



IMO 2020

Understanding the potential impact of the maritime sulphur limit on aviation

Why should airlines care?

Starting January 2020, the new Marpol Annex VI fuel regulation (hereafter IMO 2020) comes into effect in the maritime industry. The regulation caps the sulphur content in bunker fuel to 0.5% for all commercial shipping vessels, down from current 3.5% (except for Emission Control Areas). The new limit, agreed in October 2016, represents an ongoing effort of the International Maritime Organization to protect the environment and reduce air pollution.

In 2018, the shipping industry used about 3.5 million barrels of high sulphur residual fuel (sulphur content >0.5%) per day, accounting for approximately half of global demandⁱ. Under the 2020 regulation, marine vessels will either need to install exhaust gas cleaning systems (known as scrubbers) or switch to low sulphur distillate fuels or low sulphur fuel oils. Some analysts worry that this demand shift for the compliant fuel will tighten supply in the middle distillates (refinery products with low sulphur content including diesel and jet fuel), causing product prices to spike. Since fuel consumption currently accounts for close to 25%ⁱⁱ of airline operating expenses, the potential jet fuel price increase might pose a risk for airline profitability and risk management.

What can we learn from history?

IMO 2020 is not the first limit that was passed by the International Maritime Organization (see Table 1). The very first regulation took an effect in July 2010 in more strictly controlled Emission Control Areas (ECA)¹ where the cap pushed fuel sulphur content down from 1.5% to 1.0% and then again to 0.1% in January 2015.

Table 1: Sulphur content regulations in bunker fuel

Global sulphur limits			
Worldwide (outside ECA)		Emission Control Areas (ECA)	
Date	Sulphur %	Date	Sulphur %
Prior to January 1st, 2012	4.50%	Prior to July 1st, 2010	1.50%
January 1st, 2012	3.50%	July 1st 2010	1.00%
January 1st, 2020	0.50%	January 1st 2015	0.10%

Source: International Maritime Organizationⁱⁱⁱ

The first global level regulation in the maritime industry came into force in 2012, when the sulphur content in bunker fuel was cut down from 4.5% to 3.5%. The fast approaching 2020 limit represents so far the most significant reduction in sulphur emissions. This raises concerns around whether the maritime industry and refineries worldwide can adapt fast enough to meet the newest regulation criteria.

Historical evidence gives reason for optimism. The 2015 regulation in ECA led to 0.1 million barrels per day (mb/d) shift from high sulphur residual fuel (HSFO) to diesel-based low sulphur marine gas oil (MGO), a change that did not lead to a significant supply shortage or price increase in the middle distillate market. However, this was largely a result of the small demand change limited to restricted geographical locations. On top of that, although the price difference between MGO and HSFO more than doubled as result of the regulation, a sharp decline in oil prices over the same period helped to offset the increase in spread^{iv}. However, the 2020 sulphur regulation might bring a different story, given that the sulphur cap will be global and stricter (3 percentage points cut in sulphur content in 2020 vs 0.9ppt in 2015). Moreover, refineries might use more crude oil to maximize middle distillate production, which could put upward pressure on its price^v.

What options do shippers have?

The 2020 fuel switch and thus the demand for the middle distillates will depend on what approach shippers choose to adapt to the new rule. The main options appear to be:

Q1: Switching from HSFO to more expensive low sulphur fuel

Instead of high sulphur fuel, ships can start burning more expensive MGO, new very low sulphur fuel oil (VLSFO) – blended from HSFO and MGO – or other low sulphur fuel blends. Another option is to use alternative fuels such as LNG which has, however, limited supply and infrastructure currently^{vi}. One of the main challenges associated with this option is a potential risk of engine malfunctions resulting from using unknown fuel blends as well as challenging cost recovery that stems from burning the more expensive low sulphur fuels^{vii}.

