LOUISIANA MARITIME ASSOCIATION

LAMA Circular Number: 02-2019 Date: 03 October 2019

SUBJECT: LOW SULPHUR FUEL OIL 2020

Key Agency: Regulatory: International Maritime Organization (IMO
U.S. Enforcement: USEPA/USCG

References –
(a) IMO Annex VI - Regulations for the Prevention of Air Pollution from Ships
Chapter 3 – Requirements for Control of Emissions from Ships
Regulation 14 – Sulphur Oxides (SOx)
(b) IMO Resolution MEPC.320(74) – 2019 Guidelines for Consistent implementation of the 0.50% Sulphur Limit Under MARPOL Annex VI
(c) US – EPA – 40 CFR Parts 80, 85, 86. Control of Emissions from Marine Engines

Discussion

January 1, 2020 – Global Implementation Date

- Under the International Maritime Organization (IMO) regulations, as of January 1, 2020, vessels operating outside of Emission Control Areas (ECA) are limited to the use of fuel oil with a SOx content of not more than 0.50% (a reduction from the current limit of 3.50% which has been in effect since 01 January 2012).
- Vessels operating within an ECA will *continue to be limited* to the use of fuel oil with a SOx content of not more than 0.10%.

Note that inside the North America Emissions Control Area (NA-ECA) and the U.S. Caribbean ECA the maximum fuel oil SOx content was limited to 0.10% as of January 1, 2015. ***Accordingly, there is no change to the sulphur content of fuel oil used by vessels operating up to 200 nautical miles off of U.S. shores, or roughly 50 nautical miles from the territorial sea baselines of the Commonwealth of Puerto Rico and the U.S. Virgin Islands.***

Port State Control

Section 4.2 of IMO Resolution MEPC.320(74) (reference (b) above) outlines the control measures used by Port State Control inspectors. Specifically, the port State should conduct initial inspections based on documents and other possible materials, including remote sensing and portable devices. Given "clear grounds" to conduct a more detailed inspection, the port State may conduct sample analysis and other detailed inspections to verify compliance to the regulation, as appropriate. (See attachment 1)

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Fuel Oil Non-Availability

In the event compliant fuel oil cannot be obtained, the vessel operators must provide evidence which outlines the attempts made to obtain the compliant fuel oil, including attempts to local alternative sources. Section 5 of Reference (b) describes actions required by the vessel to notify its Flag Administration as well as the port of destination (See Note 1) including the filing of the Fuel Oil Non-Availability Report or FONAR. (Appendix 1 to Attachment 1 provides the FONAR format.)

(1) Reporting Fuel Oil Non-Availability for Vessels Calling US Ports.

As of June 28, 2019, ship owners and operators of vessels heading to ports in the United States that are unable to purchase compliant fuel oil may satisfy the MARPOL Annex VI Regulation 18.2.4 requirement to notify the competent authority of the relevant port of ***destination by notifying the cognizant U.S. Coast Guard Captain of the Port (COPT).*** Effective June 30, 2019 the U.S. Environmental Protection Agency will stop accepting Fuel Oil Non-Availability Reports and the FOND portal will be closed. (See Attachment 2).

Alternative to Use of Low Sulphur Fuel Oil

Under the IMO Regulations, *Equivalent Alternatives* to the use of Low Sulphur Fuel Oil that are "*at least as effective in terms of emissions reduction*" is allowed for vessels to reduce SOx emissions. Options include:

- Heavy Fuel Oil with Exhaust Gas Cleaning System (EGCS) or "Scrubbers"
- Liquefied Natural Gas (LNG) as Fuel
- Other (Uncommon) Gas as Fuel (Ethan, Methanol and Compressed Natural Gas (CNG))
- Other Options: Biofuels, Hydrogen, Fuel Cells, Renewable Energy, Superconducting Electric Motors and Hybrid Propulsions.

Of these options, the EGCS (Scrubbers) appear to be the most popular. Information can be found in Attachment 3 – LAMA Circular 01-2019: Sulphur Emissions and Scrubbers.

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Attachments:
(1) IMO Resolution MEPC.320(74)
(2) USCG MSIB – New Procedures for Notification of Compliant Fuel Non-Availability
(3) LAMA Circular 01-2019: Sulphur Emissions and Scrubbers
(4) IMO – 2020 Sulphur Limit FAQ's

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RESOLUTION MEPC.320(74)

2019 GUIDELINES FOR CONSISTENT IMPLEMENTATION OF THE 0.50% SULPHUR LIMIT UNDER MARPOL ANNEX VI

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee (the Committee) conferred upon it by international conventions for the prevention and control of marine pollution from ships,

RECALLING ALSO that, at its fifty-eighth session, the Committee adopted, by resolution MEPC.176(58), a revised MARPOL Annex VI which significantly strengthens the emission limits for sulphur oxides (SO_X),

RECALLING FURTHER that, at its seventieth session, the Committee adopted, resolution MEPC.280(70), *Effective date of implementation of the fuel oil standard in regulation 14.1.3 of MARPOL Annex VI*, confirming "1 January 2020" as the effective date of implementation for ships to comply with global 0.50% m/m sulphur content of fuel oil requirement,

NOTING ALSO that, at its seventy-third session, the Committee approved circular MEPC.1/Circ.878 on the *Guidance on the development of a ship implementation plan for the consistent implementation of the 0.50% sulphur limit under MARPOL Annex VI*,

HAVING CONSIDERED, at its seventy-fourth session, draft 2019 Guidelines for consistent implementation of the 0.50% sulphur limit under MARPOL Annex VI, prepared by the Sub-Committee on Pollution Prevention and Response, at its sixth session,

1 ADOPTS the *2019 Guidelines for consistent implementation of the 0.50% sulphur limit under MARPOL Annex VI*, as set out in the annex to the present resolution;

2 REQUESTS Parties to MARPOL Annex VI and other Member Governments to bring these Guidelines to the attention of shipowners, ship operators, fuel oil suppliers and any other interested groups;

3 AGREES to keep these Guidelines under review in the light of experience gained with their application.

ANNEX

2019 GUIDELINES FOR CONSISTENT IMPLEMENTATION OF THE 0.50% SULPHUR LIMIT UNDER MARPOL ANNEX VI

1 Introduction

1.1 Objective

1.1.1 The purpose of these Guidelines is to ensure consistent implementation of the 0.50% sulphur limit under MARPOL Annex VI. These Guidelines are intended for use by Administrations, port States, shipowners, shipbuilders and fuel oil suppliers, as appropriate.

1.2 Definitions

1.2.1 For the purpose of these Guidelines, the definitions in MARPOL Annex VI apply.

1.2.2 The following definitions of fuel oils are used, as applicable:

.1 Distillate marine fuels (DM) are as specified in ISO 8217:2017[1] (e.g. DMA, DMB, DMX, DMZ);

.2 Residual marine fuels (RM) are as specified in ISO 8217:2017[1] (e.g. RMD 80, RMG 380);

.3 Ultra-low sulphur fuel oil (ULSFO) are as specified in ISO 8217:2017[1] (e.g. maximum 0.10% S ULSFO-DM, maximum 0.10% S ULSFO-RM);

.4 Very low sulphur fuel oil (VLSFO) (e.g. maximum 0.50% S VLSFO-DM, maximum 0.50% S VLSFO-RM); and

.5 High sulphur heavy fuel oil (HSHFO) exceeding 0.50% S.

2 Ship implementation planning for 2020

2.1 MEPC 70 agreed to "1 January 2020" as the effective date of implementation for ships to comply with the 0.50% m/m fuel oil sulphur content limit requirement and adopted resolution MEPC.280(70) on the *Effective date of implementation of the fuel oil standard in regulation 14.1.3 of MARPOL Annex VI*[2].

2.2 In this context, MEPC 73 agreed that Administrations should encourage ships flying their flag to develop implementation plans, outlining how the ship may prepare in order to comply with the required sulphur content limit of 0.50% by 1 January 2020. The plan should be complemented with a record of actions taken by the ships in order to be compliant by the applicable date.

2.3 MEPC 73, recognizing the need for guidance to support the consistent implementation of the 0.50% sulphur limit under MARPOL Annex VI, approved MEPC.1/Circ.878 on the *Guidance on the development of a ship implementation plan for the consistent implementation of the 0.50% sulphur limit under MARPOL Annex VI*.

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1 The latest edition of the ISO standard is recommended.

2 Regulation 14.1.3 of MARPOL Annex VI, was amended by resolution MEPC.305(73).

3 Impact on fuel and machinery systems

3.0.1 The experiences and lessons learned from the transition to the 0.10% m/m SO_X-ECA limit indicated that current ship machinery operations should be sufficiently capable of addressing the concerns regarding combustion of the new 0.50% m/m limit fuel oils.

3.0.2 Currently most of the marine diesel engines and boilers on ships operating outside Emission Control Areas (ECAs) are optimized to operate on heavy fuel oil. From 2020 ships are required to use fuel oils with a sulphur content of 0.50% m/m or lower, unless fitted with an approved equivalent means of compliance.

3.1 Distillate fuels

3.1.1 A major challenge with distillate fuels is low viscosity. Low viscosity may cause internal leakages in diesel engines, boilers and pumps. Internal leakages in fuel injection system may result in reduced fuel pressure to the engine, which may have consequences for the engine performance (e.g. starting of the engine). Equipment makers recommendations should be taken into account, and adequate testing, maintenance and possible installation of coolers, etc., may be performed.

