

【欧州】【海事】

Maritime Issues –Internal regulation of gas emissions/Utilisation of drone: The preparation for compliance with the new 2020 global sulphur limit and RPAS for monitoring compliance in EU waters

Andrea Antolini Former Researcher JTTRI

【概要 : Summary】

As of 1 January 2020, a new global sulphur limit of 0.5% m/m (mass by mass) will be introduced for all areas outside emission control areas (ECAs) or sulphur emission control areas (SECAs). This will result in a stricter sulphur limit for the marine fuels and will reduce their sulphur content from the currently permitted 3.5% to 0.5% m/m. There are only few months left until the new regulation of the International Maritime Organisation (IMO) based on the IMO Marpol Annex VI regulation on limiting sulphur content of bunker fuel will come into effect. The global fuel sulphur cap is part of the IMO's response to reduce the environmental impact of maritime transport and the 2020 deadline for the introduction of the new sulphur limit was confirmed at the IMO's 70th session of the Marine Environment Protection Committee (MEPC) in October 2016. The new global 0.50% sulphur limit on the sulphur contents of ships' fuel oil is expected to greatly benefit the environment and human health. However, also the delivery of compliant fuels by suppliers and the provisions and information concerning safety implications regarding the use of low-sulphur fuel oil have to be adhered. The IMO is currently discussing how to identify any potential safety issues related to new blends of fuel oil with compliant sulphur contents, as there could arise problems regarding the fuels' compatibility and stability. If needed, additional guidance for ship

owners and ship operators could be developed. While the introduction of the new global 0.5% sulphur limit puts ship owners and operators under pressure to consider their options for complying with the IMO regulation, also refiners of marine fuels have to consider issues related to the production of low-sulphur fuel. For both parties, it will become an unprecedented change in the marine fuels' supply and utilisation. Furthermore, the compliance with the new sulphur limit needs to be controlled. In the EU, in order to improve maritime surveillance capabilities the European Maritime safety Agency (EMSA) has introduced new RPAS services to assist the marine surveillance operations and to support the EU Member States' authorities involved in Coast Guard functions. These RPAS services are of high importance in connection to the inspection of vessels in EU Member States in order to prove their compliance not only in SECAs but also in EU waters outside SECAs once the global sulphur cap comes into force in 2020.

【記事 : Article】

1. IMO's preparation for the introduction of the new global sulphur limit 2020

Considering the energy efficiency of different modes of transport, maritime transport by ships is by far the most energy efficient mode, compared to aviation, road trucks and even railways on tonne/km basis. The main type of marine fuel is "bunker" oil or heavy

fuel oil, derived as a residue from crude oil distillation. Crude oil contains sulphur and following combustion in the engine, the sulphur ends up in ship emissions. These sulphur emissions are harmful to human health and to the environment in the form of acid rain and contribute to the acidification of the oceans. Therefore, limiting sulphur emissions and in particular SO_x emissions from ships will improve air quality and protect the environment. Under the IMO's "International Convention on the Prevention of Pollution from Ships", MARPOL 73/78, the 1997 MARPOL Protocol and the new Annex VI, Sulphur Emission Control Areas (SECAs) and Emission Control Areas (ECAs) for SO_x, NO_x and PM were introduced to minimize airborne emissions from ships in specified areas. Since 1 January 2015, the limits were further reduced in ECAs/SECAs to a new 0.1% sulphur limit for marine fuels. Furthermore, the IMO adopted the new general 0.5% sulphur limit for all regions outside ECAs/SECAs as of 1 January 2020.

In October 2018, the MEPC 73 invited the Maritime Safety Committee (MSC) at its 100th meeting in December 2018 to consider the outcome of the Intersessional Meeting regarding the safety implications associated with the use of low-sulphur fuel oil. At present, the minimum 60° C flash point limit for marine fuels is covered both under SOLAS and ISO 8217, which covers several other safety-related parameters. However, this has not prevented the circulation and delivery of fuels with non-compliant flashpoint.

Accordingly, the MSC 100 considered the submissions on the potential need for guidance and advice related to possible safety issues related to the implementation of the global 0.50% limit of the sulphur content of marine fuel oil. The MSC 100 agreed that a joint-MSC-MEPC circular should be issued on ensuring that fuel suppliers deliver compliant fuels. The circular should be developed by the Sub-Committee on Pollution Prevention and Response (PPR 6), with the aim to reach approval by the MEPC 74 and the MSC 101. The MSC 100 concluded that the fuel safety related issues should be carefully addressed but should not

affect the commitment to implement the new global sulphur limit on 1 January 2020. Finally, the MEPC 74 from 13 to 17 May 2019 is expected to finalise the IMO's response to some of the still unresolved questions related to the introduction of the 2020 global sulphur limit.

