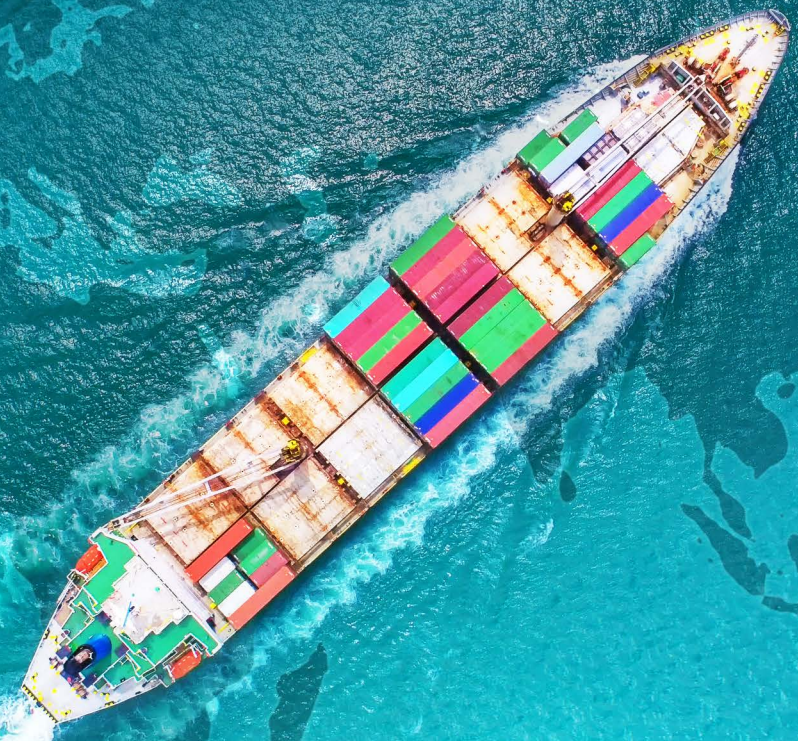


Designed by Redbean Da Pire Ltd

IMO 2020 SULPHUR LIMIT

A Guide For Singapore-Registered Ships



The contents of this guidebook is correct as of the date of printing. For updated version of the guidebook, you may scan or click on the QR code on the left. It will be in PDF format.



Part of:



BACKGROUND ON IMO 2020 SULPHUR LIMIT

On October 27, 2016 the International Maritime Organisation (IMO) decided that the Sulphur Limit under MARPOL Annex VI would enter into force on January 1, 2020.

IMO is a specialised agency of the United Nations, responsible for the safety and security of shipping and the prevention of marine pollution by ships. The International Convention for the Prevention of Pollution from Ships (MARPOL), developed by IMO, is one of the most important international marine environmental conventions. It aims to preserve the marine environment by minimising pollution of the oceans and seas. MARPOL Annex VI was adopted in 1997 and took effect in 2005 to address air pollution from shipping.

In October 2008, MARPOL Annex VI was amended to reduce the sulphur content limit of marine fuels. The reduced sulphur content limit permissible for marine fuel is as follows: The sulphur content of any fuel oil used on board ships shall not exceed the following limits:

- 4.50%*m/m* prior to 1 January 2012;
- 3.50%*m/m* on and after 1 January 2012; and
- 0.50%*m/m* on and after 1 January 2020.

While ships are operating within an emission control area (ECA), the sulphur content of fuel oil used on board ships shall not exceed the following limits:

- 1.50%*m/m* prior to 1 July 2010;
- 1.00%*m/m* on and after 1 July 2010; and
- 0.10%*m/m* on and after 1 January 2015.

IMO in October 2016, agreed on the implementation date of January 1, 2020 as scheduled, for 0.50%*m/m* limit on and after 1 January 2020.

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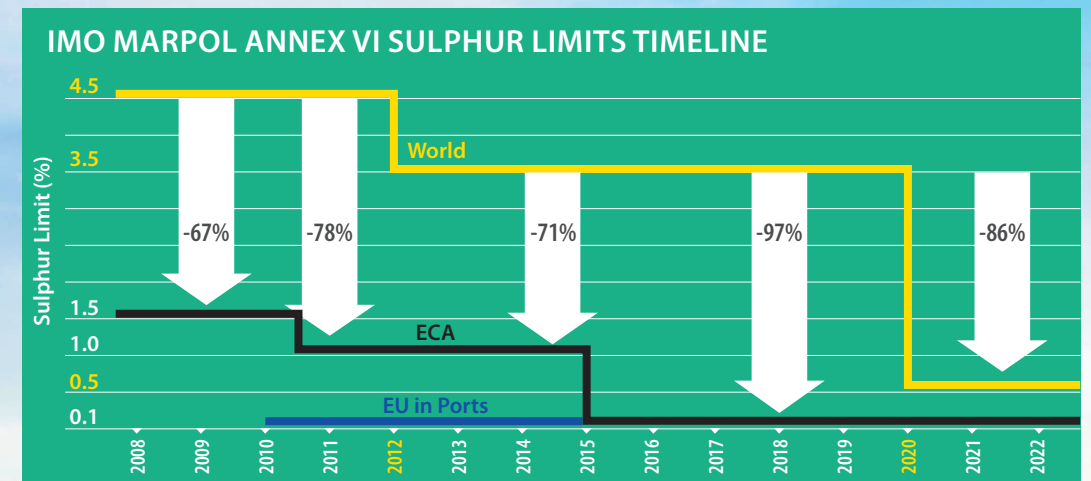
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Source: Wärtsilä



