Seatrade Maritime News

What you need to know: The 2020 IMO fuel sulphur regulation

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The bunker fuel supply and availability landscape is set to change when IMO's global 0.5% fuel sulphur content cap regulation is enforced from 2020. Shipowners have a few options to choose from for them to comply with the regulation, while refiners are expected make changes to refinery configuration and production in response to market demand. Thus far, there is no silver bullet solution ahead of 2020 and the involved parties will have to decide on the most appropriate approach to take so as to suit their operations and remain commercially sustainable in the long run.

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Executive summary

The International Maritime Organization (IMO) will enforce a new 0.5% global sulphur cap on fuel content from 1 January 2020, lowering from the present 3.5% limit. The global fuel sulphur cap is part of the IMO's response to heightening environmental concerns, contributed in part by harmful emissions from ships.

The 2020 deadline was confirmed at the 70th session of IMO's Marine Environment Protection Committee (MEPC) held in October 2016.

The more stringent sulphur regulation has led to shipowners and operators mulling over which options they should choose in order to comply with the IMO regulation, and refiners considering whether to produce more low-sulphur fuel to meet possibly higher demand, as both parties anticipate an unprecedented change in the marine fuels supply landscape.

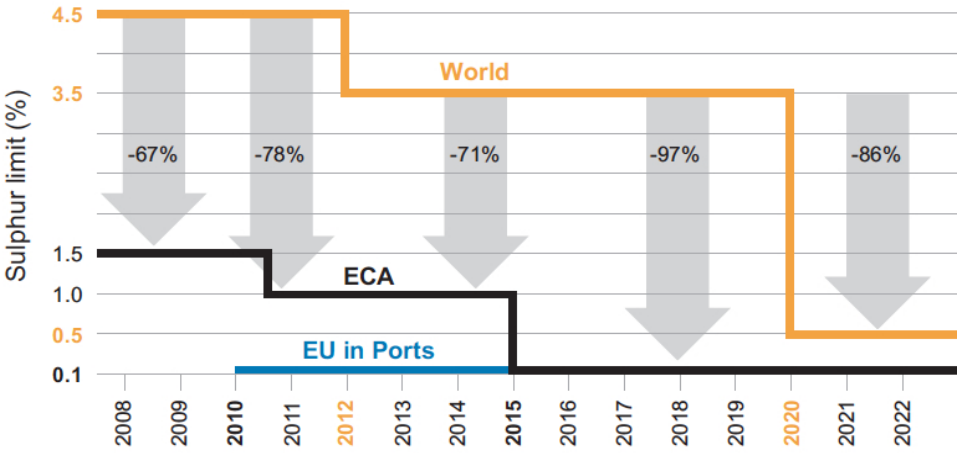
The issue with the 0.5% sulphur cap regulation is that it has turned into a textbook conundrum for refiners (the fuel suppliers) and shipowners (the fuel buyers), caught in a quandary whereby suppliers are unable to commit on how much to produce as buyers do not know how much is needed, vice versa.

The refiners, though they are not regulated by IMO, cannot pretend that nothing has happened as they have a commercial interest to cater to market needs through changes to production configuration so as to maximise margins.

The shipping industry, the one on the receiving end of the IMO regulation, will have to deal with not only the upcoming global 0.5% sulphur cap, but also the existing 0.1% sulphur cap in designated Emission Control Areas (ECAs).

There are three options set out in this paper that shipowners can consider in order to comply with the IMO regulations. First, shipowners can install exhaust gas cleaning systems on their ships. Second, owners can simply buy compliant fuels at higher costs. Third, ships can run on the clean gas LNG as fuel.