2. Issues related to the compliance with the new global sulphur limit

The maritime transport sector and its supply chain are facing several uncertainties related to the introduction of the new global 0.5% sulphur limit. While the industry is preparing for the introduction of the new global sulphur limit, there are still several compliance related issues to be considered and solved. The new legislation puts ship owners and operators under pressure, as they have to consider their options in order to comply with the 2020 sulphur limit. Also refiners have to meet a possibly higher demand of low-sulphur fuel. For both parties, suppliers and consumers, it will be an unprecedented change.

2.1. The ship owners' preparation

Since 2015, the shipping industry has already to comply with the existing 0.1% sulphur cap in designated ECAs/SECAs, while from 1 January 2020 onwards it will also have to deal with the 0.5% sulphur limit in marine fuel at global level. The new sulphur limit puts the ship owners and operators at a challenge, as they will have to find a fuel solution for their vessels, considering their options including the costs and market implications. Since the low-sulphur fuels cost more, ship owners and operators have to find the least costly solution in their individual case. In order to assist ship operators and owners, the MEPC has approved guidance on ship implementation planning as part of a set of IMO guidelines for consistent implementation of the new global sulphur limit.

There are mainly three options ship owners could choose regarding the implied financial and operational advantages and disadvantages. They could

install exhaust gas cleaning systems (scrubbers) on their ships, buy compliant fuels at higher costs or they could retrofit their ships to run on liquefied natural gas (LNG). However, this involves high costs of retrofitting or replacing the entire vessel. Furthermore, alternative fuel types other than LNG could also meet the sulphur limit requirements, such as methanol or hydrogen, some biofuels as well as synthetically manufactured fuel oils.

According to a 2018 survey by maritime consultants Drewry, 66% of ship operators are expected to opt for low-sulphur fuels. However, also this solution comes at a price, as low-sulphur fuel costs around EUR 250 more per tonne than standard heavy fuel oil. This price could also increase further depending on the increasing demand in or after 2020. The option of purchasing a LNG-ready ship is the preferred option of 24% of ship operators. Some companies are converting their existing vessel fleet, such as Hapag-Lloyd, which stated it planned to convert 17 vessels to LNG. Maersk also seems to consider to converting existing ships. In mid to long term, it can be expected that the purchase of LNG-fuelled ships will be an increasingly popular option when end-of-life ships need to be replaced by new ships.

The Consultancy Rystad Energy estimates that by the end of 2020 there will be around 2,800 scrubbers installed consuming 690,000 (barrel per day, bpd) of high sulphur fuel oil (HSFO). Furthermore, non-compliance could lead to additional 860,000 bpd of HSFO demand in 2020. This will come from areas where compliant fuel will not be readily available, or areas with low monitoring, according to Rystad Energy.

In any case, the ship owners will have to make a strategic choice regarding the utilisation of marine fuel or other alternatives, considering the age of their vessels, trading routes and locational availability of low-sulphur fuels, among others.

2.2. Challenges for refiners to produce compliant fuels

Ahead of the decision to introduce the new sulphur limit in 2020 or 2025, the IMO had commissioned a

review to assess the availability of sufficient compliant fuel oil to meet the 2020 deadline. The independent Dutch research and consultancy organisation CE Delft analysed the question in a study to determine the capacity projections for the oil refineries around the world and how much fuel with less than 0.5% sulphur could be produced for ship-owners' use. The study also considered the shipping fuel's requirements. The study's main analysis focused on the question whether refinery capacity could meet the demand for low-sulphur marine fuels by 2020. The CE Delft study came to the conclusion that there could be sufficient refining capacity to meet the demand for low-sulphur compliant bunkers by 2020.

The High sulphur fuel oil (HSFO) currently represents nearly 80% (approx. 3.84 million barrel per day, bpd) of the 5.0 million bpd global bunker demand and will become non-compliant in 2020. Now, only months ahead of the introduction of the new global sulphur limit, it is difficult for refiners to commit on how much to produce as buyers do not know how much will be needed. The refiners are not regulated by IMO and have a commercial interest to meet the demand by changing their production configuration. As a result, the Consultancy Rystad Energy has estimated that the IMO's 2020 new global sulphur limit could cause a deficit of 600,000 barrel per day (bpd) of marine gasoil in 2020. The share of very low-sulphur fuel oil (VLSFO) and other compliant fuel oil blends could be low, because ship owners seem to be reluctant to adopt the new fuel immediately. This seems to be due to uncertainties also regarding the compatibility of low-sulphur fuel oil offered at different ports. The Consultancy Rystad Energy estimates that around 700,000 bpd of VLSFO would be available in 2020, rising to 1.3 million bpd in 2025.