REFERENCES

ASSESSMENT OF SELECTED ALTERNATIVE FUELS AND TECHNOLOGIES
DNV GL

BEST PRACTICE GUIDANCE FOR SUPPLIERS FOR ASSURING THE QUALITY OF BUNKERS DELIVERED TO SHIPS
IBIA

MARINE FUEL OIL ADVISORY 2018
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RESOLUTION MEPC.259(68) – 2015 GUIDELINES FOR EXHAUST GAS CLEANING SYSTEMS
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MEPC.1/CIRC.875 – GUIDANCE ON BEST PRACTICE FOR FUEL OIL PURCHASERS/USERS FOR ASSURING THE QUALITY OF FUEL OIL USED ON BOARD SHIPS
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MEPC.1/CIRC.864 – GUIDELINES FOR ON BOARD SAMPLING FOR THE VERIFICATION OF THE SULPHUR CONTENT OF THE FUEL OIL USED ON BOARD SHIPS
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PPR 6/8 – REPORT OF THE INTERSESSIONAL MEETING ON CONSISTENT IMPLEMENTATION OF REGULATION 14.1.3 OF MARPOL ANNEX VI (ISWG-AP 1)
IMO

MEPC 73/5 – OUTCOME OF THE INTERSESSIONAL MEETING ON CONSISTENT IMPLEMENTATION OF REGULATION 14.1.3 OF MARPOL ANNEX VI CONCERNING THE DEVELOPMENT OF GUIDANCE ON SHIP IMPLEMENTATION PLANNING FOR 2020
IMO



MARPOL ANNEX VI REGULATIONS

MARPOL AMENDMENTS

Besides the 0.50%*m/m* sulphur limit of fuel oil used on board ships as required by Regulation 14 of MARPOL Annex VI, there was yet another proposal to amend the same regulation in order to bring about a carriage ban of non-compliant fuel (i.e. fuel of more than 0.50%*m/m* sulphur content). The carriage ban was intended to help Port State Control (PSC) administrations enforce the 0.50%*m/m* sulphur limit contained in bunker fuel, especially to avoid ships violating the limit while at sea. The ban would not apply to ships that use abatement technology such as scrubbers as equivalent means of compliance, ships conducting tests for abatement technology and ships reporting non-availability of fuel. The ban also would not apply to carriage of non-compliant fuel as cargo.

In October 2018, IMO adopted the draft amendments to the MARPOL Convention to ban ships from carrying non-compliant fuel oil. The new text of Regulation 14.1 of MARPOL Annex VI reads, "The sulphur content of fuel oil used or

carried for use on board a ship shall not exceed 0.50%*m/m*." The ban will come into force on March 1, 2020.

Points to note:

- ships shall not use (burn) non-compliant fuel oil by January 1, 2020 and shall not carry non-compliant fuel for use on board by March 1, 2020 (unless the ship is using abatement technology).
- ships fitted with abatement technology, subject to the approval of the flag Administration, may continue to use and carry non-compliant fuel.

There are still ongoing discussions at IMO to ensure the consistent implementation of the IMO 2020 Sulphur Limit. Some of the discussions include the development of a definition of "sulphur content" and regulatory changes regarding sulphur verification for samples taken from ships' fuel systems, known as in-use samples.

For more information on the guidelines, please scan or click on the QR codes below

Exhaust Gas Cleaning Systems (EGCS)



Fuel Oil Sampling Points



Fuel Purchasers



IMO GUIDELINES FOR COMPLIANCE TO MARPOL ANNEX VI

GUIDELINES FOR EXHAUST GAS CLEANING SYSTEMS (EGCS)

The acceptance of exhaust gas cleaning systems (scrubbers) should be based on the criteria stipulated in the 2015 Guidelines for Exhaust Gas Cleaning Systems.

GUIDELINES FOR FUEL OIL SAMPLING POINTS

IMO in October 2016 approved Guidelines for on board sampling for the verification of the sulphur content of the fuel oil used on board ships. This guideline covers the following areas:

- be easily and safely accessible;
- take into account different fuel oil grades being used for the fuel oil combustion machinery item;
- be downstream of the in-use fuel oil service tank;
- be as close to the fuel oil combustion machinery as safely feasible taking into account the type of fuel oil, flow-rate, temperature, and pressure behind the selected sampling point;
- be clearly marked for easy identification and described in relevant documents;
- each sampling point should be located in a position shielded from any heated surface

or electrical equipment and the shielding device or construction should be sturdy enough to endure leaks, splashes or spray under design pressure of the fuel oil supply line so as to preclude impingement of fuel oil onto such surface or equipment; and

- the sampling arrangement should be provided with suitable drainage to the drain tank or other safe location.

Further works are currently in progress at IMO and expected to be completed in May 2019 with an anticipation that the ship will require to have a "designated" sampling point.

GUIDELINES FOR FUEL PURCHASERS

IMO in April 2018 approved the Guidance on best practice for fuel oil purchasers / users for assuring the quality of fuel oil used on board ships. This guidance covers the following best practices:

- choice of fuel oil supplier;
- contracting;
- documentation;
- fuel oil receiving on board, sampling and testing; and
- dispute resolution.