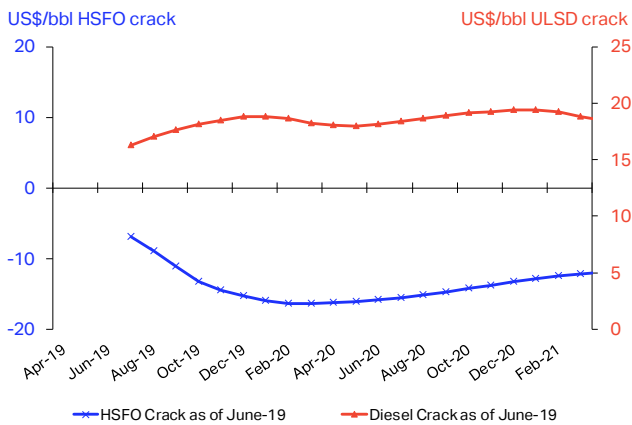
¹ Currently defined as Baltic Sea area, North Sea area, North American area, United States Caribbean Sea area ⁱⁱⁱ

Q2: Fitting exhaust gas cleaning systems (scrubbers)

Commercial vessels can also continue to use high sulphur fuel oil (HSFO) and process it through sulphur dioxide removing scrubbers. This option would lead to lower operating costs than using more expensive low sulphur fuels. Indeed, the current futures market (Chart 1) points to the HSFO crack spread² falling with January 2020 approaching, which indicates saving potential. (Notice that the middle distillate ultra low sulphur diesel (ULSD) crack spread moves in the opposite direction over the same period). That said, each scrubber costs roughly between US\$1 – 6 million based on the type^{viii}. Payback time will depend on the price difference between HSFO and low sulphur fuels, but based on available estimates, it might take about one to three years for shippers to recover the scrubber investment back^x. This represents a large-scale investment for owners of especially older ships that will need to be set aside in couple of years.

One of the main risks associated with scrubber fitting is that not all scrubbers might be accepted worldwide and that new – even stricter – regulation might come into effect in the future so that the scrubbers will not fit their purpose anymore. On top of that, although installing the scrubber takes only two to three weeks, the entire process including planning, design and scheduling will be much longer (up to 1 year^x). This might lead to delays in fitout and opportunity cost for a vessel.

Chart 1 – Futures market: High Sulphur Fuel Oil FOB ARA and ULSD Crack Spreads



Source: Thomson Reuters Eikon

About 4000 ships^{xi} are expected to get scrubbers by end-2020 out of ~60,000 commercial ships that travels international routes^{xii}; this means that less than 10% of global maritime fleet might be using HSFO in 2020.

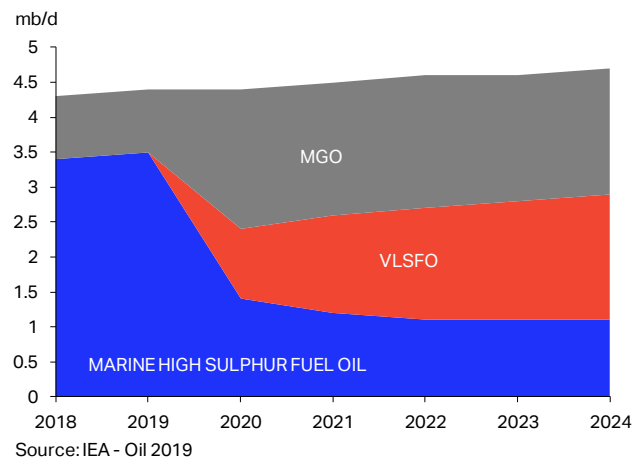
Option 3: Noncompliance with the sulphur content standard

Vessels can also choose to ignore the sulphur limitation and continue to use high sulphur fuel without scrubbers. The extent of noncompliance will depend on the low sulphur fuel availability, the price of alternative options, the nature and scope of enforcement (and punishment) as well as uncertainty about future IMO measures. Based on current rules, it will be flag and port states, not the International Maritime Organization, that will oversee the

control. The charges shall include detention of a ship and fines^{xiii}. Based on an estimate from early-2019, noncompliance is expected to be around 15% and is likely to gradually drop to zero by 2025^{xiv}. Ships can also submit a so-called Fuel Oil Non-Availability Report (FONAR) and explain why they had to use a non-compliant HSFO and what steps they took to obtain the <0.5% sulphur content fuel^{xv}. Although FONAR might seem as a 'go-around' procedure, the requirements to use this clause are strict and potentially hard to meet.

