

COMMENTARY



**2020
EMISSIONS
REGULATIONS**

A Storm Brewing
for Global Shipping

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The shipping industry, oil refiners and commodity traders will all be impacted by the new IMO sulphur emission regulations that come into effect in 2020. In this article we summarise key aspects of the regulation, how it will affect the fuels supply chain and what actions need to be taken to prepare for the change.

Summary

- Stronger controls on the level of sulphur in vessel exhaust gases come in to effect on 1 January 2020. These controls could add \$40bn to the fuel bill of the world's merchant fleet, putting more pressure on an industry already struggling with excess capacity.
- The new regulations appear to have strong momentum and backing from the major flag states, the European Union (EU) and United States (US), but it is not yet clear how they will be enforced, especially in international waters.
- The whole fuels supply chain will be impacted, requiring refiners and traders to decide what types of fuel to supply, and shipping companies to decide what types of fuel to burn and how fast to switch.
- Each industry sector along the supply chain has a different perspective on how best to respond to the regulations, but willingness to commit investment is limited until the other parties reveal their hands.
- Securing the best outcome for all parties will require more coordination and commitment across industry sectors than has happened to date. Without momentum behind cross-industry solutions, there is a high risk that the transition to the new regulations will be volatile for all; mostly to the detriment of the merchant fleet, and potentially a missed opportunity for refineries.
- Careful planning and engagement is required to ensure that companies do not over invest to secure fuel supplies / ramp up production too early, or leave it too late to avoid being held to ransom or suffer from shortages / missed opportunities down the line.

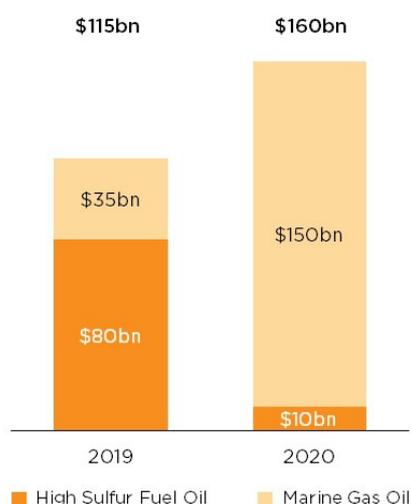
The Nature of the Regulatory Change

Environmental legislation for shipping is gradually catching up with other industries in limiting the level of pollutants in emissions. The UN body responsible for shipping standards, the International Maritime Organization (IMO), is pushing ahead to implement significantly strengthened emission controls. As of 1 January 2015, a cap of 0.1% on the sulphur content of shipping emissions came into effect in Emission Control Areas (ECAs) – coastal areas in North America and Northern Europe. On 1 January 2020 a reduction in sulphur emissions, from the current level of 3.5% to 0.5%, will come into effect for all international shipping outside ECAs.

While the introduction of the 0.1% sulphur emissions limit for ECAs represented a significant reduction in emissions, the volume of fuel burnt in ECAs made this a manageable change. The global reduction to 0.5% sulphur emissions is significantly more material. Today c. 80% of the fuel that the world's shipping fleet burns is high sulphur (3.5%) heavy fuel oil (HSFO).

If ship owners were to switch to Marine Gas Oil (MGO), a proven distillate-based light fuel oil which complies with the new regulations, it would add c. \$45bn to the global merchant fleet fuel bill. In addition, MGO has a different flashpoint and viscosity to HSFO and requires design modifications and operational adjustments to ensure the safe and efficient operation of engines and equipment using MGO.

Estimated Fuel Cost Increase for the Global Shipping Fleet



Note: Assumes shift of 90% of HSFO to MGO and overall volume growth from 295 mMT to 300 mMT. Estimated 2019 and 2020 prices.

Source: Marakon analysis

The Regulations Have Momentum, but the Practicalities are Unclear

There is tacit support from all members of the IMO to push ahead with the new regulation and over 50% of members (representing c. 95% of the world's merchant fleet) have signed up. In addition, the US and EU have publically committed to enforcing the new regulations.

The main published studies (CE Delft, Ensys) into the feasibility of the regulations assume that vessel owners will comply. However the resources, technology and legal framework required to enforce the new standards, particularly in international waters, will take time to implement. Furthermore there is no guarantee that the regulations will be enforced with the same stringency and consequences in different states.