IMO Marpol Annex VI sulphur limits timeline



source: Wartsila

1A) The IMO fuel sulphur regulation: global cap

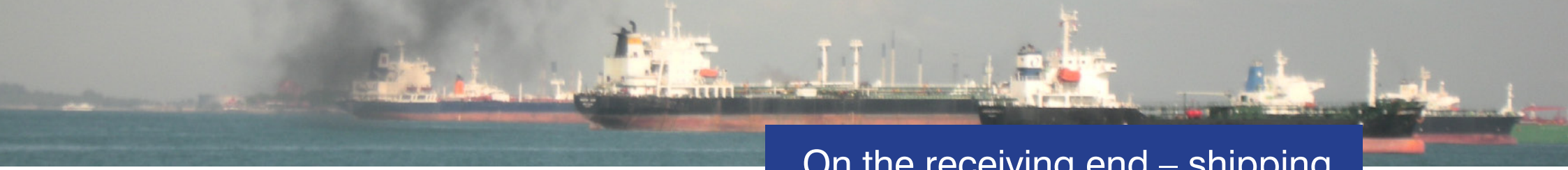
From 1 January 2020, the IMO Marpol Annex VI regulation on limiting sulphur content of bunker fuel to a maximum of 0.5% will enter into force. At present, the global sulphur content cap on bunker fuel is at 3.5%, a level considered easy to comply with for vessel operators.

The IMO Marpol Annex VI 'Prevention of Air Pollution from Ships', first adopted in 1997 and came into force in 2005, has established limits on sulphur content in bunker fuel, as well as the creation of ECAs in designated sea areas setting stricter sulphur content limits at just 0.1%.

Marpol Annex VI started with a global sulphur cap of 4.5% before it was lowered to 3.5% in 2012. The steep reduction to a global 0.5% sulphur cap by 2020 was decided in October 2016 by the IMO Marine Environment Protection Committee (MEPC).

The IMO had commissioned a review to assess whether sufficient compliant fuel oil would be available to meet the 2020 date, and this review/study was carried out by independent research and consultancy organisation CE Delft. This study was then submitted to IMO member states to help them in their deliberations.

Going forward, MEPC will look into approving a new output on consistent implementation of the sulphur regulation of Marpol Annex VI. The scope of the work, to be completed during two sessions of the Sub-Committee on Pollution Prevention and Response, during 2018 and 2019, could include considering a number of preparatory and transitional issues surrounding the shift to the new 0.5% limit from 2020.



On the receiving end – shipping

1B) The IMO fuel sulphur regulation: ECAs

Ships trading in designated ECAs have to burn bunker fuel with a sulphur content of no more than 0.1% since 1 January 2015, against the limit of 1% when ECAs were first introduced in 2010.

The Marpol Annex VI ECAs are the Baltic Sea area, the North Sea area, the North American area (covering designated coastal areas off the US and Canada), and the US Caribbean Sea area (around Puerto Rico and the US Virgin Islands).

Further formation of country-based or continent-wide IMO-approved ECAs, however, is not an easy process. In the case of establishing a region-wide ECA, it may take up to five years to complete an entire assessment and consultation process including gathering agreement from all the Marpol Annex VI signatory countries and receiving submission of emission inventories.

Many emerging economies, and even some established ones, see designating their territorial waters on ECAs as discounting their ports' competitive edge. But there are exceptions as some countries have voluntarily made positive steps to clamp down on shipping emissions in view of their own environmental agenda.

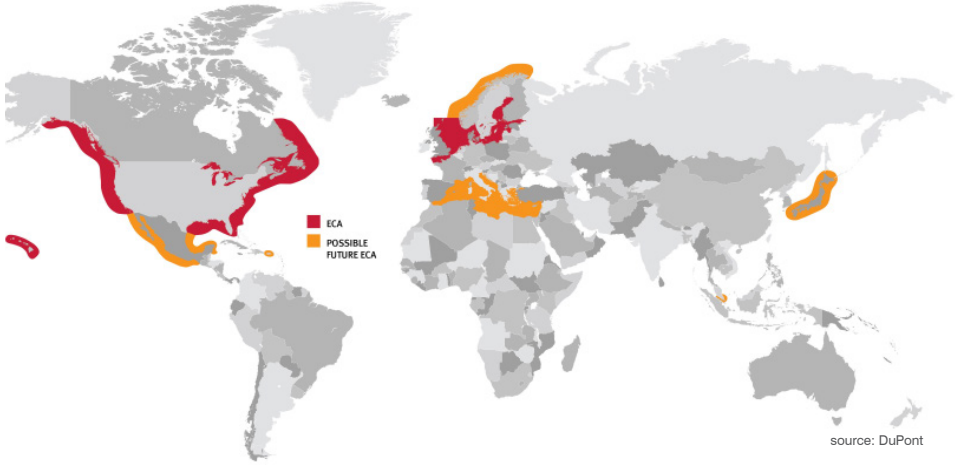
China has its own version of ECAs, enforced in phases since April 2016, requiring ships berthing at 11 ports to use 0.5% sulphur fuel. The 11 ports are Guangzhou, Huanghua, Nantong, Ningbo-Zhoushan, Qinhuangdao, Shanghai, Shenzhen, Suzhou, Tangshan, Tianjin, and Zhuhai.