3.1.2 Cold Filter Plugging Points (CFPP) and Cloud Points (CP) as well as the Pour Point (PP) for distillate fuels need to be considered in light of the ship's intended operating area and ambient temperatures.

3.1.3 These issues are critical concerns as they can result in the formation and accumulation of wax sediment, which can cause costly and avoidable maintenance. In the worst-case scenario, sediment can cause engine fuel starvation and power loss.

3.1.4 ISO 8217:2017[3] limits the cold flow properties of a fuel through setting a limit on the PP. However, given that wax crystals form at temperatures above the PP, fuels that meet the specification in terms of PP can still be challenging to operations in colder operating regions, as the wax particles can rapidly block filters, potentially plugging them completely. For cold weather, additional cold flow properties, CFPP and CP, should be reported by the supplier when the receiving ship has ordered distillate fuel for cold weather operations, a requirement that is specified in ISO 8217:2017[3].

3.1.5 Since the residual fuels are usually heated and distillate fuels are not heated, particular attention needs to be given to the cold flow properties of distillates. Cold flow property challenges can be managed by heating the fuel. CIMAC has issued "01 2015 CIMAC Guideline Cold flow properties of marine fuel oils"[4].

3.1.6 Fuel temperature should be kept approximately 10°C above the PP in order to avoid any risk of solidification, however this may not reduce the risk of filter blocking in case of high CFPP and CP.

3.1.7 It is good practice to review the possibilities of heating arrangements for distillate fuels on board. This is usually very limited, as it is not standard practice to have heating arrangements in distillate storage, settling or service tanks. Transfer arrangements may be adapted to pass through a residual fuel oil heat exchanger should the need arise.

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[3] The latest edition of the ISO standard is recommended.

[4] https://www.cimac.com/cms/upload/workinggroups/WG7/CIMAC_WG7_2015_01_Guideline_Cold__Flow_Properties_Marine_Fuel_Oils_final.pdf

3.1.8 Knowing the fuel properties before bunkering will assist in taking the necessary precautions where and when necessary. If the ship is heading towards colder climates and the cold flow properties are inferior, the fuel may be:

.1 either used before entering cold regions, or

.2 used with suitable heating arrangement, as mentioned above.

3.1.9 If the approach of applying heat is being followed it should be ensured that the fuel is not overheated resulting in the viscosity dropping below the minimum recommendation of 2 cSt at any point in the fuel system, including the engine inlet. In order to reduce this risk, heating should be limited to max 40°C.

3.2 Distillate fuel with FAME content

3.2.1 Increased demand for Distillate fuels may result in more land based products making their way into the marine supply pool, some of these fuels (e.g. biodiesel) may contain Fatty Acid Methyl Ester (FAME).

3.2.2 There are various technical challenges associated with use of fuel having FAME content, e.g. potential oxidation of biodiesel, its biodegradable nature etc. with adverse implications, limitations in storage life etc. It also needs to be tested for stability.

3.2.3 The ISO 8217:2017[3] standard includes a maximum FAME content of 7.0% by volume for DFA/DFZ/DFB fuel oil grades since some ports may offer automotive diesel fuel as the only fuel available, which contains FAME and could violate the fuel flashpoint requirements addressed in SOLAS chapter II-2. The maximum 7.0% (v/v) has been chosen as this aligns with the concentrations allowed in some of the countries applying environmental regulations.

3.2.4 Manufacturers of engines and equipment like oily water separators, overboard discharge monitors, filters, coalescers etc. need to be consulted to confirm the ability of engines and equipment to handle biodiesel blends of up to B7 (i.e. 7.0% v/v).

3.2.5 It is recommended to avoid using such biodiesel blend fuels for lifeboat engines, emergency generators, fire pumps, etc. where it is stored in isolated individual unit fuel tanks and subjected to conditions for accelerated degradation.

3.2.6 CIMAC has provided a Guideline for Shipowners and Operators on Managing Distillate Fuels up to 7.0% v/v Fame (Biodiesel).[5]

3.3 Residual fuels

3.3.1 Stability and compatibility

3.3.1.1 It is essential to distinguish between "Fuel stability" within a single batch of fuel and "Fuel compatibility" between different fuel batches.

3.3.1.2 Regarding stability: the fuel shall be stable and homogeneous at delivery and it is the responsibility of the fuel oil blenders and suppliers to ensure this.

3.3.1.3 A wide range of blends of refined products will be used to make the new 0.50% sulphur fuels, and the stability and compatibility of the blends will be an important concern for shipowners/operators. Unstable fuels can separate on their own and incompatible ones can do so when mixed in a single bunker tank, forming sludge that can block filters and ultimately cause engine failures.

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5 https://www.cimac.com/cms/upload/workinggroups/WG7/CIMAC_WG7_Guideline_for_Ship_Owners_and_Operators_on_Managing_Distillate_Fuels_May_2013.pdf

3.3.1.4 It is recommended that ships have a commingling procedure. The procedure should primarily aim to ensure new bunkers are loaded into empty tanks to the extent possible. In the event that a ship finds itself possibly having to commingle a new bunker with bunkers already on board, then it is important that the ship determines the compatibility between the two said bunkers before comingling.

3.3.1.5 The reference test method shall be the total potential sediment test in accordance with ISO 10307-2:2009.

3.3.2 Catalytic fines (cat fines)

3.3.2.1 Cat fines are a by-product of refining and consist of small particles of metal that are deliberately introduced as catalysts to "crack" the fuel oil. Unless reduced by purification, cat fines will become embedded in engine parts and cause serious and rapid engine damage. Reference should be made to engine manufacturer's guidance with respect to managing cat fines.

3.4 Key technical considerations for shipowners and operators

3.4.1 Ship tank configuration and fuel system – the viscosity of most of these blended residual fuels is such that they cannot be used in distillate fuel-only systems and machinery, as they require heating for cleaning and combustion. A fully segregated fuel system for both distillate fuels and these new fuels is recommended.

3.4.2 Tank cleaning is recommended when using a residual fuel tank for storing these new fuels. This is to prevent sludge that has built up in these tanks from entering the fuel system. Further information on tank cleaning is set out in appendix 3 of MEPC.1/Circ.878 on *Guidance on the development of a ship implementation plan for the consistent implementation of the 0.50% sulphur limit under MARPOL Annex VI*.

3.4.3 Heating requirements – due to the cold flow properties of most of these new fuels, permanent heating of the fuel may be necessary to minimize the risk of wax formation, also in storage. This is especially important in colder regions.

3.4.4 Fuel treatment system – Some of these new fuels may contain cat fines and/or sediments and therefore need on board cleaning. Separator temperature and settings should be adjusted to the fuels' viscosity and density. Please refer to recommendations from OEM and fuel supplier.

3.4.5 Considering that many of these new fuels have lower viscosities compared to conventional residual fuels, care should be taken to ensure no overheating occurs.

3.5 ISO Standard for residual fuels

3.5.1 The bunker market uses ISO 8217:2017[6] specifications to ensure that the properties of the fuels it delivers conform to a standard that mean they comply with MARPOL Annex VI.

3.5.2 The existing ISO 8217:2017[6] specification for marine fuels takes into consideration the diverse nature of marine fuels and incorporates a number of categories of distillate or residual fuels, even though not all categories may be available in every supply location it covers all marine petroleum fuel oils used today as well as the 0.50% Sulphur fuels of 2020. The General requirements, in the ISO 8217:2017[6] specification for marine fuels and characteristics, included in table 1 and 2 of ISO 8217:2017[6] identified safety, performance and environmental concerns and further takes into consideration the on board handling requirements, including

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[6] The latest edition of the ISO standard is recommended.

storage, cleaning and combustion aspects of all fuel oils used today and the anticipated fuel blends of 2020, irrespective of the sulphur content of the fuel oils.

3.5.3 It is important that any new standards address and do not preclude the use of renewable and alternative non-fossil crude derived products, so long as they comply with the chemical properties specified for these fuel oils.

3.6 Cylinder lubrication

3.6.1 The choice of cylinder lubricating oils will often follow the fuel type in use. So, when changing to VLSFO operation from RM operation the choice of appropriate cylinder lubricating oil should be considered in accordance with the recommendations of the engine manufacturer.

4 Verification issues and control mechanism and actions

4.1 Survey and certification by Administrations

4.1.1 When undertaking a survey in accordance with regulation 5 of MARPOL Annex VI, the Administration should conduct a survey of a ship to verify that the ship complies with the provisions to implement the 0.50% sulphur limit. In particular, the Administration should check whether the ship carries compliant fuel oils for use, based on the Bunker Delivery Note (BDN) on board, any other document or fuel oil samples as appropriate consistent with the provisions of regulation 18 of MARPOL Annex VI. If carriage of HSHFO for use is identified, the Administration should check whether regulation 3.2, regulation 4 of MARPOL Annex VI are applied to the ship, or if the ship encountered a fuel availability problem and is operating pursuant to regulation 18.2 of MARPOL Annex VI.