Note: IMO is currently developing "Best practice guidance for suppliers for assuring the quality of bunkers delivered to ships". This guidance is for suppliers which should cover quality control during production of bunkers, quality control in the supply chain, cargo transport, storage and transfer, delivery to ship (bunkering operations), representative sampling, testing and interpretation of test results, documentation, contracting, and dispute resolution. This guidance is expected to be completed by May 2019.

OPTIONS AVAILABLE TO MEET IMO 2020 SULPHUR LIMIT REQUIREMENT

Come January 1, 2020 ship operators have the following 3 main options for compliance with the IMO 2020 sulphur limit:

Abatement technology for example scrubbers;	Alternative fuel for example LNG / methanol ; or	Fuel oil with sulphur content not more than 0.50% <i>m/m</i> .
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SCRUBBERS (EXHAUST GAS CLEANING SYSTEM)

Ships may meet the sulphur emission requirements by using approved abatement technology, such as scrubbers, which “scrub and clean” the emissions before they are released into the atmosphere. In this case, the abatement technology must be approved by the ship’s flag Administration. In this regard, Singapore-registered ships (SRS) are to consult their respective classification society for further guidance.

For the purpose of sulphur removal, a number of scrubber technology options is available

to ship owners and operators. There are dry scrubbers which utilise chemical as its scrubbing medium. However, the more common ones in use are the wet types, which comprise open, closed or hybrid loop modes.

For more information on the guidelines, please scan or click on the QR code on the right

Exhaust Gas Cleaning Systems



ALTERNATIVE FUEL

Aside from the conventional oil-based marine fuels, there are other alternative fuels that could comply with IMO 2020 sulphur limit requirements. The ones that are commonly explored for use as marine fuel are Liquefied Natural Gas (LNG), Electricity, Biodiesel and Methanol. Other alternative fuels that are less in the limelight but could equally be significant in the near future are Liquefied Petroleum Gas (LPG), Ethanol, Dimethyl Ether (DME), Biogas, Synthetic Fuels and Hydrogen (particularly for use in fuel cells).

When assessing alternative fuels for shipping, many factors need to be considered, including:

- commercial factors such as cost, availability and supply infrastructure;
- technical and operational factors such as interface with other machinery on board in cases of retrofit, safety issues, reliability of technology, crew training and maintenance support; and
- environmental factors such as life cycle impact assessment from fuel production, transport and emission (well to wake), and impacts from accidental spills.

Common concerns associated with the use of most alternative fuels are low flashpoints, high volatility, low energy content per unit mass and toxicity in some cases. The International Code of Safety for Ships using Gases or other Low flash point Fuels (IGF Code), which came into force on 11 June 2015, addresses these issues. The IGF Code includes mandatory provisions for the arrangement, installation, control and monitoring of machinery, equipment and systems using low flash point fuels, such as liquefied natural gas (LNG), to minimise the risk to the ship, its crew and the environment. Although LNG was the first focus of the IGF Code, provisions for Methyl/Ethyl alcohols, Fuels Cells and Low Flash Point Oil Fuels are currently being discussed at IMO for revisions of the Code.

COMPLIANT FUEL

The sulphur content of crude oil varies significantly in different parts of the world. Hence, to meet the IMO regulations, the refiners have to either treat the fuel or blend it with ultra-low sulphur fuel oil. Other options to obtain a 0.50%*m/m* sulphur content fuel include blending with hydro-treated residuals, heavy fractions from hydro-crackers and lighter hydro-treated fractions.

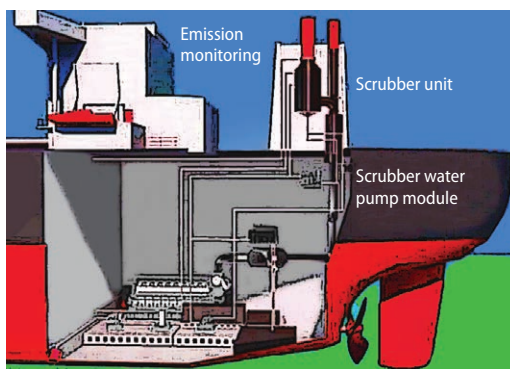
EXHAUST GAS CLEANING SYSTEMS (SCRUBBERS)



ACCEPTANCE AS EQUIVALENT

Regulation 4 of MARPOL Annex VI (Equivalent) allows the use of an alternative compliance method such as approved abatement technology (scrubbers). The Administration of a Party which allows such alternative compliance method as equivalent to that required by MARPOL Annex VI shall report so to IMO via the Global Integrated Shipping Information System (GISIS) platform for information.

Maritime and Port of Authority's (MPA) approval is required for the use of scrubbers onboard SRS.



Application for approval shall be made to MPA through our Recognised Organisations (RO).

The 2015 Guidelines for exhaust gas cleaning systems specifies the requirements for the testing, survey certification and verification of EGC systems under Regulation 4 of MARPOL Annex VI to ensure that they provide effective equivalence to the requirements of Regulations 14 of MARPOL Annex VI.

APPROVAL SCHEMES

Under the 2015 Guidelines for exhaust gas cleaning systems), there are 2 schemes for approving a scrubbing system as an alternative method of compliance with Regulation 14 of MARPOL Annex VI on fuel sulphur limits.