Hong Kong has required all ocean-going veswsels to switch to fuel not exceeding 0.5% while at berth starting 1 July 2015.

While Sydney, Australia has imposed a 0.1% sulphur limit for cruise ships berthing at the port.

Some areas touted as possible future ECAs include Japan, Norway, Mexico and the Mediterranean.

Existing ECA zones and possible future ECAs



source: DuPont

Heavy fuel oil (HFO), which is high in sulphur content and considered the bane in terms of emissions for environmentalists, is the traditional source of energy to power ships.

In 2016, global demand for HFO accounted for 70% of a mixed grade of bunker fuels, including the low-sulphur marine gas oil (MGO) with below 0.5% sulphur content and the ultra low sulphur fuel oil (ULSFO) of 0.1% maximum sulphur content. The switch to burning either MGO or ULSFO is an option for shipowners to be in compliant with the IMO regulation, and two other alternatives are installing abatement technology such as scrubbers or using LNG as fuel.

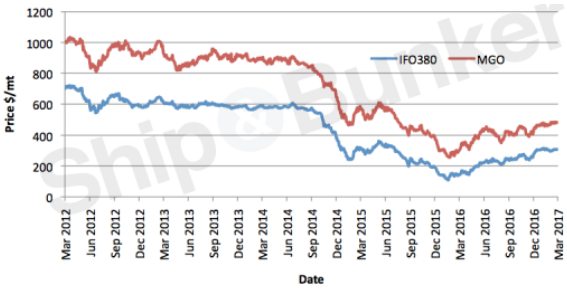
Unni Einemo, IMO representative, media and communications manager, International Bunker Industry Association (IBIA), warned that the global sulphur regulation is "not step changes but brutal changes", requiring "paradigm shifts on ship engines" that are designed to run on HFO.

"We are looking at a virtually overnight shift from 3.5% fuel sulphur content to 0.5%. There is a real risk that the change would cause a period of severe product shortages and inflated prices," she said.

Moreover, the production and supply of up to 3.5% sulphur marine fuels would need to continue until the day before the 0.5% requirement kicks in, and immediately demand for HFO will shrink dramatically the day after, creating a never before known situation of severe supply/demand mismatch.

Einemo said the transition from 3.5% to 0.5% is "not as easy as flicking a switch" as she highlighted the near-impossible undertaking for global refining to switch production overnight, the need for huge logistics involving transport between refineries, storage and delivery vessels, and the massive work for ships to clean out fuel systems to avoid sulphur contamination.

Rotterdam bunker prices – IFO380 vs MGO source: Ship & Bunker



Analyst Wood Mackenzie suggested that the shipping industry would need to fork out an additional $60bn annually by 2020, based on an expected rise in MGO and ULSFO demand and their premiums over HFO.

According to data from specialist bunker news and price provider Ship & Bunker, the premium of MGO over 3.5% sulphur 380 cst in Rotterdam, for example, has averaged $255 per tonne over the last five years between 1 March 2012 to 1 March 2017. At present, shipping is consuming around 3.2m barrels per day (bpd) of HFO and 700,000-800,000 bpd of MGO. From 2020, this proportion will change to 700,000 bpd of HFO and 3.4m bpd of MGO.

Sushant Gupta, director - Asia Pacific, refining and chemicals research, Wood Mackenzie, noted that switching to the use of the compliant low sulphur products is a costly solution for shipping, hence the industry will try to pass the cost to consumers and freight rates from the Middle East to Singapore could increase by up to $1 a barrel.

Higher bunker bills, on the other hand, may make the installation of scrubbers a more attraction solution as the price differential between low sulphur fuels and HFO would widen and consequently the scrubber repayment period would be quicker.

What it means for the refiners

It is without doubt that the 0.5% sulphur rule will have huge implications for the global refining sector in terms of refinery configuration and operations. Simple refineries that produce a substantial share of their crude run into HFO may face margins pressure, while complex refineries may potentially boost margins with a larger production of low-sulphur products.