4.1.2 When an Administration decides to analyse a fuel oil sample to determine compliance with the sulphur limits in regulation 14.1 or 14.4, the final analysis should be carried out in accordance with ISO 8754:2003 by a laboratory that is accredited for the purpose of conducting the test in accordance with ISO/IEC 17025 or an equivalent standard. The test results should be in accordance with ISO 8754 reporting protocol, meaning a tested value at or above 0.10% sulphur should be reported with no more than two decimal places.

4.1.3 According to regulation 11.4 of MARPOL Annex VI, the Administration shall investigate any report of an alleged violation and thereafter promptly inform the Party which made the report, as well as the Organization, of the action taken. When informing the Organization, the MARPOL Annex VI GISIS module should be used.

4.2 Control measures by port States

4.2.1 Port States should take appropriate measures to ensure compliance with the 0.50% of sulphur limit under MARPOL Annex VI, in line with the regulation 10 of MARPOL Annex VI and the *2019 Guidelines for port State control under MARPOL Annex VI* (resolution MEPC.321(74)) (2019 PSC Guidelines). Specifically, the port State should conduct initial inspections based on documents and other possible materials, including remote sensing and portable devices. Given "clear grounds" to conduct a more detailed inspection, the port State may conduct sample analysis and other detailed inspections to verify compliance to the regulation, as appropriate.

4.2.2 Regulation 18.2.3 of MARPOL Annex VI requires a Party to take into account all relevant circumstances and the evidence presented to determine the action to take, including not taking control measures. Administrations and port State control authorities may take into account the implementation plan when verifying compliance with the 0.50% sulphur limit requirement.

4.2.3 Inspections based on documents and other possible targeting measurements

4.2.3.1 During the port State control and other enforcement activities, the port State should investigate whether a ship carries either compliant fuel oils or HSHFOs for use, based on the documents listed in paragraph 2.1.2 of the 2019 PSC Guidelines additionally records required to demonstrate compliance should also then be viewed. Results from remote sensing could be used to trigger inspections and portable devices could be used during the initial inspections, as appropriate. Remote sensing and portable devices are, however, of indicative nature and should not be regarded as the evidence of non-compliance, but may be considered clear grounds for expanding the inspection.

4.2.3.2 Port state should determine if regulations 3.2, 4 or 18.2.3 apply together with retained bunker delivery notes and IAPP Certificate when considering the status of any HSHFO being carried for use on board.

4.2.4 Fuel oil sample analysis

4.2.4.1 When the port State identifies clear grounds of suspected non-compliance of a ship based on initial inspections, the port State may require samples of fuel oils to be analysed. The samples to be analysed may be either the representative samples provided with BDN in accordance with regulation 18.8.2, MARPOL delivered samples or samples from designated sampling points in accordance with the *2019 Guidelines for on board sampling for the verification of the sulphur content of the fuel oil used on board ships* (MEPC.1/Circ.864/Rev.1) (in-use fuel oil samples) or other samples obtained by the port State.

4.2.4.2 Where the MARPOL delivered sample is taken from the ship a receipt should be provided to the ship. The outcome of the analysis undertaken with appendix VI of MARPOL Annex VI should be advised to the ship for its records.

4.2.4.3 In detecting suspected non-compliance, the sample analysis should be conducted in a uniform and reliable manner as described in paragraph 4.1.2. The verification procedure for MARPOL delivered samples should be in accordance with appendix VI[7] of MARPOL Annex VI. For other samples taken on board the ship, the in-use and onboard sample, the sample should be deemed to meet the requirements provided the test result from the laboratory does not exceed the specification limit +0.59R (where R is the reproducibility of the test method) and no further testing is necessary.

4.2.4.4 Notwithstanding the above process, all possible efforts should be made to avoid a ship being unduly detained or delayed. In particular, sample analysis of fuel oils should not unduly delay the operation, movement or departure of the ship.

4.2.4.5 If a non-compliance is established, consistent with regulation 18.2.3 the port State may prevent the ship from sailing until the ship takes any suitable measures to achieve compliance which may include de-bunkering all non-compliant fuel oil. In addition, the port State should report the information of the ship using or carrying for use non-compliant fuel oil to the Administration of the ship and inform the Party or non-Party under whose jurisdiction a bunker delivery note was issued of cases of delivery of non-compliant fuel oil, giving all relevant information. Upon receiving the information, the Party detecting the deficiency should report the information to the MARPOL Annex VI GISIS module in accordance with paragraph 3.4 of these Guidelines.

4.2.4.6 The Parties (the port and flag States), however, may permit, with the agreement of the destination port authority, a single voyage for bunkering of compliant fuel oil for the ship, in accordance with regulation 18.2.4 of MARPOL Annex VI. The single voyage should be one

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[7] Amendments to MARPOL VI, Appendix VI, *Verification procedures for a MARPOL Annex VI fuel oil sample (regulation 18.8.2 or regulation 14.8)*, expected to be adopted in Spring 2020 and set out in annex 11 to document MEPC 74/18.

way and minimum for bunkering, and the ship proceeds directly to the nearest bunkering facility appropriate to the ship. In the case that the parties permit a single voyage of a ship, the port State should confirm that the Administration of the ship has advised the authority at the destination port of the approval for a single voyage including information on the ship granted with the approval and the certified record of analysis of the sample as the evidence. Once confirmation has been provided the port State should permit the ship to sail as agreed.

4.2.4.7 If the port State is made aware that a ship is carrying non-compliant fuel oil, which is not for use through an equivalent method under regulation 4 or a permit under regulation 3.2 of MARPOL Annex VI, the port State should take action to confirm the fuel is not being used. Action to confirm should include, but is not limited to the examination of the oil record book and the record of tank soundings. Where necessary the port State may require tank soundings to be undertaken during the inspection. Where it is determined that the fuel has been used the control action in paragraph 4.2.4.5 should be applied.

4.2.5 Other open-sea compliance monitoring tools:

.1 fuel oil changeover calculator;

.2 data collection system for fuel oil consumption of ships (resolution MEPC.278(70)); and

.3 continuous SO_X monitoring.

4.3 Control on fuel oil suppliers

4.3.1 Designated authorities should, if deemed necessary, take a sample and test fuel oils from bunker barges or shore bunker terminals. Sampling of fuel oils in bunker barges or shore bunker terminals can be taken and tested in the same manner that the MARPOL delivered fuel oils are tested by the PSC. All possible efforts should be made to avoid a ship being unduly detained or delayed. If a sample is analysed, sample analysis of fuel oils should not unduly delay the operation, movement or departure of the ship.

4.3.2 If non-compliance, such as issuance of an incorrect BDN or a BDN without measurement of sulphur content, was found, the designated authorities should take appropriate corrective measures against the non-compliant supplier. In such case, the designated authorities should inform the Organization for transmission to the Member States of the non-compliant supplier, in accordance with the regulation 18.9.6 of MARPOL Annex VI and paragraph 4.4 of these Guidelines.

4.4 Information sharing related to non-compliances under MARPOL Annex VI

4.4.1 When a Party finds a non-compliance of a ship or a fuel oil supplier, the information of the non-compliance should be reported to the MARPOL Annex VI GISIS module (regulation 11.4).

4.4.2 Publication of information on non-compliant ships/fuel oil suppliers or a reporting scheme to IMO to be registered on centralized information platforms are proposed as elements of an effective enforcement strategy. Various PSC regimes have successfully used the publishing of information related to substandard ships/fuel suppliers as a deterrent to non-compliance. Port States also need to report detentions of ships to IMO which may affect the future PSC targeting of the ship. The IMO GISIS database already makes available certain information related to non-compliances with the MARPOL Annex VI regulations.

5 Fuel oil non-availability

5.1 Guidance and information sharing on fuel oil non-availability

5.1.1 Regulation 18.2.1 of MARPOL Annex VI provides that in the event compliant fuel oil cannot be obtained, a Party to MARPOL Annex VI can request evidence outlining the attempts made to obtain the compliant fuel oil, including attempts made to local alternative sources. Regulations 18.2.4 and 18.2.5 then require that the ship notifies its Administration and the competent authority of the port of destination on the inability to obtain compliant fuel oil, with the Party to notify IMO of the non-availability. This notification is commonly referred to as a Fuel Oil Non-Availability Report (FONAR).

5.1.2 Guidance on consistent evidence

5.1.3 Regulation 18.2.1.2 of MARPOL Annex VI requires that evidence be provided to support a claim that all efforts were made to obtain compliant fuel oil. In this regard, a Party may develop more detailed guidance for the consistent use and acceptance of these reports, including what evidence is needed to accompany a report to ensure that port States are applying the provisions under regulation 18.2.3, consistently.

5.1.4 Should a ship, despite its best effort to obtain compliant fuel oil, be unable to do so, the master/company must:

.1 present a record of actions taken to attempt to bunker correct fuel oil and provide evidence of an attempt to purchase compliant fuel oil in accordance with its voyage plan and, if it was not made available where planned, that attempts were made to locate alternative sources for such fuel oil and that despite best efforts to obtain compliant fuel oil, no such fuel oil was made available for purchase; and

.2 best efforts to procure compliant fuel oil include, but are not limited to, investigating alternate sources of fuel oil prior to commencing the voyage. If, despite best efforts, it was not possible to procure compliant fuel oil, the master/Company must immediately notify the port State Administration in the port of arrival and the flag Administration (regulation 18.2.4 of MARPOL Annex VI).