In the US, the ECA regulations have been adopted as part of Federal Law, and are likely to represent the strictest application of the new regulation, subject to the will of the new government. The Environmental Protection Agency works with the US Coast Guard to monitor compliance. If a vessel is found in breach of the regulation the owners can

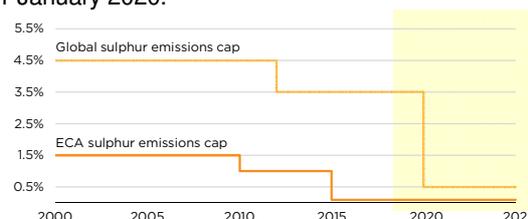
be prosecuted and the US Customs and Border Protection agency can detain vessels. Ultimately owners could face fines of up to \$250,000 and risk a prison term.

At a Glance: The IMO and the Regulation

The IMO is a specialised agency of the United Nations responsible for global standard-setting for safety, security and environmental performance of international shipping. Its main role is to create a regulatory framework for the shipping industry that is fair and effective, universally adopted and implemented. The IMO is funded by 170 + member states, primarily based on the tonnage of each state's merchant fleet. (The largest contributors are Panama, Liberia, Marshall Islands, Singapore and Malta.)

The prevention of pollution of the marine environment by ships from operational or accidental causes is covered by the MARPOL treaty. Annex VI of the treaty was adopted in 1997 to limit the main air pollutants contained in ships' exhaust gas. This includes sulphur oxides (SOx), nitrous oxides (NOx), and prohibits deliberate emissions of ozone-depleting substances (ODS). There are currently 86 member states signed up to Annex VI, representing c. 95% of the gross tonnage of the world's merchant fleet.

In 2010 the IMO adopted a revised MARPOL Annex VI with the aim of significantly strengthening the emission limits. This committed member states, who are signatories to Annex VI, to a progressive reduction globally in emissions of SOx, NOx and particulate matter, and the introduction of Emission Control Areas (ECAs) in designated coastal areas (Baltic Sea, North Sea, North American coast, and United States Caribbean Sea). Ships trading in ECAs have had to use on board fuel oil with a sulphur content of no more than 0.10% since 1 January 2015. Outside ECA zones the global sulphur cap will be reduced from the current 3.5% sulphur cap to 0.50%, effective 1 January 2020.



In Europe the situation is more complex. As a whole, the EU has committed to strict enforcement of the new regulations, however the coordination of coast guard and environmental agencies across countries with territorial waters creates practical logistical difficulties. Overlay the different judicial regimes (criminal vs. civil) and the relative importance of shipping to each country's economy, and it's clear that the enforcement of the new regulation is unlikely to be homogenous.

In the flag states which represent the majority of the global merchant fleet (e.g., Panama, Liberia, Marshall Islands, Malta, The Bahamas), the situation is more complex. The flag state will be responsible for monitoring and enforcing compliance in international waters. However a lack of resources, technical challenges with monitoring compliance in international waters, and potential conflicts of interest from strict enforcement of the new regulations, means there are likely to be different levels of enforcement, at least initially.

Each Industry Sector Along the Supply Chain will be Impacted

Ship owners from containers, bulkers and tankers to passenger vessels will need to find solutions to comply with the new regulations. Refiners will need to adjust crude inputs and production to meet demand for lower sulphur fuels. Finally, fuel suppliers and traders will need to adjust the operating infrastructure to supply new fuels, and establish new supply routes that link refinery supply of compliant fuels with shipping demand.

Solutions for Shipping Exist, but are Largely Unproven

A full switch to MGO would be the most expensive outcome. There are three potential lower-cost alternatives: continue to burn HSFO but invest in on-board scrubber technology to clean emissions to the required standard; switch to a low-sulphur, heavy-fuel oil alternative; and convert to liquefied natural gas (LNG). However none of these are fully proven or likely to be available at scale by 2020.

On Board Scrubbers

On board scrubbers are unlikely to be widely adopted given the upfront capital required to purchase and fit the equipment as well as uncertainty around how the technology would work on large vessels. On paper, the economic case for large and newer vessels (with a longer lifespan to pay back the investment), looks compelling. However the case is predicated on significant future spreads between MGO and HSFO, and varies greatly depending on the type of scrubbing technology adopted (open vs. closed loop). Given the levels of uncertainty, the capital investment required and the need to schedule dry dock time for vessels, very few scrubbers are expected to be retro-fitted before 2020. The economic case may become more certain once the new regulations come into force, but it is more likely that scrubbers will be fitted to new vessels rather than retro-fitting the current fleet.