The first oil firm to be ready to supply 2020-compliant marine fuel seems to be Petrobras, which has just produced and supplied its first batch of compliant fuel. The fuel oil was produced in the 45,000 bpd Isaac Sabba Refinery in Manaus, Brazil. According to Petrobras, it has 0.34% sulphur content,

viscosity of 323cst at 50° C, and density of 932.7 kg/m³ at 15° C. 618t of this compliant marine fuel was supplied on 21 April 2019 to a vessel. Also other Petrobras Brazilian refineries are testing the production of IMO 2020-compliant marine fuel. In preparation for the new global sulphur limit in 2020, Shell Marine has also introduced a new oil type, specifically for use with engines running on 0.5% sulphur content or VLSFO. Shell Marine expects most of the world's shipping fleet will aim to comply with the new sulphur limit by switching to fuels with a sulphur content of 0.5% and below. The new product will be available for use in Singapore from 1 June 2019, and will be gradually introduced to other main supply ports within the Shell Marine global network including the US, China, United Arab Emirates, and the Netherlands before 1 January 2020. According to ExxonMobil's marine fuels venture manager Luca Volta, the industry, including all stakeholders suppliers, traders, consumers, port authorities, flag states, regulators, with interest in the shipping value chain industry, is making "significant progress" to prepare for the introduction of the new sulphur limit. Also some ports are offering more clarity to ship owners about the availability of the different types of compliant fuels. Accordingly, VLSFO, MGO, ULSFO, distillates, residual fuels with abatement technology, and alternatives such as LNG will all play a part to reach compliance with the 2020 rule, according to Volta.

Although, the necessary additional 600,000 bpd of marine fuel demand in 2020 could be met by blends manufactured from existing low-sulphur fuels, middle distillates and high sulphur fuel oil.

However, due to differences in the quality of otherwise compliant fuels, the low-sulphur fuels could separate or form sludge when they are mixed. Also viscosity differences could be vast, as the fuels could have much higher presence of substances or compounds or there could be questions regarding the impacts of mixing aromatic and paraffinic refinery streams. In the worst case mixed fuels could destroy the motor.

Therefore, the refining industry suggests ship owners and operators to clearly avoid mixing of different fuels, unless the refiners say otherwise. For example, ExxonMobil announced that its range of 0.5% sulphur marine fuel blends would be compatible with each other. This could lead to a situation in which due to the uncertainty regarding the compatibility of different fuels, ship-owners could end up willing to pay a premium for Exxon's products, which are compatible and available at a wide range of ports. Also Shell is conducting trials with new 0.5% sulphur fuels and customers in Rotterdam, Singapore and New Orleans. Nevertheless, uncertainty will still remain high among the ship owners or operators.

Therefore, some ship owners themselves have started to study their options for solving this brand-mixing problem in their own approach. The world's largest consumer of bunker fuel AP Moller-Maersk is planning to becoming a supplier of this own fuel products as it takes control of its supply chain ahead of the introduction of the 2020 sulphur limit. AP Moller-Maersk signed an agreement with New Jersey-based PBF Logistics in April 2019 to produce and store 0.5% sulphur bunker fuels both for its own needs and third-party customers on the east coast of the US. The agreement follows a similar agreement with Vopak in Rotterdam in August 2018, and it has also leased storage capacity in Singapore in October 2018.

3. Monitoring of compliance with drones in the EU

Although the IMO regulations on the 2020 global sulphur limit were announced more than three years ago, many shipping companies remain undecided on how best to meet them. In the EU, SO_x emissions from ships are regulated by Directive (EU) 2016/802 (Sulphur Directive). It transposes the IMO's limits on the maximum sulphur contents of gas oils, heavy fuel oil in marine fuels, including the global 2020 sulphur limit, into EU law. The Sulphur Directive also lays down the procedures regarding the mechanisms for monitoring compliance.

Monitoring, compliance and enforcement of the new

sulphur limit is the task of the respective national authorities of EU Member States that are Parties to MARPOL Annex VI. The owners of non-compliant vessels could face fines, or might even have their vessel declared unseaworthy. Refineries and blenders of marine fuel will also have to take over responsibility as they will need to certify that the fuels they are supplying meet the ISO 8217 specifications and the sulphur limit's requirements.