For more information on the guidelines, please scan or click on the QR code on the right

Exhaust Gas Cleaning Systems



SCHEME A

- The EGCS must be certified as meeting the emission limit value specified by the manufacturer (the 'certified value') for continual operation with fuel oils of the manufacturer's specified maximum sulphur content over the range of declared exhaust gas mass flow rates.
- The certification can be undertaken prior to or after installation on board and is approved by the issue of a serial number-based Sulphur Emissions Compliance Certificate (SECC) on behalf of the vessel's flag Administration.
- The basis of the approval and the EGCS operating and maintenance parameters, together with survey procedures, are to be contained within the EGCS - Technical Manual for Scheme A (ETM-A), which is also to be approved by the Administration, or RO acting on its behalf.
- The EGCS is to be surveyed after installation to confirm that the scrubber is installed in accordance with the ETM-A, and has the relevant SECC. This would enable the ship's MARPOL Annex VI International Air Pollution Prevention (IAPP) Certificate to be amended and re-issued to reflect the EGCS installation. Subsequent surveys will be undertaken at the usual MARPOL Annex VI annual, intermediate and renewal survey intervals. Continual compliance is verified by continuous monitoring of the EGCS operating parameters, daily checks of the exhaust emissions and continual monitoring of the washwater discharge.
- The ship operator is required to maintain an EGCS Record Book, in which the maintenance and service of the EGCS is to be recorded and made available for inspection at EGCS surveys. The form of this record book is to be approved by the Administration and may form part of the vessels planned maintenance record system.

SCHEME B

- The Scheme B EGCS does not need to be pre-certified as meeting the emission limit value but must demonstrate compliance with the required equivalent emission values to the fuel sulphur content requirements in Regulation 14 of MARPOL Annex VI at any load point, including during transient operation, by verification of the SO₂/CO₂ ratio after the scrubber. This must be undertaken on a continual basis by the use of a continuous exhaust gas monitoring system (data logger) that is approved by the Administration, and which records data at a rate not less than 0.0035 Hz.
- Similar to Scheme A, Scheme B EGCS units are to be supplied with an approved EGCS Technical Manual -B (ETM-B) detailing the EGCS operating parameters and limits. The EGCS is to be surveyed after installation and at the usual MARPOL Annex VI Annual, Intermediate and Renewal Survey intervals, in the same manner as Scheme A is surveyed for issue of the IAPP Certificate. Continual compliance is verified by continuous monitoring of the exhaust emissions, daily spot checks of the EGCS operating parameters and by continual monitoring of the washwater discharge. Scheme B ship operators should be supplied with an EGCS Record Book in the same manner as Scheme A.

For ships which are to use an exhaust gas cleaning system in order to comply with Regulation 14 of MARPOL Annex VI, there should be an approved Sulphur Emissions Compliance Plan (SECP) on board.

TYPES OF SCRUBBERS

The 3 main types of scrubber systems are as follows:

OPEN LOOP	An open loop system uses ambient seawater for exhaust gas scrubbing. The sea water is filtered for heavy metals and particulate matter and then discharged into the sea containing all the sulphur cleaned from the exhaust.
CLOSED LOOP	A closed loop system uses fresh water that is chemically treated usually by caustic soda injection to effect scrubbing.
HYBRID	Hybrid systems can operate in either open or closed loop mode depending on design.

TECHNICAL AND OPERATIONAL MATTERS FOR CONSIDERATION

It is advisable to take into consideration some of the technical and operational matters in order to ensure the smooth application of the scrubber system installed on board.

BACK PRESSURE

Installing a system such as a scrubber on the exhaust stream of an engine or boiler would inevitably introduce back pressure to the system. Effects on other components in the exhaust stream such as turbo chargers should be considered in consultation with the engine / boiler makers.

This is especially critical when it comes to making a decision on whether to opt for Single stream (Main Engine on one scrubber and all generators on one scrubber) or Multi stream (main engine, generators and boiler in a single exhaust manifold to one scrubber) arrangements. For the Multi stream arrangement, the interaction of main engine exhaust at low temperature

and high pressure with generators of relatively high temperatures and low pressure need to be studied and accommodated for. Zero leak gas valves may need to be used to provide flexibility in isolating individual streams from the common manifold.

The capability of a scrubber in reacting (changing water flow) to fluctuating engine load during manoeuvring is also something to be taken into consideration. Owners / Managers should consult the engine / boiler maker's for advice with regard to this back pressure and its impact to engine / boiler's operation and even its certification.

CORROSION

The advent of technological solutions such as the use of super duplex material, high temperature acid resistant coating and glass reinforced epoxy (GRE) piping have greatly mitigated issues with corrosion. Attention should also be paid to potential corrosion problems on

the shell in the vicinity of the wash water outlet. Proper design and workmanship are of utmost importance. SRS owners and managers should consult the scrubber makers and installation yards in regard to this.

SUPPLY OF NEUTRALISING AGENTS AND RECEPTION FACILITIES FOR RESIDUE

For ship operators that choose closed loop/ hybrid scrubbers, consideration should be given to logistic support in terms of availability of

reception facilities for the scrubber residue and also supply of neutralising agent used in the system such as caustic soda.