To sum up, with the currently low rate of scrubber adoption and low expected level of noncompliance, a majority of ships are likely to choose Option 1, that is to switch from high sulphur fuel oil to low sulphur fuels and thus increase demand for low sulphur middle distillates (mostly diesel-type products). As a result, around 3mb/d of bunker fuel demand might be impacted, a volume that is equivalent to the total consumption of every airline in Europe and the US combined (Aviation Fuel Forum, May 21st, 2019^{xvi}).

Chart 2: Projected marine demand split by type of fuel according to the International Energy Agency³



Source: IEA - Oil 2019

The estimates about the composition of the bunker fuel consumption in 2020 vary across the markets but generally MGO demand is expected to rise the most at the expense of HSFO in 2020, followed by VLSFO⁴ and blends made of available low sulphur fuel, middle distillates and HSFO. According to the International Energy Agency, MGO consumption will more than double in 2020 (Chart 2) – a major change compared to zero incremental estimated between 2018 and 2019^{xvii} – while production of cheaper VLSFO will increase from zero to about 1mb/d. By 2024, the two fuels are expected to have equal share on the bunker demand (~1.8mb/d)^{xviii}.

How will the jet fuel price react?

The large shift in bunker fuel demand is expected to have spillover effect to the aviation industry. There are currently two main scenarios on the table about the impact of IMO 2020 on jet fuel prices:

Scenario 1: Higher shipper demand for low sulphur distillate fuels will push refineries worldwide to use middle distillates such as diesel-based MGO, diesel (especially ultra-low sulphur diesel - ULSD) and jet fuel to blend down

² Crack spread: price difference between a barrel of refined petroleum product and crude oil

³ Does not include LNG, IEA scenario does not account for low sulphur fuel blends
⁴ Most likely blend of MGO and HSFO

HSFO and produce the compliant fuel. More diesel will be also needed to produce MGO. This will tighten supply in the middle distillate market, causing refinery margins – including jet fuel – to spike. Refineries with advanced processing flexibility could also decide to boost diesel yields at the expense of jet fuel production, adding extra risk of lower jet fuel supply on the global market^{xix}.

Scenario 2: Given the single process to produce refinery products, with more diesel distilled to satisfy the demand, more jet fuel will be produced, too. However, if the demand for jet fuel to blend down HSFO is low, it might lead to higher overall jet fuel supply in the market, which would lower prices^{xx}.

With IMO 2020 approaching, refineries seem to be increasingly ready for the 2020 bunker demand – major oil producers including Shell and BP announced plans to meet the 0.5% sulphur fuel demand but concerns remain about the availability of the low sulphur fuel at smaller ports^{xxi}. The IEA has predicted a shortage of 200,000^{xxii} barrels per day of the compliant fuel in 2020. According to the US CEA (Council of Economic Advisers), the shortage might reach up to 600,000 barrels per day^{xxiii}. Based on these predictions some tightening of the whole middle distillate market might be inevitable in 2020.

Indeed, looking at the futures market, the ultra-low sulphur diesel (ULSD) futures contract price moves higher towards January 2020. This could relate, at least in part, to IMO 2020 (Chart 1). If that is the case, given almost perfect correlation between the jet fuel and diesel price (Table 2) and the nature of the sulphur limit policy, it is natural to expect the jet fuel price to rally, too.

Table 2: Hist. correlation between petroleum products

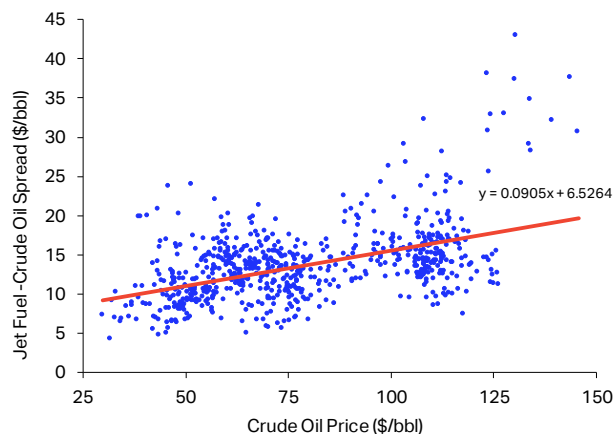
Correlation	Brent crude	Diesel	HSFO	Naphtha	Gasoline
Jet fuel	0.95	0.99	0.89	0.88	0.79