The International Energy Agency (IEA) mentioned that by 2020 the price of fuel oil is expected to drop in tandem with demand. This will in turn put pressure on (fuel oil) cracks and simple refineries with high fuel oil yields. On the other hand, it could become more attractive to modern, complex refineries who have the secondary units capable of upgrading fuel oil into higher value lighter products.

The IEA stated: "Global refiners will be put under enormous strain by the shifting product slate. If refiners ran at similar utilisation rates to today, they would be unlikely to be able to produce the required volumes of gas oil. If they increased throughputs to produce the required gas oil volumes, margins would be adversely affected by the law of diminishing returns. In order to increase gas oil output, less valuable products at the top and bottom of the barrel would be produced in tandem, which would likely see cracks for these products weaken and weigh margins down."

The world's three leading oil majors – BP, ExxonMobil and Shell – have not mentioned anything on a mass production of 0.5% blends, neither have they announced commitments to invest in reconfiguring their crude runs on a global scale to produce 0.5% fuels. "At present, we have not heard of new refinery investments announced as a result of this regulation. It is too early to have that, as IMO's decision in July will influence many of these uncertainties," said Serena Huang, research analyst-downstream, Asia Pacific, Wood Mackenzie.

In general, oil majors and refiners are looking to support the shift in bunker fuel demand arising from the new sulphur regulation in various ways. Firstly, refiners can increase ULSFO production by extracting low sulphur fuel oil streams that are currently blended into LSFO or HSFO to be made available to the market as ULSFO. ExxonMobil, for instance, has launched a relatively new product, Heavy Distillate Marine ECA 50 (HDME 50), that can be handled onboard like HFO and has only 0.1% sulphur content.

Secondly, refiners in general have an issue of managing their surplus residue. "In some instances, exploring residue destruction investments may make sense, but this option comes with higher risk on returns of investment, as gas oil demand is predicated on shippers' uptake of alternative options such as scrubber installation and LNG bunkering," said Huang.

Thirdly, refiners can raise LNG bunker supplies in major bunkering hubs. In Singapore, Shell and ExxonMobil are working with Maritime and Port Authority of Singapore (MPA) to supply LNG as fuel. In Rotterdam, Shell this year launched a LNG bunker tanker to supply LNG from Rotterdam's Gate Terminal.

Shipping options

4A) Abatement technology

The use of exhaust gas cleaning systems, also known as scrubbers, is a commercially available option for the shipping industry. Ships installed with scrubbers mean they can continue to burn high-sulphur bunker fuel from 2020 and comply with the 0.5% sulphur limit.

The abatement technology works by spraying alkaline water into a vessel's exhaust to remove sulphur and other unwanted chemicals, either via open-loop system, closed-loop system, or hybrid (open-and-closed loop) system.

The use of scrubbers will enable the eradication of almost all the harmful emissions from ships, with major scrubber manufacturers like Alfa Laval, DuPont and Wartsila having systems that eliminate 97-98% of sulphur oxides (SOx) and 70-80% of particulate matter (PM), which makes up most of the visible smoke.

Despite an initial hefty investment ranging from $5m to $10m per vessel, depending on the number and capacity of the main engines, installing scrubbers can potentially be an economically attractive option, according to Wood Mackenzie. Shipowners can expect a high rate of return of between 20-50% depending on investment cost, MGO-HFO price spread and ships' fuel consumption.

The uptake of scrubbers could be limited by access to finance, scrubber manufacturing capacity, drydock space and technological uncertainties. Wood Mackenzie forecast that the retrofitting or installation of scrubbers will not pick up substantially until 2020 while McQuilling Services noted that players with difficult access to financing for a scrubber can look to potential cooperation with trading companies as alternatives to banks and investors. The availability of dry-docking space at shipyards is definitely an issue if a large number of ships are sent for scrubber retrofit work.

4B) LNG

The viability for ships to burn LNG as fuel depends very much on the availability of a worldwide network of LNG bunkering infrastructure, which to-date is severely underdeveloped. Global LNG bunkering infrastructure is considered to be at an infant stage today, as most LNG-powered ships are mainly coastal vessels limited to European waters, and major bunkering ports in the world have yet to develop full-scale LNG bunkering facilities.

There continues to be interest in some countries such as Singapore, Japan and the Netherlands in pursuing the development of LNG bunkering infrastructure. But there has not been any indication that developments will blossom to a global scale to offer any real change for LNG to become a viable option come 2020.