New Blended Fuels

A blended or straight-run, low-sulphur heavy fuel oil is likely to be the preferred choice for compliant fuels, providing stability and supply reliability issues can be resolved. However at current course and speed, it is not expected that low-sulphur heavy fuels will be a viable alternative at scale by 2020. Experience in the ECA zones has shown that straight-run, low-sulphur heavy fuels can provide a lower-cost, stable alternative to MGO, but requires collaboration between shippers, traders and refiners to get there. This is a fundamental shift away from a traditional procurement model and requires larger ship owners to move up the value chain and proactively build or access trading and manufacturing capabilities. The adoption of blended fuels will require corporate commitment and investment from cash-strapped owners, but has the potential to halve the incremental costs vs. moving to MGO.

Liquefied Natural Gas (LNG)

LNG will not be available at scale for 2020 due to the high cost of retro-fitting a vessel to use it, a lack of infrastructure to support refuelling ships, and no existing regulations on how LNG must be handled. The use of LNG as a marine fuel has been limited to date but an increasing number of vessel owners

are now exploring it. LNG exceeds all IMO emission standards and could be significantly cheaper than HSFO. However the cost of retro-fitting a vessel with LNG is in the tens of millions of dollars, so it is more likely to be seen as an alternative fuel for new ships. Finally, in order to be scalable, there needs to be considerable investment in purpose-built infrastructure as well as a new set of guidelines and regulations around the handling of LNG.

Non Compliance

While the emissions regulation is clear, there is still discussion around the transition and whether there will, in effect, be a grace period to comply. The logistics associated with the production and supply of new compliant fuels to the world's merchant fleet means the switch cannot happen overnight. Add to that the challenges of monitoring compliance on the open seas, a common enforcement framework and meaningful deterrent, and it is more likely there will be a gradual transition to the new regulations.

Large Refiners Can Adopt a “Wait and See” Approach While Smaller, Less Complex Refiners Have Difficult Investment Decisions to Make

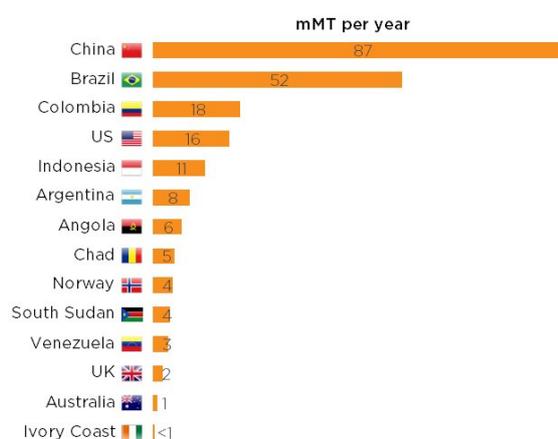
If the shipping industry switches from HSFO to MGO, it would require significant adjustments in the refining industry to meet demand for more distillate-based MGO and a reduction in output of fuel oil (HSFO). The official study commissioned by the IMO¹ concluded that, in theory, the refining industry can adjust. However, this assumes that the refining industry acts as one, and all planned investments to upgrade capacity comes on line, on time. This is in turn dependent on it making economic sense for refiners to invest in developing lower cost fuels for the shipping industry, when in fact the reverse is more likely

Major refineries that have invested in upgrading equipment (cokers, hydrocrackers and desulphurisation plant) can afford to adopt a “wait

and see” approach. High sulphur fuel oil represents a small proportion of output and is effectively a by-product of the refining process. A switch to marine gas oil in 2020 is likely to lead to a spike in gas oil prices and will benefit these refineries that are already set up to produce distillate-based fuel.

The choice for less sophisticated refineries that currently produce a higher proportion of HSFO is more difficult. With the shipping industry not investing in scrubbers, there is risk that HSFO prices collapse post 2020 in a compliant world. Therefore these refineries need to decide between investing in coking / cracking capacity, finding an alternative buyer for HSFO (e.g., in power generation), continuing to produce HSFO in the hope of a long transition period and eventual adoption of scrubber technology, or source low sulphur crudes to manufacture new, compliant fuels.