Already with the introduction of the 0.1% sulphur limit in SECAs in 2015, the compliancy of ship operators and owners with the sulphur limit had to be controlled. Besides several other methods, the utilisation of remotely piloted aircraft systems (RPAS), also called UAVs (unmanned aerial vehicles) or drones, was considered an option for individualising non-compliant ships in SECAs.

The monitoring of marine pollution requires day- and night-time operations. Therefore, the responsible authorities in EU Member States also use long endurance RPAS, which are equipped with appropriate sensors that allow an automatic observation pattern, navigation for target tracking and identification of potential polluters. Recently, the European Maritime Safety Agency (EMSA) announced that it has contracted more RPAS for being utilized by EU Member States for monitoring purposes of the vessels' emission monitoring. These contracts will provide increased maritime surveillance capabilities to European agencies and EU Member States within the context of their coast guard functions.

These RPAS use also gas sensors ("sniffers") to measure the amount of SO_x in a plume emitted by a ship. The sulphur emissions detecting drones are also equipped with cameras and infrared cameras that can photograph the ships both during the day and at night. The technology also includes an automatic identification system (AIS) receiver. In addition to this, the service will be developed so that flights can be monitored through the EMSA's RPAS data centre, offering users an online interface, which provides details on the drone's journey and measurements. The RPAS are used as a complementary tool in the

surveillance chain, which includes satellite imagery, vessel positioning information and surveillance by manned maritime patrol aircraft and vessels.

While EMSA has already been providing RPAS services since 2017, it has agreed on new contracts with RPAS providers in direct response to increased user demand for night and day maritime surveillance, oil spill detection, and gas sensors to measure SO_x in a plume emitted by a ship.

The EMSA recently announced that its service of RPAS is being utilized by Danish authorities to monitor vessel emissions. In Denmark, authorities have deployed a large sulphur-detecting drone to monitor compliancy for the sulphur content of marine fuel. Special UAS Skeldar V-200 drones equipped with sulphuric gas sensors are measuring in real-time the sulphur emission levels in the ship's exhaust plumes around the area of the Great Belt, where large vessels transit to and from the Baltic Sea. The first aerial sulphur emission inspection took place on a ship in this area on 11 April 2019. In the coming months, monitoring of the emissions from ships in Danish waters will continue to make sure the vessels' compliance with the current sulphur limit in European Emission Control Areas (ECA), limiting the amount of sulphur in marine fuel to 0.10%. The Danish Maritime Authority project will contribute to a more efficient enforcement of the sulphur rules, thereby ensuring fair competition for shipping companies and less pollution from ships. The EMSA's RPAS service can be expected to also monitor the ships' sulphur emissions limit compliance once the global sulphur limit will be introduced in 2020.

4. Conclusion

The introduction of the 2020 global sulphur limit will have a wide impact on the ship owners and operators as well as on the refiners regarding the utilisation and supply of the compliant marine fuels. Most studies on the future development of measures by ship owners to comply with the new 2020 global sulphur limit suggest that ship owners and operators will opt for the use of low-sulphur fuels with a sulphur content

of 0.5% and below, as ship engines can be switched to those fuels with minimal operational change and no significant costs or time out of service for the switch. Therefore, refiners will have to significantly expand their capacity of low-sulphur fuels. However, in mid-term, this switch will come at a price for the users, as even with no change in current pricing conditions, the change to marine gasoil would significantly increase fuel costs. Furthermore, it can also be expected that with the increased demand, the price level of low-sulphur marine fuels will rise. Furthermore, the option to retrofitting of vessels with scrubbers would allow shippers to continue to burn high-sulphur fuel oil (HSFO). However, besides the options of using low-sulphur fuels or retrofitting the vessels with exhaust cleaning systems, in the mid- and long-term, ship owners might opt for a switch to vessels with alternative propulsion like LNG, hydrogen, methanol or biofuels among others. The MEPC 74 will finalise the IMO's response to some of the unresolved issues regarding the implementation of the new 2020 global sulphur limit. Regarding the surveillance of compliancy, already today, RPAS monitor maritime pollution and emissions in order to control the vessel operators' or owners' compliancy with the sulphur limits. In the EU, in order to further improve maritime surveillance capabilities, EMSA has introduced more RPAS services to assist the EU Member States' authorities in their task to monitor emissions. In future, RPAS services can be expected to have an increasing importance for monitoring the vessels' emissions regarding their compliance with sulphur limits not only in SECAs, but also outside SECAs in the waters of EU Member States, once the global sulphur cap will come into force in 2020.