5.1.5 In order to minimize disruption to commerce and avoid delays, the master/company should submit a FONAR as soon as it is determined or becomes aware that it will not be able to procure and use compliant fuel oil.

5.1.6 Investigating non-availability

5.1.7 A Party should investigate the reports of non-availability. This process is important to ensure a consistent supply of compliant fuel to industry, as well as prevent incentives for ships to use ports where it is known that compliant fuel is not available on an ongoing basis. Critical to this process will be the sharing of information between Member States on reported compliant fuel oil supply issues.

5.1.8 Regulation 18.2.5 of MARPOL Annex VI provides that a Party to MARPOL Annex VI notify the Organization when a ship has presented evidence of the non-availability of compliant fuel oil in a port or at their terminal. For this purpose, MARPOL Annex VI GISIS module provides the platform for Parties to upload such notifications.

5.1.9 Regulation 18.1 of MARPOL Annex VI provides that each Party take all reasonable steps to promote the availability of above compliant fuel oil and inform the Organization through MARPOL Annex VI GISIS module of the availability of compliant fuel oils in its ports and terminals.

5.1.10 Port State control authority may contact the submitter (and/or shipowner or operator), including in the event of an incomplete submission, and request additional information, or to pursue an enforcement action such as a Notice of Violation.

5.2 Standard format for reporting fuel oil non-availability

5.2.1 For ships which are unable to purchase fuel oil meeting the requirements of regulations 14.1 or 14.4 of MARPOL Annex VI, the standard format for reporting fuel oil non-availability is set out in appendix 1 to this document, pursuant to regulation 18.2.4 of MARPOL Annex VI.

6 Possible safety implications relating to fuel oils meeting the 0.50% m/m sulphur limit

6.1 MEPC 73 (October 2018) approved MEPC.1/Circ.878 on *Guidance on the development of a ship implementation plan for the consistent implementation of the 0.50% sulphur limit under MARPOL Annex VI* (hereafter the "Ship Implementation Plan Guidance") addresses some safety issues identified with regard to 0.50% maximum sulphur fuel oil, in particular through the section on risk assessment (section 1 of the Ship Implementation Plan Guidance) and additional guidance provided on impact on machinery systems and tank cleaning (appendix 2 and appendix 3 of the Ship Implementation Plan Guidance, respectively).

6.2 Identified potential safety implications include, but are not limited to, the following:

.1 stability of blended fuel oil;

.2 compatibility, including new tests and metrics appropriate for future fuels;

.3 cold flow properties;

.4 acid number;

.5 flash point;

.6 ignition and combustion quality;

.7 cat fines;

.8 low viscosity; and

.9 unusual components.

6.3 Additional technical information and a review, displayed in tabular format, of the possible potential safety implications is set out in appendix 2.

6.4 Reference should also be made to general industry guidance on potential safety and operational issues related to the supply and use of 0.50% maximum sulphur fuels[8].

[8] ICS, ASA and ECSA Guidance to shipping companies and crews on preparing for compliance with the 2020 global sulphur limit can be accessed at the following link: http://www.ics-shipping.org/free-resources/2020-sulphur-compliance

APPENDIX 1

FUEL OIL NON-AVAILABILITY REPORT (FONAR)

Note:

1 This report is to be sent to the flag Administration and to the competent authorities in the relevant port(s) of destination in accordance with regulation 18.2.4 of MARPOL Annex VI. The report shall be sent as soon as it is determined that the ship/operator will be unable to procure compliant fuel oil 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 36 months.

2 This report should be used to provide evidence if a ship is unable to obtain fuel oil compliant with the provisions stipulated in regulations 14.1 or 14.4 of MARPOL Annex VI.

3 Before filing a FONAR, the following should be observed by the ship/operator:

3.1 A fuel oil non-availability report is not an exemption. According to regulation 18.2 of MARPOL Annex VI, it is the responsibility of the Party of the destination port, through its competent authority, to scrutinize the information provided and take action, as appropriate.

3.2 In the case of insufficiently supported and/or repeated claims of non-availability, the Party may require additional documentation and substantiation of fuel oil non-availability claims. The ship/operator may also be subject to more extensive inspections or examinations while in port.

3.3 Ships/operators are expected to take into account logistical conditions and/or terminal/port policies when planning bunkering, including but not limited to having to change berth or anchor within a port or terminal in order to obtain compliant fuel.

3.4 Ships/operators are expected to prepare as far as reasonably practicable to be able to operate on compliant fuel oils. This could include, but is not limited to, fuel oils with different viscosity and different sulphur content not exceeding regulatory requirements (requiring different lube oils) as well as requiring heating and/or other treatment on board.

1 Particulars of ship

1.1 Name of ship: _____
1.2 IMO number: _____
1.3 Flag: _____
1.4 (if other relevant registration number is available, enter here): _____

2 Description of ship's voyage plan

2.1 Provide a description of the ship's voyage plan in place at the time of entry into "country X" waters (and ECA, if applicable) (Attach copy of plan if available):

_____
_____
_____

2.2 Details of voyage:

1 – Last port of departure

_____

2 – First port of arrival in "country X":

_____

3 – Date of departure from last port (dd-mm-yyyy):

_____

4 – Date of arrival at first "country X" (dd-mm-yyyy):

_____

5 – Date ship first received notice that it would be transiting in "country X" waters (and ECA, if applicable) (dd-mm-yyyy):

_____

6 – Ship's location at the time of notice:

_____

7 – Date ship operator expects to enter "country X" waters (and ECA, if applicable) (dd-mm-yyyy):

_____

8 – Time ship operator expects to enter "country X" waters (and ECA, if applicable) (hh:mm UTC):

_____

9 – Date ship operator expects to exit "country X" waters (and ECA, if applicable) (dd-mm-yyyy):

_____

10 – Time ship operator expects to exit "country X" waters (and ECA, if applicable) (hh:mm UTC):

_____

11 – Projected days ship's main propulsion engines will be in operation within "country X" waters (and ECA, if applicable):

_____

12 – Sulphur content of fuel oil in use when entering and operating in "country X" waters (and ECA, if applicable):

_____

3 Evidence of attempts to purchase compliant fuel oil

3.1 Provide a description of actions taken to attempt to achieve compliance prior to entering "country X" waters (and ECA, if applicable), including a description of all attempts that were made to locate alternative sources of compliant fuel oil, and a description of the reason why compliant fuel oil was not available:

_____
_____
_____

3.2 Name and email address of suppliers contacted, address and phone number and date of contact (dd-mm-yyyy):

_____
_____
_____
_____
_____

Please attach copies of communication with suppliers (e.g. emails to and from suppliers)

4 In case of fuel oil supply disruption only

4.1 Name of port at which ship was scheduled to receive compliant fuel oil:

_____
_____
_____
_____
_____

4.2 Name, email address, and phone number of the fuel oil supplier that was scheduled to deliver (and now reporting the non-availability): _____

5 Operation constraints, if applicable

5.1 If non-compliant fuel has been bunkered due to concerns that the quality of the compliant fuel available would cause operational or safety problems on board the ships, the concerns should be thoroughly documented.

5.2 Describe any operational constraints that prevented use of compliant fuel oil available at port:

_____

5.3 Specify steps taken, or to be taken, to resolve these operational constraints that will enable compliant fuel use:

_____

6 Plans to obtain compliant fuel oil

6.1 Describe availability of compliant fuel oil at the first port-of-call in "country X", and plans to obtain it:

_____

6.2 If compliant fuel oil is not available at the first port-of-call in "country X", list the lowest sulphur content of available fuel oil(s) or the lowest sulphur content of available fuel oil at the next port-of-call:

_____

7 Previous Fuel Oil Non-Availability Reports

7.1 If shipowner/operator has submitted a Fuel Oil Non-Availability Report to "country X" in the previous 12 months, list the number of Fuel Oil Non-Availability Reports previously submitted and provide details on the dates and ports visited while using non-compliant fuel oil, as set out below:

Report: _____
Date (dd-mm-yyyy): _____
Port: _____
Type of fuel: _____
Comments: _____

8 Master/Company information

Master name: _____
Local agent in "country X": _____
Ship operator name: _____
Shipowner name: _____
Name and position of official: _____
Email address: _____
Address (street, city, country, postal/zip code): _____
Telephone number: _____

Signature of Master: _____

Print name: _____
Date (DD/MM/YYYY): _____

APPENDIX 2

TECHNICAL REVIEW OF IDENTIFIED POTENTIAL SAFETY IMPLICATIONS ASSOCIATED WITH THE USE OF 2020 COMPLIANT FUELS

Fuel Property	Potential Challenges	Remarks
Stability	The consequences of a ship receiving an unstable fuel, or one that becomes unstable during storage or handling, can be serious. Sludge may build up in the storage tanks, piping systems or centrifuges and filters can become totally blocked by voluminous amounts of sludge.	The challenge for the fuel producer is to blend a fuel which is not only stable but also has a degree of reserve stability such that it will remain stable during periods of storage and treatment at elevated temperatures. More paraffinic blend components are expected for Very Low Sulphur Fuel Oil (VLSFO) compared to existing fuels. Whereas aromatic components have a stabilizing effect on asphaltenes, paraffins do not. Fuel suppliers are responsible for ensuring that the supplied fuel is stable.
Compatibility issues	Challenges are the same as with stability (above).	An incompatible mix may be harmful to ship's operation. VLSFOs are expected to be paraffinic based in some regions and aromatic based in other regions. There is a risk of experiencing incompatibility when mixing an aromatic fuel with a paraffinic fuel. The same risk exists today, but with the wide range of products which may exist post 2020, it is important to segregate fuels as far as possible and to be cautious of how to manage/handle incompatible fuels on board.
Cold flow properties and Pour Point	ISO 8217:2017 limits the cold flow properties of a fuel through setting a limit on the pour point (PP). However, given that wax crystals form at temperatures above the PP, fuels that meet the specification in terms of PP can still be challenging when operating in colder regions. Wax particles can rapidly block filters, potentially plugging them completely. The paraffin's may crystallize and/or deposit in the storage tanks leading to blockages at the filters and reduced fuel flow to the machinery plants. If fuels are held at temperatures below the pour point, wax will begin to precipitate. This wax may cause blocking of filters and can deposit on heat exchangers. In severe	VLSFO products are expected to be more paraffinic compared to existing fuels. As such, it is important to know the cold flow properties of the bunkered fuel in order to ensure proper temperature management on board. It is important to note that for additives to be effective, they have to be applied before crystallization has occurred in the fuel. Reference 1.