Low sulphur crude production by country



Note: 2015 crude production with a sulphur content <1.0%

Source: ENI World Oil and Gas Review 2016

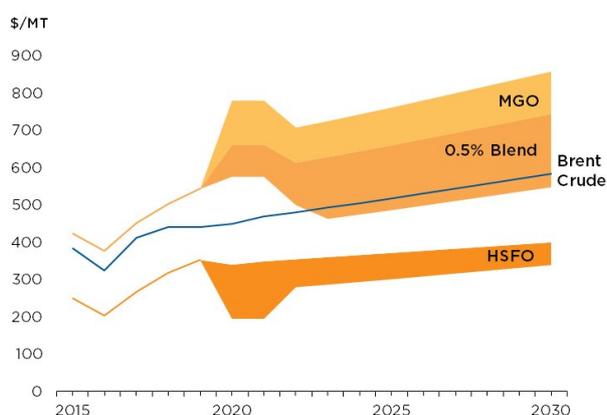
Given the uncertainty, there will inevitably be greater supply-demand mismatches within regions as refiners and ship owners navigate the new regulations. The fuel market will experience price volatility, creating opportunities for those with the physical assets to take advantage of dislocations in the market.

¹ “Assessment of Fuel Oil Availability”, prepared by CE Delft, Stratas Advisors, UMAS, NMRI, Petromarket Research Group, Shinichi Hanayama, July 2016, available at http://www.cedelft.eu/publicatie/assessment_of_fuel_oil_availability/1858.

Opportunities for Trading Houses with Physical Assets

A shift to a more distillate-based mix of shipping fuels has the potential to radically alter the global landscape of supply and demand. Investment in new infrastructure to accommodate a broader range of fuels and a new pattern of supply lines will need to be established. The nature of arbitrage and cargo opportunities post 2020 will be different, and will likely lead to more opportunities as the market transitions. For trading houses with infrastructure assets in the physical bunker supply and that are willing to invest, the new regulations are likely to represent a significant opportunity.

Illustration of future fuel price range



Source: World Energy Outlook 2016, Marakon analysis

For broad commodity traders, however, the new regulations will also put pressure on returns and change established patterns of trade. First, shipping costs will increase across the board, perhaps dramatically if the industry is slow to find / adopt low-cost solutions. Second, there is a risk that a lack of coordination around the transition could lead to issues with compliant fuel availability and added bureaucracy to secure exemptions for continuing use of high sulphur fuel, both of which increase costs and uncertainty for trading houses.

A Universal Transition Plan to Navigate the Uncertainty?

The IMO recognises the challenges and is seeking input from member states on how best to effect the transition. It is examining enforcement guidelines and management of exemptions, however there is no clarity around mechanisms to get ship owners, traders and refiners aligned on a common solution. The most likely outcome is a messy transition, with refiners, ship owners and enforcement agencies finding their own way toward full adoption of the new regulations.

The lack of certainty makes it difficult for refiners, ship owners and commodity traders to plan ahead and commit to marine fuel-related investments now. The sums are significant and the payback is long. The potential costs of over investing or investing too early vs. the competition, are significant. The prospect of being too late and risk exposure to significant increases in fuel costs, or the reputational risk and fines linked to non-compliance of a charter vessel, are real. Doing nothing is not an option.

Actions that refiners, ship owners and commodity traders can take

The actions that refiners, ship owners and commodity traders need to take will depend on individual starting points. However there are common actions to get prepared:

- Set up a systematic process to make decisions on how to respond to what will be a fluid transition e.g.,
 - Ensure alignment on the implications of the regulations and choices facing the business
 - Set up a regular forum with the key decision makers who will bring different lenses to the issues
 - Use scenarios to explore how best to respond in advance and speed up decision making
 - Systematically gather competitive intelligence in the lead up to 2020

- Make progress on “no regrets” actions e.g.,
 - Lock in agreements to match rateable demand with rateable supply i.e., construct physical solutions / partnerships that match 20/30/40% of demand with possible supply solutions
 - Set up JVs to test and establish stability of blended / straight-run fuels
 - Set up JVs to secure potential for reliable supply (i.e., tanks) in key ports that match with the rateable demand

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 - A better understanding of what drives client economics and value
 - Insight into changing industry dynamics and the context in which clients need to succeed
- A stronger management framework to generate better ideas and link decisions and actions to value
- A stronger organization with a more focused top management agenda and well-aligned resources
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