Source: citi^{xxv}, Jan 2000 - Jan 2019

The opinions regarding the extent to which jet fuel price will rise over crude oil as a result of IMO 2020 are diverse. Given available estimates in the market, the U.S. Energy Information Administration expects the jet crack spread to increase to US\$17.62/bbl in 2020^{xxiv}. Citi research predicts the spread to rise up to US\$30/bbl globally between the end of 2019 and early 2020^{xxv}, while the forward curve points to a price between US\$18-19/bbl (Aviation Fuel Forum, May 21st, 2019^{xxvi}).

One way of getting insight about the impact of IMO 2020 on the jet fuel price is to look at the historical relationship between the price of crude oil and the jet fuel crack spread. Using weekly data between December 2005 and April 2019, there is a significant positive relationship between the two variables; if the price of crude oil per barrel increases by one dollar, the jet fuel crack spread rises on average by US\$0.09/bbl, everything else equal (Chart 3). This means that based on current future prices of US\$60-65 for a barrel of crude oil, we could expect the jet fuel crack spread (difference between price per barrel of jet fuel & crude oil) to hover around US\$12-13/bbl without any IMO 2020 effect.

Chart 3: Jet Fuel – Crude Oil Spread (2005-2019)



Source: Thomson Reuters Eikon

According to S&P Platts, the sulphur limit could add up to US\$7.0/bbl on top of the current crude oil price as refineries will need more oil to maximize middle distillate production^y. Using this estimate, this would move crude oil into the US\$67-72/bbl price territory in 2020 (other things unchanged). As a result, the model suggests the jet fuel crack spread could lift to US\$14-15/bbl⁵.

However, IMO 2020 is a unique event that is expected to bring an historically unmatched demand shift in the global oil market. This means that historical information might not be enough to estimate the overall effect of the limit on the jet fuel price. Indeed, the available market predictions forecast the jet fuel crack spread above the historical maximum for the US\$60-75/bbl crude oil price range⁶.

Nevertheless, it is important to keep in mind that the demand for middle distillates is generally highly correlated with the state of global economy. If the economic backdrop remains strong in 2020, demand from the transport industry will remain robust, accelerating any shortages in the middle distillate market (as bunkers will compete for middle distillates with other modes of transport). By contrast, with weaker than expected economic growth and potential escalation in trade tensions, demand would ease, limiting the upward pressure on prices stemming from the new regulation. Given current market economic indicators, it is widely believed that the global economy may have passed its peak in this economic cycle. That is said, recession is not yet expected for the next year.

Concluding comment

To sum up, there is still considerable uncertainty about how exactly IMO 2020 will impact the oil market. However, current indications are that there could be middle distillates shortage if the economic backdrop remains solid. In turn, this could result in the jet fuel crack spread widening. As fuel is airlines' largest expense, they should be prepared for this IMO 2020 risk and ensure it is incorporated in their broader risk management strategies.

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 4th July 2019

⁵ 95% confidence level is used in the analysis

⁶ For 97% of the cases, Dec 2005 – Apr 2019 weekly data

ⁱ McKinsey & Company, 'IMO 2020 and the outlook for marine fuels', September 2018. <https://www.mckinsey.com/industries/oil-and-gas/our-insights/imo-2020-and-the-outlook-for-marine-fuels>

ⁱⁱ IATA, 'Economic Performance of the Airline Industry', 2 June 2019.

ⁱⁱⁱ International Maritime Organization, 'Sulphur oxides (SOx) and Particulate Matter (PM) – Regulation 14', undated.

[http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Sulphur-oxides-\(SOx\)-%E2%80%93-Regulation-14.aspx](http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Sulphur-oxides-(SOx)-%E2%80%93-Regulation-14.aspx)

^{iv} International Bunker Industry Association, 'Transition to the global 0.50% cap – should we act to avoid chaos?', 22 June 2016. <https://ibia.net/transition-to-the-0-50-global-sulphur-cap-tell-us-what-you-want-ibia-to-do/>

^v Platts, 'Turning tides, The future of fuel oil after IMO 2020', February 2019.

https://s3-ap-southeast-1.amazonaws.com/sp-platts/IMO_20190207.pdf

^{vi} Hellenic Shipping News Worldwide, 'IMO 2020: Ready or not?', 6 May 2019.