Fuel Property	Potential Challenges	Remarks
	cases the wax will build up in storage tank bottoms and on heating coils, which can restrict the coils from heating the fuel (fuel will become unpumpable from the bunker tanks).	
Acid number	The fuel shall be free from strong, inorganic acids. Fuels with high acid number test results arising from acidic compounds cause accelerated damage to marine diesel engines. Such damage is found primarily within the fuel injection equipment.	There is currently no recognized correlation between an acid number test result and the corrosive activity of the fuel. ISO 8217:2017, appendix E covers the topic.
Flashpoint	Flashpoint is considered to be a useful indicator of the fire hazard associated with the storage of marine fuels. Even if fuels are stored at temperatures below the determined flash point, flammable vapours may still develop in the tank headspace.	SOLAS requirement.
Ignition and combustion quality	Fuels with poor ignition & combustion properties can, in extreme cases, result in serious operational problems, engine damage and even total breakdown. Poor combustion performance is normally characterized by an extended combustion period and/or poor rates of pressure increase and low "p max" resulting in incomplete combustion of the fuel. The resulting effects are increased levels of unburned fuel and soot that may be deposited in the combustion chamber, on the exhaust valves and in the turbocharger system, exhaust after treatment devices, waste heat recovery units and other exhaust system components. Extended combustion periods may also result in exposure of the cylinder liner to high temperatures which may disrupt the lubricating oil film, leading to increased wear rates and scuffing. Unburnt fuel droplets may also carry over impinging on the liner surfaces causing further risk of damage to the liner.	High and medium-speed engines are more prone to experience operational difficulties due to poor ignition and combustion properties than low speed two stroke types. With four stroke engines, poor ignition can result in excessive exhaust gas system deposits, black smoke, engine knocking and difficulties operating at low load. If the ignition process is delayed for too long a period by virtue of some chemical quality of the fuel, too large a quantity of fuel will be injected into the engine cylinders and will ignite at once, producing a rapid pressure and heat rise and causing associated damage to the piston rings and cylinder liners of the engine. Reference 2.

Fuel Property	Potential Challenges	Remarks
Cat fines	Cat fines will cause abrasive wear of cylinder liners, piston rings and fuel injection equipment if not reduced sufficiently by the fuel treatment system. High wear in the combustion chamber can result.	Major engine manufacturers recommend that the fuel's cat fines content does not exceed 10 mg/kg (ppm) at engine inlet.
Low viscosity	Low-viscosity fuels (less than 2 cSt at engine inlet) challenge the function of the fuel pump in the following ways: .1 breakdown of the oil film, which could result in seizures; .2 insufficient injection pressure, which results in difficulties during start-up and low-load operation; and .3 insufficient fuel index margin, which limits acceleration.	Low fuel viscosity does not only affect the engine fuel pumps. Most pumps in the external fuel oil system (supply pumps, circulating pumps, transfer pumps and feed pumps for the centrifuge) also need viscosities above 2 cSt to function properly. Viscosity is highly temperature dependent and the crew must take proper care of fuel oil temperature management to avoid viscosity related issues. Reference 3.
Unusual components	The below components and group of components can be linked to the risk of encountering the following problems: Polymers (e.g. polystyrene, polyethylene, polypropylene) Associated with filter blocking Polymethacrylates Associated with fuel pump sticking Phenols Occasionally Associated with filter blocking/fuel oil pump sticking Tall oils Associated with filter blocking Chlorinated hydrocarbons Associated with fuel pump seizures Estonian shale oil Associated in the past with excessive separator sludging Organic acids Associated with corrosion as well as fuel pump sticking	Only for few components, there exists a clear cause and effect between component and associated operational problems. There is no statistical study performed of which components are typically found in marine fuels and in which concentration. As per ISO 8217:2017, annex B: The marine industry continues to build on its understanding of the impact of specific chemical species and the respective critical concentrations at which detrimental effects are observed on the operational characteristics of marine fuels in use. Only in some of the past cases the origin of the unusual components found in bunkers were revealed and were due to various reasons such as: .1 Russia/Baltic states 1997, cross contamination in storage/piping (polypropylene); .2 Singapore 2001, 4 bunker barges received material from road

Fuel Property	Potential Challenges	Remarks
		tankers which, in addition to transporting fuel, also collected/transported waste oil from shipyards and motor shops (esters); .3 Ventspils 2007, Estonian shale oil to convert HSHFOs to LSFOS; and .4 Houston 2010/11, bunker barges that were not cleaned between cargoes (polyacrylates) Reference 4.

References

1 CIMAC WG7 Fuels Guideline 01/2015: "Cold flow properties of marine fuel oils"
2 CIMAC WG7 Fuels 2011: "Fuel Quality Guide: Ignition and Combustion"
3 MAN Service Letter SL2014-593/DOJA
4 Bureau Veritas Verifuel, Investigative analysis of marine fuel oils: Pros & Cons

_____

Marine Safety Information Bulletin

Commandant
U.S. Coast Guard
Inspections and Compliance Directorate
2703 Martin Luther King Jr Ave SE, STOP 7501
Washington, DC 20593-7501

MSIB Number: 005-19
Date: June 28, 2019
Contact: cgcvc@uscg.mil
Phone: 202-372-1435

NEW PROCEDURE FOR SHIPPING INDUSTRY TO NOTIFY THE US GOVERNMENT OF NON AVAILABILITY OF COMPLIANT FUEL OIL

1. Effective immediately, owners and operators of vessels operating in the North American (NA) or U.S. Caribbean Sea Emission Control Area (ECA) that are unable to acquire sufficient MARPOL Annex VI compliant fuel oil at a foreign or U.S. port may satisfy the MARPOL Annex VI Regulation 18.2.4 requirement to notify the competent authority of the relevant port of destination by notifying the cognizant U.S. Coast Guard Captain of the Port (COTP). Effective June 30, 2019, the U.S. Environmental Protection Agency (EPA) will stop accepting Fuel Oil Non-Availability Reports (FONARs).

2. Failure to make the notifications required by MARPOL Annex VI, 18.2.4 may result in a vessel control (e.g., detention) and/or enforcement action.

3. There is no specific format* for the notification; however, consistent with MARPOL Annex VI, Regulation 18.2.1, the ship owner or operator should be prepared to present a record of the actions taken to achieve compliance, including evidence that they attempted to purchase compliant fuel oil in accordance with the vessel's voyage plan.

4. The U.S. Coast Guard will investigate all reports of non-compliance with MARPOL Annex VI to determine what actions may be warranted. Such actions may range from completing the investigation with no follow-on action, detaining the vessel, and/or pursuing civil penalties. The Coast Guard may also refer the matter to EPA.

5. Ship owners and operators are reminded that the sulfur content of any fuel oil used onboard ships within the NA or U.S. Caribbean Sea ECAs will not change when the worldwide sulfur cap is reduced on January 1, 2020.

6. The information herein is not a substitute for applicable legal requirements, nor is it itself a rule. It is not intended to nor does it impose legally binding requirements on any party. It represents the Coast Guard's current thinking on this topic and may assist industry, mariners, the general public, and the Coast Guard, as well as other federal and state regulators, in applying statutory and regulatory requirements. You can use an alternative approach for complying with these requirements if the approach satisfies the requirements of the applicable statutes and regulations. If you want to discuss an alternative approach (you are not required to do so), you may contact Office of Commercial Vessel Compliance, (CG-CVC) by email at cgcvc@uscg.mil.

* There is no specific format at this time for a FONAR. Until the International Maritime Organization (IMO) adopts one, it is suggested ships use the format provided in the Annex to PPR 6/8/2 ("Consistent Implementation of Regulation 14.1.3 of MARPOL Annex VI: Proposed Template to report compliant fuel oil non-availability").