References:

Billing, Emily/Fitzgibbon, Tim/ Shankar, Anantharaman: IMO 2020 and the outlook for marine fuels. In: <https://www.mckinsey.com/industries/oil-and-gas/our-insights/imo-2020-and-the-outlook-for-marine-fuels>,

September 2018, retrieved 8 May 2019

Danish Maritime Authority: Sulphur-sniffing drone to patrol Danish waters. In:

https://www.dma.dk/Presse/Nyheder/Sider/_-Sulphur_sniffing-drone-to-patrol-Danish-waters-.aspx, 12 April 2019, retrieved 29 April 2019

Directive (EU) 2016/802 of the European Parliament and of the Council of 11 May 2016 relating to a reduction in the sulphur content of certain liquid fuels. In: OJ L 132, 21.5.2016, p. 58-78,

<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32016L0802>, retrieved 10 May 2019

Dogan, Duygu: So long Sulphur emissions: navigating the new IMO regulations. In:

<http://www.mondaq.com/turkey/x/803880/Marine+Shipping/So+Long+Sulphur+Emissions+Navigating+The+New+IMO+Regulations>, 30 April 2019, retrieved 8 May 2019

gCaptain: Sulphur-Sniffing Drone to Sniff Out Polluters in Danish Waters. In:

<https://gcaptain.com/denmark-sulphur-limit-drone/>, April 15, 2019, retrieved 29 April 2019

<http://www.imo.org/en/mediacentre/hottopics/pages/sulphur-2020.aspx>, retrieved 7 May 2019

IMO 2020 - A Breath of Fresh Air - In:

<http://www.imo.org/en/mediacentre/hottopics/pages/sulphur-2020.aspx>, retrieved 7 May 2019

IMO: Frequently Asked Questions. The 2020 global sulphur limit.

In: <http://www.imo.org/en/MediaCentre/HotTopics/GHG/Documents/2020%20sulphur%20limit%20FAQ%202019.pdf>, retrieved 7 May 2019

IMO's sulphur regulation to result to deficit of marine gasoil in 2020. In:

<https://safety4sea.com/imos-sulphur-regulation-to-result-to-deficit-of-marine-gasoil-in-2020/>, 05/04/19, retrieved 7 May 2019

Jallal, Craig: Managing the 2020 sulphur cap transition.

Smallbone, Sammy Christopher: Guidance on preparing for IMO 2020. In:

https://www.mpropulsion.com/news/view/managing-the-2020-sulphur-cap-transition_57484.htm, 12/04/2019, retrieved 8 May 2019

Kesteloo, Haye: Denmark to deploy drones to detect shipping

sulphur emission levels. In:

<https://dronedj.com/2019/04/19/denmark-drones-shipping-sulphur-emission-levels/> Apr. 19th 2019, retrieved 29 April 2019

Lee Hong Liang, What you need to know: The 2020 IMO fuel sulphur regulation. In:

http://www.seatrade-maritime.com/images/PDFs/SOMWME-whitepaper_Sulphur-p2.pdf, retrieved 7 May 2019

Mason, Chris: Denmark Launches Sulphur Inspection Drones.

In: https://www.porttechnology.org/news/denmark_launches_sulphur_inspection_drones, 15 Apr 2019, retrieved 29 April 2019

Oil firms struggle to meet IMO 2020 clean fuel for ships.

In: International Shipping News, 06/05/2019,

<https://www.hellenicshippingnews.com/oil-firms-struggle-to-meet-imo-2020-clean-fuel-for-ships/>, retrieved 7 May 2019

RPAS drones now monitoring ship emissions in Danish waters.

In: <http://www.emsa.europa.eu/news-a-press-centre/external-news/item/3513-rpas-drones-now-monitoring-ship-emissions-in-danish-waters.html>, retrieved 7 May 2019

Rystad Energy: What Is The IMO 2020 Effect On The Fuel Bunker Mix Short- And Long Term? In:

<https://www.rystadenergy.com/newsevents/news/press-releases/What-is-the-IMO-2020-effect-on-the-fuel-bunker-mix-short-and-long-term/>. 05/04/2019, retrieved 7 May 2019

Sea News, April 4. In:

<https://seanews.co.uk/safety-regulations/imo2020/shipowners-refiners-at-odds-over-imo-fuel-quality/> retrieved 7 May 2019