PROHIBITION ON DISCHARGE OF OPEN LOOP SCRUBBER WASHWATER

For ship operators that choose open loop scrubbers, they should take notice of the various ports globally that have prohibited the discharge of washwater from open loop scrubbers in their

port waters. Plans should be in place for such vessels operating at these ports, such as the use of compliant fuel instead.

SAFETY AND CREW TRAINING

The crew should be appropriately trained to operate the scrubber system and is familiar with safety aspects which include but not limited to:

- the handling and proximity of exhaust gases;
- storage and use of pressurised containers

of pure and calibrated gases;

- position of permanent access platforms and sampling locations; and
- hazards associated with the handling of caustic materials.

CONTINGENCY

As with any other systems, there is always the possibility of equipment malfunction. To mitigate the possibility and effects of equipment malfunction, proper design, material selection, good workmanship, correct installation coupled with crew competency and diligence all come together to ensure safe and reliable operation of the scrubber system.

If the scrubber malfunction is to such an extent that the system is inoperable, the ship would still not be in immediate breach of the regulations. In such a circumstance, MARPOL Annex VI Regulation 3.1.2 should apply;

Regulations of this Annex shall not apply to any emission resulting from damage to a ship or its equipment:

- *provided that all reasonable precautions have been taken after the occurrence of the damage or discovery of the emission for the purpose of preventing or minimising the emission; and*
- *except if the owner or the master acted either with intent to cause damage, or recklessly and with knowledge that damage would probably result.*

Ships should have contingency measures in place to continue operation in case of scrubber failure and one possible option to consider is to have a designated fuel oil tank with IMO 2020 compliant fuel with the appropriate change over procedures (please refer to page 13 on fuel oil change over procedures).

However, if there is insufficient or no compliant fuel on board, the ship should be allowed to complete the current leg of its voyage without deviation and then carry out repair works or bunker compliant fuel at the next port of call.

Similarly, should the scrubber's emissions monitoring system (CEMS) malfunction, the ship should not be considered as being in immediate breach of regulations.

In all cases of scrubber malfunction, the flag Administration and the next port of call should be informed and arrangements to be made for the scrubber to be repaired as soon as possible. If immediate repairs at the next port of call is not possible, then the ship should bunker compliant fuel and use compliant fuel until such time the scrubber is repaired.

COMPLIANT FUEL

Listed below are most commonly used fuel types to meet the IMO 2020 0.5 m/m sulphur requirements.

FUEL TYPES

Marine Gas Oil (MGO)	Marine Diesel Oil (MDO)	0.10% m/m sulphur fuel oil	0.50% m/m sulphur fuel oil
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FUEL BLEND SPECIFICATIONS

The most widely used fuel standard in the marine industry is ISO 8217 with the latest edition issued in 2017. The ISO 8217 standard specifies the requirements of fuels for use in marine diesel engines and boilers for marine applications. The ISO 8217 standard covers the fuel characteristics limits of viscosity, density, cetane index, sulphur, flash point, hydrogen sulphide, acid number, total sediment, carbon residue, cloud point, pour point, cold filter plugging point, appearance, water, ash, lubricity, vanadium, sodium, aluminium plus silicon (cat fine), calcium and zinc.

A revised ISO 8217 standard will not be issued prior to 2020. However, ISO has confirmed that the general requirements of ISO 8217:2017



covers IMO 2020 0.50% m/m sulphur fuels in the same way as they cover today's fuels including 0.10% m/m sulphur fuels. The ISO 8217:2017 standard reflects on the technical requirements for machinery operations and considers the aspects of safety, environment, on board handling (storage and cleaning) and combustion.

ISO has initiated the development of a Publicly Available Specification (PAS) "Considerations for fuel suppliers and users regarding marine fuel quality in view of the implementation of maximum 0.50% m/m sulphur limit in 2020". This PAS is expected to be ready by August 2019.

It is to be noted that Regulation 18.3 of MARPOL Annex VI prohibits adding any substance or chemical waste to fuel oil which:

- jeopardises the safety of ships or adversely affects the performance of the machinery;
- is harmful to personnel; or
- contributes to additional air pollution.

Further, SOLAS II-2 Regulation 4.2 requires that fuel oils must have a flash point of 60°C or higher in order to reduce the risk of fires on board. Ships cannot use fuel with a flash point lower than 60°C unless they have been certified in accordance with the IGF Code.



FUEL COMPATIBILITY

As with common engineering best practice for fuel handling onboard ships, precautions should be taken by ship crews to minimise incompatibility by avoiding mixing bunker fuels from different sources, choosing a fuel with similar viscosity and density, and avoiding the mixing of low sulphur heavy fuel oil with distillate fuel oil. Fuel oil tanks should be suitably cleaned prior to loading compliant fuel in the tank for the first time (Please refer to page 16 - cleaning of tank section). Ship operators should plan in advance and prepare for increased bunker segregation to minimise the associated risks and work closely with their bunker suppliers to purchase compatible fuels.

FUEL STABILITY

Fuel oils are produced on the basis of widely varying crude oils and refinery processes. There is a potential for a fuel to change conditions in storage in certain circumstances. Bulk fuel stored for long periods can become unstable because the asphaltenes can precipitate out of solution, causing the formation of sludge. Optimising

bunker lifting to avoid having to store the same bunkers on board for a long time, coupled with proper storage temperature on board would help to mitigate the stability issues.