Attachment (3)

LOUISIANA MARITIME ASSOCIATION

LAMA Circular Number: 01-2019 Date: 02 October 2019

SUBJECT: SULPHUR EMISSIONS AND SCRUBBERS

Key Agency: Regulatory: International Maritime Organization (IMO
U.S. Enforcement: USEPA/USCG

References –
(a) IMO Annex VI - Regulations for the Prevention of Air Pollution from Ships
Chapter 3 – Requirements for Control of Emissions from Ships
Regulation 14 – Sulphur Oxides (SOx)
(b) Resolution MEPC 259(68) 2015 Guidelines for Exhaust Gas Cleaning Systems
(c) US – EPA – 40 CFR Parts 80, 85, 86. Control of Emissions from Marine Engines

Short Answer

- The use of Scrubbers in lieu of burning Low Sulphur Fuel Oil is allowed.
- The Flag State is responsible for the testing and approval of the Scrubber.
- The scrubber system must be installed, inspected, certificated, and operated in accordance with MEPC 184(59).
- The Flag State must issue the International Air Pollution Prevention (IAPP) Certificate with Sections 2.3 and 2.6 completed indicating the specifics of the scrubber system.
- The vessel must operate all systems in accordance with the IAPP Certificate and the system operating guidelines.
- Sections 5.3.2, 4.2.3.2, and 10.1.5.2 of MEPC 259(68) refer to Port State Control inspections.

Discussion

January 1, 2020 -

- Under the International Maritime Organization (IMO) regulations, as of January 1, 2020, vessels operating outside of Emission Control Areas (ECA) are limited to the use of fuel oil with a SOx content of not more than 0.5%.
- Vessels operating within an ECA will be limited to the use of fuel oil with a SOx content of not more than 0.1%.

Note that inside the North America Emissions Control Area (NA-ECA) the maximum fuel oil SOx content was limited to 0.1% as of January 1, 2015.

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LOUISIANA MARITIME ASSOCIATION

Alternative to Use of Low Sulphur Fuel Oil

Under the IMO Regulations, *Equivalent Alternatives* to the use of Low Sulphur Fuel Oil that are "*at least as effective in terms of emissions reduction*" is allowed for vessels to reduce SOx emissions.

Exhaust Gas Cleaning System (EGCS) – "*Scrubbers*"

As the Global Sulfur Cap comes into place, owners and operators who choose to continue using HFO will need to install an Exhaust Gas Cleaning Systems (EGCS), commonly known as a scrubber. These systems are designed to remove air pollutants from the exhaust gas. The exhaust can be treated with different substances including sea water, fresh water or dry chemicals. After treating the exhaust, the EGCS creates a waste stream that requires disposal.

IMO MEPC 259(68) provides the "Guidelines for Exhaust Gas Cleaning Systems. (Attached)

Ronald W. Branch
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ANNEX 1

RESOLUTION MEPC.259(68)
(adopted on 15 May 2015)

2015 GUIDELINES FOR EXHAUST GAS CLEANING SYSTEMS

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee (the Committee) conferred upon it by international conventions for the prevention and control of marine pollution from ships,

RECALLING ALSO that, at its fifty-eighth session, the Committee adopted, by resolution MEPC.176(58), a revised MARPOL Annex VI which significantly strengthens the emission limits for sulphur oxides (SO_X),

RECALLING FURTHER that, at its fifty-ninth session, the Committee adopted, by resolution MEPC.184(59), the *2009 Guidelines for exhaust gas cleaning systems* (hereinafter referred to as "2009 EGCS Guidelines"),

NOTING that the revised MARPOL Annex VI entered into force on 1 July 2010,

NOTING ALSO that regulation 4 of MARPOL Annex VI allows the use of an alternative compliance method at least as effective in terms of emission reductions as that required by MARPOL Annex VI, including any of the standards set forth in regulation 14, taking into account guidelines developed by the Organization,

RECOGNIZING the need to update the 2009 EGCS Guidelines accordingly,

HAVING CONSIDERED, at its sixty-eighth session, draft amendments to the 2009 EGCS Guidelines, prepared by the Sub-Committee on Pollution Prevention and Response, at its second session,

1 ADOPTS the *2015 Guidelines for exhaust gas cleaning systems*, as set out in the annex to the present resolution;

2 INVITES Administrations to take these Guidelines into account when allowing the use of an exhaust gas cleaning system in accordance with regulation 4 of MARPOL Annex VI;

3 REQUESTS Parties to MARPOL Annex VI and other Member Governments to bring these Guidelines to the attention of shipowners, ship operators, shipbuilders, marine diesel engine manufacturers and any other interested groups;

4 INVITES Administrations to provide for collection of data as described in appendix 3 of these Guidelines;

5 AGREES to keep these Guidelines under review in the light of experience gained with their application;

6 SUPERSEDES the 2009 EGCS Guidelines adopted by resolution MEPC.184(59).

ANNEX

2015 GUIDELINES FOR EXHAUST GAS CLEANING SYSTEMS

1 INTRODUCTION

1.1 Regulation 14 of Annex VI requires ships to use fuel oil with a sulphur content not exceeding that stipulated in regulations 14.1 or 14.4. Regulation 4 allows, with the approval of the Administration, the use of an alternative compliance method at least as effective in terms of emission reductions as that required by the Annex, including the standards set forth in regulation 14. The Administration of a Party should take into account any relevant guidelines developed by the Organization pertaining to alternatives provided for in regulation 4.

1.2 Similar to a NO_X emission reduction system, an exhaust gas cleaning (EGC) unit may be approved subject to periodic parameter and emission checks or the system may be equipped with a continuous emission monitoring system. These guidelines have been developed with the intention of being objective and performance oriented. Furthermore, use of the SO_2(ppm)/CO_2(%) ratio method will simplify the monitoring of SO_X emission and facilitate approval of an EGC unit. See appendix II for the rationale explaining the use of SO_2(ppm)/CO_2(%) as the basis for system monitoring.

1.3 Compliance should be demonstrated on the basis of the SO_2(ppm)/CO_2(% v/v) ratio values.

Table 1: Fuel oil sulphur limits recorded in regulations 14.1 and 14.4 and corresponding emissions values

Fuel oil sulphur content (% m/m)	Ratio emission SO_2(ppm)/CO_2(% v/v)
4.50	195.0
3.50	151.7
1.50	65.0
1.00	43.3
0.50	21.7
0.10	4.3

Note: The use of the ratio emissions limits is only applicable when using petroleum based distillate or residual fuel oils. See appendix II for application of the ratio method.

1.4 These guidelines are recommendatory in nature, however, Administrations are invited to base the implementation of the relevant requirements of regulation 4 of MARPOL Annex VI on them.

2 GENERAL

2.1 Purpose

2.1.1 The purpose of these guidelines is to specify 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 14.1 and 14.4 of MARPOL Annex VI.

2.1.2 These guidelines permit two schemes: Scheme A (unit certification with parameter and emission checks and Scheme B (continuous emission monitoring with parameter checks).

2.1.3 For ships which are to use an exhaust gas cleaning system in part or in total in order to comply with regulations 14.1 and/or 14.4 of MARPOL Annex VI, there should be an approved SO_X Emissions Compliance Plan (SECP).

2.2 Application

2.2.1 These guidelines apply to any EGC unit as fitted to fuel oil combustion machinery, excluding shipboard incinerators, installed on board a ship.

2.3 Definitions and required documents

Fuel oil combustion unit	Any engine, boiler, gas turbine, or other fuel oil fired equipment, excluding shipboard incinerators
EGC	Exhaust gas cleaning
SO_X	Sulphur oxides
SO_2	Sulphur dioxide
CO_2	Carbon dioxide
UTC	Universal Time Co-ordinated
Certified Value	The SO_2/CO_2 ratio specified by the manufacturer that the EGC unit is certified as meeting when operating on a continuous basis on the manufacturers specified maximum fuel sulphur content
In situ	Sampling directly within an exhaust gas stream
MCR	Maximum Continuous Rating
Load range	Maximum rated power of diesel engine or maximum steaming rate of the boiler
SECP	SO_X Emissions Compliance Plan
SECC	SO_X Emissions Compliance Certificate
ETM-A	EGC system – Technical Manual for Scheme A
ETM-B	EGC system – Technical Manual for Scheme B
OMM	Onboard Monitoring Manual
EGC Record Book	A record of the EGC unit in-service operating parameters, component adjustments, maintenance and service records as appropriate

Document	Scheme A	Scheme B
SECP	X	X
SECC	X	
ETM Scheme A	X	
ETM Scheme B		X
OMM	X	X
EGC Record Book or Electronic Logging System	X	X

3 SAFETY NOTE

Due attention is to be given to the safety implications related to the handling and proximity of exhaust gases, the measurement equipment and the storage and use of pressurized containers of pure and calibration gases. Sampling positions and permanent access platforms should be such that this monitoring may be performed safely. In locating discharge outlet of washwater used in the EGC unit, due consideration should be given to the location of the

ship's seawater inlet. In all operating conditions the pH should be maintained at a level that avoids damage to the vessel's anti-fouling system, the propeller, rudder and other components that may be vulnerable to acidic discharges, potentially causing accelerated corrosion of critical metal components.

4 SCHEME A – EGC SYSTEM APPROVAL, SURVEY AND CERTIFICATION USING PARAMETER AND EMISSION CHECKS

4.1 Approval of EGC systems

4.1.1 General

Options under Scheme A of these guidelines provide for:

.1 unit approval;

.2 serially manufactured units; and

.3 production range approval.