The LNG option in itself is facing a 'chicken and egg' situation. There is a need for demand to increase in order to generate greater supply, but the same is true vice versa. LNG as bunker fuel continues to face issues such as the need for increased and dedicated storage space, a gap in supply chain logistics, and requirements for costly modifications to existing port infrastructure. Additional costs to carry out LNG bunkering include delivery of the clean gas to the import terminal, breakbulk charges, the need for shuttle vessels delivering to LNG bunker tankers, and the fee of bunker tanker delivering LNG fuel ship-to-ship. Moreover, there is the unforeseen factor of fossil fuel prices, which have now fallen and making the economic business case for LNG less attractive.

Another dampener is the retrofitting of ships to burn LNG as it is a sophisticated, complex operation that require modification of existing engines or addition of gas tanks, as well as the huge cost of fitting LNG tanks and gas piping systems. The LNG option makes more sense for newbuilds rather than conversions of existing ships. On top of these, a good-sized LNG bunker tanker costs $60-80m to build, vastly more expensive than a fuel oil barge.

Last but not least, there is an absence of a global regulatory standard on LNG fuel propulsion. All the above factors make LNG as bunker fuel a distant option for shipowners.

Shipping options continued

4C) Compliant fuels

The most straightforward way for ships is to simply switch to burning MGO or ULSFO to meet IMO's sulphur limits. The operators will have to either absorb the cost of the higher fuels or pass it on to their customers whenever possible.

Baseload demand for fuel oil in Asia has already been steadily declining in recent years, falling by about 20% from 2011 to 2016. The HFO imports into Asia – mainly Singapore, China and Japan - averaged about 6.92m tonnes each month last year, down from the monthly average of about 8.5m tonnes between 2011 and 2012.

Operators can procure the ULSFO of 0.1% maximum sulphur content, a grade that already exists and is used in the ECA zones as a cheaper alternative to MGO. The ULSFO is a category of fuel that sits between MGO and HFO. The ULSFO has lower sulphur content than HFO but higher viscosity and low volatility than MGO. The quality difference also means a price difference with ULSFO typically trading at $20 pmt or more discount to MGO in Rotterdam, according to Platts data.

In 2016, the use of ULSFO has risen by 9% year-on-year in the North Sea and ARA (Amsterdam-Rotterdam-Antwerp) region and inched up about 2% on a worldwide scale, according to data from Veritas Petroleum Services (VPS).

By 2020, there will be around 900,000 bpd of ULSFO made available to the market by various stream optimisation, according to Huang of Wood Mackenzie. "In case there is a hard deadline from IMO in 2020, we expect the MGO demand could increase from 1.3m bpd in 2019 to 3.4m bpd in 2020. This will be new demand from the marine sector and meeting the compliant fuels demand from the shipping sector will bring a big step-change for refiners. Refiners will be challenged to increase global refining run rates to unprecedented levels."

Wood Mackenzie expects a shift in bunkering locations starting 2020 based on compliant fuels availability, with Singapore potentially losing some of its market share to China as fuel buyers look for alternative locations that have a surplus of compliant fuels. China is anticipated to continue to hold ample MGO supply and will be well positioned to attract fuel buyers looking for MGO. Singapore, currently the world's largest bunkering port, will need to repurpose some storage tanks and other infrastructure to prepare for a shift from HFO to MGO bunkering.

Fuel usage 2014-2016: Worldwide vs North Sea & ARA

source: VPS

Conclusion

The shipping industry is faced with several options ahead of 2020 with no silver bullet solution.

If refiners indeed move to significantly restrict the sale of HFO as they see higher margins from selling MGO, ships fitted with scrubbers and potential scrubber users would be left wondering if there will be enough supply of HFO to use. The surge in use of MGO will then lead to the question of what how will refiners deal with all the surplus of HFO which is a natural by-product of the cracking process. The double-edge sword is that refiners also worry that any extra production of MGO would go unsold if more ships continue to equip themselves with scrubbers and seek to purchase the less costly HFO.

Refiners are certainly not taking the plunge first by making huge investment costs to change production configurations, while most shipowners are adopting a wait-and-see approach as they consider the options before them. It is a dilemma for the parties involved.

All the different options will be assessed by all the involved parties and they will have to choose one that they consider the most cost effective, suitable for their operations, and commercially sustainable for the long term.

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