FLASH POINT

Concern has been raised with regard to the possibility of blended fuel oil having flash point below the current SOLAS requirement of 60°C (SOLAS Regulation II-2/4) due to the properties of distillate being used in the mix.

Ship operators should ensure that the bunkered fuel are ordered to comply with the ISO 8217:2017 requirements. Pay attention to the flash point of bunker fuel oil being lifted and ensure that it is at least 60°C or more as the existing safety construction standards for ships are based on this minimum flash point. Flash point is one of the parameters under the ISO 8217:2017 standards. This information on flash point of the fuel supplied could be obtained from the Bunker Deliver Note (BDN) of the parcel received.

VISCOSITY

Viscosity is a measure of the fluidity of the product at a certain temperature. Viscosity outside the engine manufacturers' specifications at the injectors will lead to poor combustion, deposit formation and energy loss. For heavy fuels with high viscosity, the required operating viscosity is achieved by heating the fuel to lower the viscosity. For distillate fuels, the fuel at ambient temperature normally has a viscosity within the specified limits.

SRS shipowners / managers / masters should consult with the engine makers for the allowable viscosity of the ships engine. Similarly, shipowners / managers / masters should pay due diligence to the viscosity level of the bunker received. This information on viscosity of the fuel supplied could be obtained from the Bunker Deliver Note (BDN) of the parcel received.

CAT FINES

These are created as a result of catalytic cracking during the crude oil refining process, during which tiny fragments of the catalyst material become entrained in the refined and residue products. These cat fines are typically a combination of aluminium and silicon and are very hard, abrasive particles, capable of causing severe wear to engines. Cat fines exist in fuel oil even after being purified and conditioned, and



are the cause of gradual engine wear. However, if excessive amounts of cat fines are introduced into the engine, they can cause significant damage to sensitive engine components such as fuel pumps and fuel injection valves as well as cylinder liners and piston rings.

Appropriate fuel temperature should be maintained in the settling tank to aid settling and water content removal. Settling tanks are requiring to be drained at regular intervals throughout the period of operation when fuel with high catalytic fines contents is being used. Cat fines should also be reduced as much as possible by ensuring proper filtering (both manual and auto backwash filters) and operating the fuel oil purifiers on low throughput. To mitigate the above issue arising from cat fines it is a good practice to send a fuel sample for lab testing prior using the parcel.

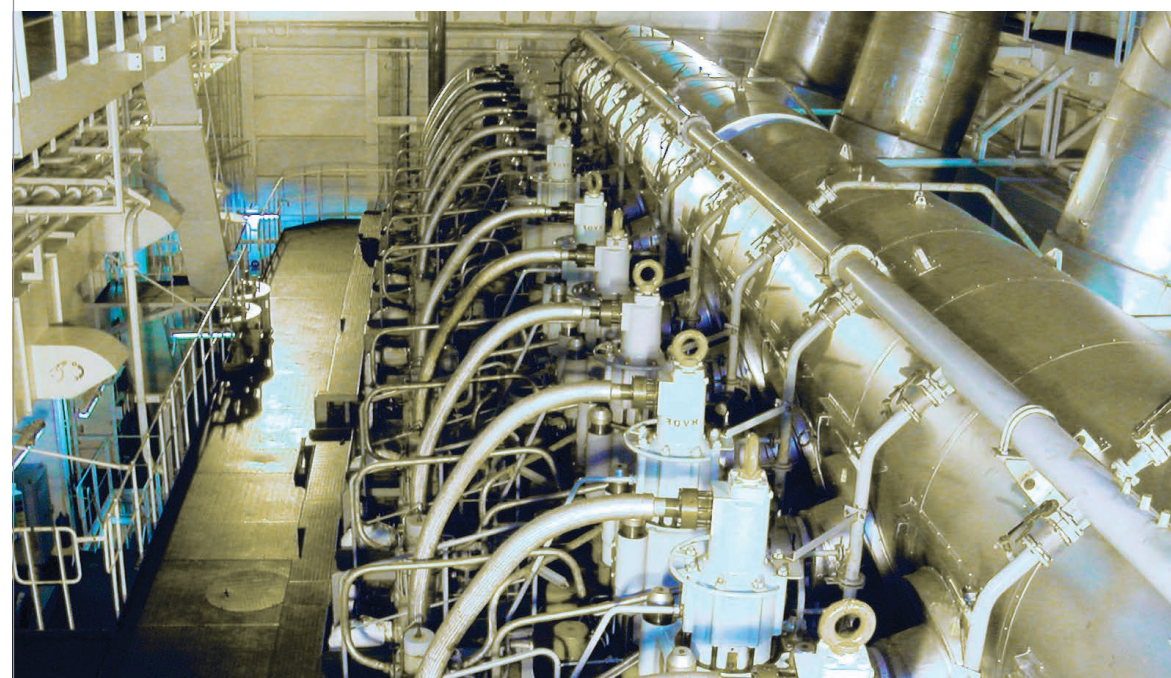
It is a common practice today for companies to send fuel oil bunkered for lab test prior use and this is normally included in the company's Safety Management System (SMS) for proper fuel oil management. The above fuel properties and mitigating measures are not exhaustive, therefore shipowners / managers / masters of SRS are advised to send new parcel of bunker received for lab testing before using the parcel and similarly incorporate this in their SMS.