4.1.2 Unit approval

4.1.2.1 An EGC unit should be certified as capable of meeting the limit value, (the Certified Value), specified by the manufacturer (e.g. the emission level the unit is capable of achieving on a continuous basis) with fuel oils of the manufacturer's specified maximum % m/m sulphur content and for the range of operating parameters, as listed in paragraph 4.2.2.1.2, for which they are to be approved. The Certified Value should at least be suitable for ship operations under requirements given by MARPOL Annex VI regulations 14.1 and/or 14.4.

4.1.2.2 Where testing is not to be undertaken with fuel oils of the manufacturer's specified maximum % m/m sulphur content, the use of two test fuels with a lower % m/m sulphur content is permitted. The two fuels selected should have a difference in % m/m sulphur content sufficient to demonstrate the operational behaviour of the EGC unit and to demonstrate that the Certified Value can be met if the EGC unit were to be operated with a fuel of the manufacturer's specified maximum % m/m sulphur content. In such cases a minimum of two tests, in accordance with section 4.3 as appropriate, should be performed. These need not be sequential and could be undertaken on two different, but identical, EGC units.

4.1.2.3 The maximum and, if applicable, minimum exhaust gas mass flow rate of the unit should be stated. The effect of variation of the other parameters defined in paragraph 4.2.2.1.2 should be justified by the equipment manufacturer. The effect of variations in these factors should be assessed by testing or otherwise as appropriate. No variation in these factors, or combination of variations in these factors, should be such that the emission value of the EGC unit would be in excess of the Certified Value.

4.1.2.4 Data obtained in accordance with this section should be submitted to the Administration for approval together with the ETM-A.

4.1.3 Serially manufactured units

In the case of nominally similar EGC units of the same mass flow ratings as that certified under 4.1.2, and to avoid the testing of each EGC unit, the equipment manufacturer may submit, for acceptance by the Administration, a conformity of production arrangement. The

certification of each EGC unit under this arrangement should be subject to such surveys that the Administration may consider necessary as to assure that each EGC unit has an emission value of not more than the Certified Value when operated in accordance with the parameters defined in paragraph 4.2.2.1.2.

4.1.4 Product range approval

4.1.4.1 In the case of an EGC unit of the same design, but of different maximum exhaust gas mass flow capacities, the Administration may accept, in lieu of tests on an EGC unit of all capacities in accordance with section 4.1.2, tests of EGC systems of three different capacities provided that the three tests are performed at intervals including the highest, lowest and one intermediate capacity rating within the range.

4.1.4.2 Where there are significant differences in the design of EGC units of different capacities, this procedure should not be applied unless it can be shown, to the satisfaction of the Administration, that in practice those differences do not materially alter the performance between the various EGC unit types.

4.1.4.3 For EGC units of different capacities, the sensitivity to variations in the type of combustion machinery to which they are fitted should be detailed together with sensitivity to the variations in the parameters listed in paragraph 4.2.2.1.2. This should be on the basis of testing, or other data as appropriate.

4.1.4.4 The effect of changes of EGC unit capacity on washwater characteristics should be detailed.

4.1.4.5 All supporting data obtained in accordance with this section, together with the ETM-A for each capacity unit, should be submitted to the Administration for approval.

4.2 Survey and certification

4.2.1 Procedures for the certification of an EGC unit

4.2.1.1 In order to meet the requirements of section 4.1 either prior to, or after installation on board, each EGC unit should be certified as meeting the Certified Value specified by the manufacturer (e.g. the emission level the unit is capable of achieving on a continuous basis) under the operating conditions and restrictions as given by the EGC Technical Manual (ETM-A) as approved by the Administration.

4.2.1.2 Determination of the Certified Value should be in accordance with the provisions of these guidelines.

4.2.1.3 Each EGC unit meeting the requirements of paragraph 4.2.1.1 should be issued with a SECC by the Administration. The form of the SECC is given in appendix 1.

4.2.1.4 Application for an SECC should be made by the EGC system manufacturer, shipowner or other party.

4.2.1.5 Any subsequent EGC units of the same design and rating as that certified under paragraph 4.2.1.1 may be issued with an SECC by the Administration without the need for testing in accordance with paragraph 4.2.1.1 subject to section 4.1.3 of these guidelines.

4.2.1.6 EGC units of the same design, but with ratings different from that certified under paragraph 4.2.1.1 may be accepted by the Administration subject to section 4.1.4 of these guidelines.

4.2.1.7 EGC units which treat only part of the exhaust gas flow of the uptake in which they are fitted should be subject to special consideration by the Administration to ensure that under all defined operating conditions that the overall emission value of the exhaust gas downstream of the system is no more than the Certified Value.

4.2.2 EGC System Technical Manual "Scheme A" (ETM-A)

4.2.2.1 Each EGC unit should be supplied with an ETM-A provided by the manufacturer. This ETM-A should, as a minimum, contain the following information:

.1 the identification of the unit (manufacturer, model/type, serial number and other details as necessary) including a description of the unit and any required ancillary systems;

.2 the operating limits, or range of operating values, for which the unit is certified. These should, as a minimum, include:

.1 maximum and, if applicable, minimum mass flow rate of exhaust gas;

.2 the power, type and other relevant parameters of the fuel oil combustion unit for which the EGC unit is to be fitted. In the cases of boilers, the maximum air/fuel ratio at 100% load should also be given. In the cases of diesel engines whether the engine is of 2 or 4-stroke cycle;

.3 maximum and minimum washwater flow rate, inlet pressures and minimum inlet water alkalinity (ISO 9963-1-2);

.4 exhaust gas inlet temperature ranges and maximum and minimum exhaust gas outlet temperature with the EGC unit in operation;

.5 exhaust gas differential pressure range and the maximum exhaust gas inlet pressure with the fuel oil combustion unit operating at MCR or 80% of power rating whichever is appropriate;

.6 salinity levels or fresh water elements necessary to provide adequate neutralizing agents; and

.7 other factors concerning the design and operation of the EGC unit relevant to achieving a maximum emission value no higher than the Certified Value;

.3 any requirements or restrictions applicable to the EGC unit or associated equipment necessary to enable the unit to achieve a maximum emission value no higher than the Certified Value;

.4 maintenance, service or adjustment requirements in order that the EGC unit can continue to achieve a maximum emission value no higher than the Certified Value. The maintenance, servicing and adjustments should be recorded in the EGC Record Book;

.5 corrective actions in case of exceedances of the applicable maximum allowable SO_2/CO_2 ratio, or wash water discharge criteria;

.6 a verification procedure to be used at surveys to ensure that its performance is maintained and that the unit is used as required (see section 4.4);

.7 through range performance variation in washwater characteristics;

.8 design requirements of the washwater system; and

.9 the SECC.

4.2.2.2 The ETM-A should be approved by the Administration.

4.2.2.3 The ETM-A should be retained on board the ship onto which the EGC unit is fitted and should be available for surveys as required.

4.2.2.4 Amendments to the ETM-A which reflect EGC unit changes that affect performance with respect to emissions to air and/or water should be approved by the Administration. Where additions, deletions or amendments to the ETM-A are separate to the ETM-A as initially approved, they should be retained with the ETM-A and should be considered as part of it.

4.2.3 In-service surveys

4.2.3.1 The EGC unit should be subject to survey on installation and at initial, annual/intermediate and renewals surveys by the Administration.

4.2.3.2 In accordance with regulation 10 of MARPOL Annex VI, EGC units may also be subject to inspection by port State control.

4.2.3.3 Prior to use, each EGC unit should be issued with an SECC by the Administration.

4.2.3.4 Following the installation survey as required by paragraph 4.2.3.1, section 2.6 of the Supplement to the ship's International Air Pollution Certificate should be duly completed.

4.3 Emission limits

4.3.1 Each EGC unit should be capable of reducing emissions to equal to or less than the Certified Value at any load point when operated in accordance with the criteria as given in paragraph 4.2.2.1.2, as specified in paragraphs 4.3.2 to 4.3.5 of these guidelines, and as excepted in paragraph 4.3.7.

4.3.2 EGC units fitted to main propulsion diesel engines should meet the requirements of paragraph 4.3.1 at all loads between 25 to 100% of the load range of the engines to which they are fitted.

4.3.3 EGC units fitted to auxiliary diesel engines should meet the requirements of paragraph 4.3.1 at all loads between 10 to 100% of the load range of the engines to which they are fitted.

4.3.4 EGC units fitted to diesel engines which supply power for both main propulsion and auxiliary purposes should meet the requirements of paragraph 4.3.3.

4.3.5 EGC units fitted to boilers should meet the requirements of paragraph 4.3.1 at all loads between 10 to 100% of the load range (steaming rates) or, if the turn down ratio is smaller, over the actual load range of the boilers to which they are fitted.

4.3.6 In order to demonstrate performance, emission measurements should be undertaken, with the agreement of the Administration, at a minimum of four load points. One load point should be at 95 to 100% of the maximum exhaust gas mass flow rate for which the unit is to be certified. One load point should be within ± 5% of the minimum exhaust gas mass flow rate for which the unit is to be certified. The other two load points should be equally spaced between the maximum and minimum exhaust gas mass flow rates. Where there are discontinuities in the operation of the system the number of load points should be increased, with the agreement of the Administration, so that it is demonstrated that the required performance over the stated exhaust gas mass flow rate range is retained. Additional intermediate load points should be tested if there is evidence of an emission peak below the maximum exhaust gas mass flow rate and above, if applicable, the minimum exhaust gas flow rate. These additional tests should be sufficient number as to establish the emission peak value.