<https://www.hellenicshippingnews.com/imo-2020-ready-or-not-2/>

^{vii} S&P Global Platts, 'How will shipping cope with fuel bills from IMO 2020?', May 2019.

<https://www.spglobal.com/platts/plattscontent/assets/files/en/specialreports/shipping/imo-2020-shipping-fuel-bills.pdf>

^{viii} Reuters, 'Shippers scramble to install sulphur filters ahead of rule change', 16

October 2018. <https://www.reuters.com/article/us-oil-shipping/shippers-scramble-to-install-sulphur-filters-ahead-of-rule-change-idUSKCN1MQ28U>

^{ix} PacificGreen Technologies Group, 'Fitting Exhaust Gas Scrubbers In Time For 2020 – Has That Ship Sailed?', 28 January 2019.

<http://www.pacificgreentechnologies.com/articles/fitting-scrubbers-in-time-for-2020-has-that-ship-sailed/>

^x Reuters, 'INTERVIEW-Sulphur scrubbers "no silver bullet" for shipping industry - Wartsila', April 2018. <https://www.reuters.com/article/shipping-fuels-scrubbers/interview-sulphur-scrubbers-no-silver-bullet-for-shipping-industry-wartsila-idUSL8N1RU63B>

^{xi} Reuters, 'Big oil traders set to cash in on shipping fuel overhaul', 2 November 2018. <https://www.reuters.com/article/us-commodities-summit-imo/big-oil-traders-set-to-cash-in-on-shipping-fuel-overhaul-idUSKCN1N70QD>

^{xii} Reuters, 'New fuel rules push shipowners to go green with LNG', 16 August 2018. <https://www.reuters.com/article/uk-shipping-fuel-lng-analysis/new-fuel-rules-push-shipowners-to-go-green-with-lng-idUKKBN1L10IT>

^{xiii} Reuters, 'Factbox: IMO 2020 - a major shake-up for oil and shipping' 17 May 2019. <https://www.reuters.com/article/us-imo-shipping-factbox/factbox-imo-2020-a-major-shake-up-for-oil-and-shipping-idUSKCN1SN2BX>

^{xiv} Hellenic Shipping News Worldwide, 'IMO 2020: Ready or not?', 6 May 2019. <https://www.hellenicshippingnews.com/imo-2020-ready-or-not-2/>

^{xv} International Bunker Industry Association, 'Some unresolved issues remaining around IMO 2020 non-availability situations', 13 March 2019 <https://ibia.net/some-unresolved-issues-remaining-around-imo-2020-non-availability-situations/>

^{xvi} Aviation Fuel Forum, Athens, Greece, 'Joint Session – Ask the Experts, Patrick Callan', 21 May 2019.

^{xvii/xviii} International Energy Agency, 'Oil 2019', undated.

<https://www.iea.org/oil2019/>

^{xix} gCaptain, 'Shipping's 2020 Low Sulphur Fuel Regulation to Hit Airlines', 11 June 2018. <https://gcaptain.com/shippings-2020-low-sulphur-fuel-regulation-to-hit-airlines/>

^{xx} Reuters, 'Factbox: IMO 2020 - a major shake-up for oil and shipping', 17 May 2019. <https://www.reuters.com/article/us-imo-shipping-factbox/factbox-imo-2020-a-major-shake-up-for-oil-and-shipping-idUSKCN1SN2BX>

^{xxi} Reuters, 'Oil traders wait to assess impact of IMO regulations: Kemp', 27 March 2019. <https://www.reuters.com/article/us-shipping-imo-kemp/oil-traders-wait-to-assess-impact-of-imo-regulations-kemp-idUSKCN1R81NO>

^{xxii} U.S. Energy Information Administration, 'This week in Petroleum', 30 January 2019. https://www.eia.gov/petroleum/weekly/archive/2019/190130/includes/analysis_print.php

^{xxiii} citi, 'IMO 2020 – Equity/Commodity View', 28 February 2019.

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