FUEL OIL CHANGE-OVER PROCEDURES

SRS ship owners / managers / masters should consult the engine maker while developing the fuel oil change over procedures. It is also recommended that such procedure is documented in the company SMS. When changing over from high sulphur fuel oil (HSFO) to low sulphur fuels, the following are the items to be considered and attention be paid to:

- control of viscosity
- procedures for switching with fuel mixing
- reducing engine power
- thermal shock avoidance while switching fuels
- manual fuel switching
- fuel pump considerations (pumps may lose suction because of reduced fuel oil viscosity)
- fuel heating
- gassing
- fuel compatibility

It is to be noted that when using low sulphur fuel oil, only small amounts of sulphuric acid are formed in the combustion chamber. The cylinder lube oil additives, when are not used for the designed purpose, tend to build up as deposits. These deposits may disturb the lube oil film and obstruct the piston ring movement, which could lead to micro-seizures on the piston rings and liner and increase the risk of scuffing. Deposit formation and the total lack of corrosion increase the risk of bore-polishing, which could also lead to increased wear and scuffing. Complications caused by deposit build-up can be avoided by using cylinder lube oils with a low amount of deposit-forming additives and good detergency properties (low-BN oils) and by operating at the lowest recommended cylinder lube oil feed rate. The general lubrication strategy is to use a high-BN cylinder oil when operating on high-sulphur fuels and a low-BN oil when operating on low-sulphur fuel. It is advisable to seek the engine maker's recommendation.



ALTERNATE FUELS

Listed below are some of the possible alternate fuels for compliance with IMO 2020 requirements. The list is not exhaustive and covers only the most prevalent two options.



LNG

LNG-fuelled ships are compliant with IMO 2020 regulations. LNG eliminates both sulphur and PM emissions and reduces NOx by up to 90%. Factoring in the shape-related space requirements, cylindrical LNG tanks typically occupy three times the volume of an equivalent amount of energy stored in the form of fuel oil. Aside from scrubbers and IMO 2020 compliant fuel, LNG leads the pack of alternative fuels being adopted for use as marine fuel.

For SRS shipowners / managers exploring options of using LNG as fuel the following should be taken into consideration as per the IGF code:

- ship design arrangement – fuel containment system, piping, ventilation, electrical installation etc.
- bunkering
- fire safety
- control monitoring and safety systems
- training etc.

SRS shipowners / managers are further advised to approach the RO and / or MPA for further clarification, if required.

METHANOL

Methanol can be produced from several different feedstock resources, mainly natural gas or coal, but also from renewable resources like black liquor from pulp and paper mills, forest thinning or agricultural waste. Methanol has a flash point of 11°C to 12°C and is considered a low-flash point fuel. Using methanol virtually eliminates sulphur emissions and meets the sulphur emission limit.

Methanol is a liquid fuel and can be stored in standard fuel tanks for liquid fuels, with certain modifications to accommodate its low-flash point properties and the requirements currently under development for the IGF Code at IMO. Fuel tanks should be provided with an arrangement for safe inert gas purging and gas freeing.

IMO is discussing as a priority to develop the technical provisions for using ethyl / methyl alcohols (ethanol / methanol) as fuel. The interim guidelines for the safety of ships using methyl / ethyl alcohol is envisaged to be approved before 2020.

PREPARATION

SHIP IMPLEMENTATION PLAN

IMO has developed the Guidance on the Development of a Ship Implementation Plan (SIP) for the consistent implementation of the 0.50% sulphur limit under MARPOL Annex VI (MEPC.1/Circ.878). This guidance provides for developing a non-mandatory SIP, a sample format for the implementation plan, potential impacts of low sulphur fuel oil on machinery systems and guidance for fuel oil tank cleaning.

It should be emphasized that the SIP is not mandatory and hence, the absence of which or incorrect entries etc. should not form the basis for a PSC deficiency. However, the SIP can be utilised by ship operators to help them plan and demonstrate the actions taken by their ships to prepare for compliance with the 0.50% m/m sulphur limit come January 1, 2020. Preparatory measures such as modifications to fuel oil systems, fuel oil capacity and segregation capability, tank cleaning and bunkering plans, complemented with the record of implementation in the lead-up to the compliance date would serve to facilitate the documentation check by inspectors.

SRS are strongly encouraged to have a Ship Implementation Plan on board.

DESIGNATED FUEL OIL SAMPLING POINTS

SRS owners / managers / masters are advised to take note that they should be prepared to designate an appropriate “In-Use” sampling point(s). The designated sampling point should ideally be clearly marked in-situ and also indicated on the relevant machinery piping diagram on board. When designating the

“In-Use” sampling point(s) the following should be taken into consideration:

- be easily and safely accessible;
- take into account different fuel oil grades being used for the fuel oil combustion machinery item;
- be downstream of the in-use fuel oil service tank;
- be as close to the fuel oil combustion machinery as safely feasible taking into account the type of fuel oil, flow-rate, temperature, and pressure behind the selected sampling point;
- be clearly marked for easy identification and described in relevant documents;
- each sampling point should be located in a position shielded from any heated surface or electrical equipment and the shielding device or construction should be sturdy enough to endure leaks, splashes or spray under design pressure of the fuel oil supply line so as to preclude impingement of fuel oil onto such surface or equipment; and
- the sampling arrangement should be provided with suitable drainage to the drain tank or other safe location.

