and LS straight run; in the US and Asia-Pacific, LS vacuum bottoms and LS straight run—and the manufacturing cost (not selling price) should be $30–$50 above 3.5% sulfur HFO. Stability and compatibility will be the same as today's HSFO, so attention must be paid to the aromaticity of the fuel. This is the cheapest solution, unless scrubbers are used with HSFO. HP

LITERATURE CITED

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