While the above advice is in preparation for designating an “In-Use” designated sampling point(s), further amendments can be expected as the amendments to Regulation 14 of MARPOL Annex VI is currently under revision and expected to be finalised by May 2019. It is expected that the amendments will require ships to have a “designated” sampling point. It is up to the ship to decide on the location to be designated as the sampling point.

FUEL OIL (BUNKER) TANK PREPARATION TO RECEIVE COMPLIANT FUEL

Fuel oil tank cleaning is an important measure to avoid compatibility and stability issues while transitioning to 0.50%*m/m* compliant fuel from high sulphur fuel oil (HSFO). There is a high risk of undetected residue of non-compliant fuels remaining in tanks when switching from HSFO to 0.50%*m/m* compliant fuel. If there is a fraction of HSFO left in the tank, then it will contaminate the new fuel loaded, rendering the fuel non-compliant. There is also the risk of compatibility issue by mixing the new compliant fuel with the remaining HFSO, which may cause the dislodge of sediments and asphaltenic sludge to the system.

The process of fully cleaning and flushing fuel oil tanks and piping system requires advance planning. It would be prudent for ship operators who intend to use compliant fuel as the compliance method to start planning for this early.

Options for preparing HSFO tanks for compliance include flushing through fuel systems (i.e. not cleaning tanks first), manual cleaning of tanks during dry docking, manual cleaning during service, and cleaning tanks in service with specialised additives.

CLEANING IN SHIPYARD

The time required for manual cleaning of fuel oil tanks in shipyards can vary depending on the advance preparation carried out, tank condition (amount of remaining sludge) and efficiency of the chosen shipyard. In addition to cleaning tanks, all of the pipework in the fuel oil transfer and service system need to be flushed through in the shipyard. The advantage is that a ship that has had all its fuel oil tanks and fuel system cleaned, can start loading compliant fuels and expect to be fully compliant right away.

CLEANING WHILE THE SHIP IS IN SERVICE

If tanks are to be cleaned manually during service, risk assessment and safety measures for entering enclosed spaces aboard ships would

need to be specially considered and managed. The factors affecting the time required are similar to manual cleaning in shipyard, except that instead of shipyard efficiency, a lot depends on the number of ship's crew and/or riding crew available to perform the task. The tanks need to be empty before they can be cleaned. While the ship is in service, this would mean transferring the tank contents to a designated tank for final consumption or temporary storage and subsequent removal. The residues from tank cleaning should also be retained on board until they can be disposed to shore reception facilities.

CHEMICAL ADDITIVES

As an alternative to manual cleaning, consideration can be given to gradually cleaning the sediments and asphaltenic sludge from HSFO tanks and fuel systems by dosing additives. Use of such additives usually involves a gradual clean-up period conducted over a few bunkers prior to loading compliant fuel. This ensures a smooth system clean-up by preventing excessive sludge blockages. As such products would be dosed directly into the fuel storage tank, it would clean the whole fuel oil service system, including settling and service tanks. SRS owners / managers / masters are advised that proper consultation is done with chemical additive manufacturer and engine maker to ensure that the chemical additives have no adverse impact on machineries.

The methods listed above for bunker fuel oil tank preparations are non-exhaustive. SRS owners / managers / masters are advised to plan in advance prior to the implementation date to ensure compliance. This planning should form a part of SIP, taking into consideration of the expected trading routes, docking etc.. It is also prudent to consult the engine maker on the appropriate method of preparation of the bunker fuel oil tanks and flushing of fuel oil piping system.

ENFORCEMENT

FUEL OIL NON-AVAILABILITY REPORT FORM

From January 1, 2020, a ship which has to procure non-compliant fuel due to the unavailability of compliant fuel would need to complete and submit a fuel oil non-availability report form (FONAR) to the ship's flag Administration and her next port of call.

The intent of FONAR is to report non-availability of compliant fuel in the last port of call. It should not be misconstrued as an exemption from compliance with the sulphur limit.

The FONAR is structured to serve both purposes: SOx Emission Control Areas (SECA) compliant fuel oil non-availability and 0.50%*m/m* fuel oil non-availability elsewhere. The contents of a FONAR cover the following:

- particulars of ship
- description of ship's voyage plan and information on entering an SOx Emission Control Areas (SECA) (if applicable)
- evidence of attempts to purchase compliant fuel oil
- plans to obtain compliant fuel oil
- special circumstances
- company information

The report shall be sent as soon as it is determined that the ship / operator will be unable to procure compliant fuel and preferably before the ship



leaves the port / terminal where compliant fuel cannot be obtained. A copy of the FONAR should be kept on board for inspection for at least 12 months.

SRS ship owners / managers / masters are to take note of the above and comply.

ENFORCEMENT ON SINGAPORE-REGISTERED SHIPS

Come January 1, 2020 Singapore-registered ships (SRS) may be subjected to verification on compliance with Regulation 14 of MARPOL Annex VI (sulphur limit) during Port State Control (PSC) inspections when calling at foreign ports which are Parties to the Convention. SRS may also be subjected to such verification during Flag State Control (FSC) inspections. These verifications would also include the carriage ban on non-compliant fuel oil on board ships come March 01, 2020.

A ship found to be in violation shall be dealt in accordance with Pollution Prevention of the Sea (Air) regulations.

For more information on the guidelines, please scan or click on the QR code on the right

Pollution Prevention of the Sea (Air) regulations.