4.3.7 For loads below those specified in paragraphs 4.3.2 to 4.3.5, the EGC unit should continue in operation. In those cases where the fuel oil combustion equipment may be required to operate under idling conditions, the SO_2 emission concentration (ppm) at standardized O_2 concentration (15.0% diesel engines, 3.0% boilers) should not exceed 50 ppm.

4.4 Onboard procedures for demonstrating compliance

4.4.1 For each EGC unit, the ETM-A should contain a verification procedure for use at surveys as required. This procedure should not require specialized equipment or an in-depth knowledge of the system. Where particular devices are required they should be provided and maintained as part of the system. The EGC unit should be designed in such a way as to facilitate inspection as required. The basis of this verification procedure is that if all relevant components and operating values or settings are within those as approved, then the performance of the EGC system is within that required without the need for actual exhaust emission measurements. It is also necessary to ensure that the EGC unit is fitted to a fuel oil combustion unit for which it is rated – this forms part of the SECP. A Technical File related to an EIAPP certificate, if available, or an Exhaust Gas Declaration issued by the engine maker or designer or another competent party or a Flue Gas Declaration issued by the boiler maker or designer or another competent party serves this purpose to the satisfaction of the Administration.

4.4.2 Included in the verification procedure should be all components and operating values or settings which may affect the operation of the EGC unit and its ability to meet the Certified Value.

4.4.3 The verification procedure should be submitted by the EGC system manufacturer and approved by the Administration.

4.4.4 The verification procedure should cover both a documentation check and a physical check of the EGC unit.

4.4.5 The surveyor should verify that each EGC unit is installed in accordance with the ETM-A and has an SECC as required.

4.4.6 At the discretion of the Administration, the surveyor should have the option of checking one or all of the identified components, operating values or settings. Where there is more than one EGC unit, the Administration may, at its discretion, abbreviate or reduce the extent of the survey on board, however, the entire survey should be completed for at least one of each type of EGC unit on board provided that it is expected that the other EGC units perform in the same manner.

4.4.7 The EGC unit should include means to automatically record when the system is in use. This should automatically record, at least at the frequency specified in paragraph 5.4.2, as a minimum, washwater pressure and flow rate at the EGC unit's inlet connection, exhaust gas pressure before and pressure drop across the EGC unit, fuel oil combustion equipment load, and exhaust gas temperature before and after the EGC unit. The data recording system should comply with the requirements of sections 7 and 8. In case of a unit consuming chemicals at a known rate as documented in ETM-A, records of such consumption in the EGC Record Book also serves this purpose.

4.4.8 Under Scheme A, if a continuous exhaust gas monitoring system is not fitted, it is recommended that a daily spot check of the exhaust gas quality in terms of SO_2(ppm)/CO_2(%) ratio, is used to verify compliance in conjunction with parameter checks stipulated in paragraph 4.4.7. If a continuous exhaust gas monitoring system is fitted, only daily spot checks of the parameters listed in paragraph 4.4.7 would be needed to verify proper operation of the EGC unit.

4.4.9 If the EGC system manufacturer is unable to provide assurance that the EGC unit will meet the Certified Value or below between surveys, by means of the verification procedure stipulated in paragraph 4.4.1, or if this requires specialist equipment or in-depth knowledge, it is recommended that continuous exhaust gas monitoring of each EGC unit be used, Scheme B, to assure compliance with regulations 14.1 and/or 14.4 of MARPOL Annex VI.

4.4.10 An EGC Record Book should be maintained by the shipowner recording maintenance and service of the unit including like-for-like replacement. The form of this record should be submitted by the EGC system manufacturer and approved by the Administration. This EGC Record Book should be available at surveys as required and may be read in conjunction with engine-room log-books and other data as necessary to confirm the correction operation of the EGC unit. Alternatively, this information should be recorded in the vessel's planned maintenance record system as approved by the Administration.

5 SCHEME B – EGC SYSTEM APPROVAL, SURVEY AND CERTIFICATION USING CONTINUOUS MONITORING OF SO_X EMISSIONS

5.1 General

This Scheme should be used to demonstrate that the emissions from a fuel oil combustion unit fitted with an EGC will, with that system in operation, result in the required emission value (e.g. as stated in the SECP) or below at any load point, including during transient operation and thus compliance with the requirements of regulations 14.1 and/or 14.4 of MARPOL Annex VI.

5.2 Approval

Compliance demonstrated in service by continuous exhaust gas monitoring. Monitoring system should be approved by the Administration and the results of that monitoring available to the Administration as necessary to demonstrate compliance as required.

5.3 Survey and certification

5.3.1 The monitoring system of the EGC system should be subject to survey on installation and at initial, annual/intermediate and renewals surveys by the Administration.

5.3.2 In accordance with regulation 10 of MARPOL Annex VI, monitoring systems of EGC units may also be subject to inspection by port State control.

5.3.3 In those instances where an EGC system is installed, section 2.6 of the Supplement to the ship's International Air Pollution Prevention Certificate should be duly completed.

5.4 Calculation of emission rate

5.4.1 Exhaust gas composition in terms of SO_2(ppm)/CO_2(%) should be measured at an appropriate position after the EGC unit and that measurement should be in accordance with the requirements of section 6 as applicable.

5.4.2 SO_2(ppm) and CO_2(%) to be continuously monitored and recorded onto a data recording and processing device at a rate which should not be less than 0.0035 Hz.

5.4.3 If more than one analyser is to be used to determine the SO_2/CO_2 ratio, these should be tuned to have similar sampling and measurement times and the data outputs aligned so that the SO_2/CO_2 ratio is fully representative of the exhaust gas composition.

5.5 Onboard procedures for demonstrating compliance with emission limit

5.5.1 The data recording system should comply with the requirements of sections 7 and 8.

5.5.2 Daily spot checks of the parameters listed in paragraph 4.4.7 are needed to verify proper operation of the EGC unit and should be recorded in the EGC Record Book or in the engine-room logger system.

5.6 EGC System Technical Manual "Scheme B" (ETM-B)

5.6.1 Each EGC unit should be supplied with an ETM-B provided by the manufacturer. This ETM-B should, as a minimum, contain the following information:

.1 the identification of the unit (manufacturer, model/type, serial number and other details as necessary) including a description of the unit and any required ancillary systems;

.2 the operating limits, or range of operating values, for which the unit is certified. These should, as a minimum, include:

.1 maximum and, if applicable, minimum mass flow rate of exhaust gas;

.2 the power, type and other relevant parameters of the fuel oil combustion unit for which the EGC unit is to be fitted. In the cases of boilers, the maximum air/fuel ratio at 100% load should also be given. In the cases of diesel engines whether the engine is of 2 or 4-stroke cycle;

.3 maximum and minimum washwater flow rate, inlet pressures and minimum inlet water alkalinity (ISO 9963-1-2);

.4 exhaust gas inlet temperature ranges and maximum and minimum exhaust gas outlet temperature with the EGC unit in operation;

.5 exhaust gas differential pressure range and the maximum exhaust gas inlet pressure with the fuel oil combustion unit operating at MCR or 80% of power rating whichever is appropriate;

.6 salinity levels or fresh water elements necessary to provide adequate neutralizing agents; and

.7 other parameters as necessary concerning the operation of the EGC unit;

.3 any requirements or restrictions applicable to the EGC unit or associated equipment;

.4 corrective actions in case of exceedances of the applicable maximum allowable SO_2/CO_2 ratio, or washwater discharge criteria;

.5 through range performance variation in washwater characteristics;

.6 design requirements of the washwater system.

5.6.2 The ETM-B should be approved by the Administration.

5.6.3 The ETM-B should be retained on board the ship onto which the EGC unit is fitted. The ETM-B should be available for surveys as required.

5.6.4 Amendments to the ETM-B which reflect EGC unit changes that affect performance with respect to emissions to air and/or water should be approved by the Administration. Where additions, deletions or amendments to the ETM-B are separate to the ETM-B as initially approved, they should be retained with the ETM-B and should be considered as part of it.

6 EMISSION TESTING

6.1 Emission testing should follow the requirements of the NO_X Technical Code 2008, chapter 5, and associated appendices, except as provided for in these guidelines.

6.2 CO_2 should be measured using an analyser operating on non-dispersive infrared (NDIR) principle and with additional equipment such as dryers as necessary. SO_2 should be measured using analysers operating on non-dispersive infrared (NDIR) or non-dispersive ultra-violet (NDUV) principles and with additional equipment such as dryers as necessary. Other systems or analyser principles may be accepted, subject to the approval of the Administration, provided they yield equivalent or better results to those of the equipment referenced above. For acceptance of other CO_2 systems or analyser principles, the reference method should be in accordance with the requirements of appendix III of the NO_X Technical Code 2008.

6.3 Analyser performance should be in accordance with the requirements of sections 1.6 to 1.10 of appendix III of the NO_X Technical Code 2008.

6.4 An exhaust gas sample for SO_2 should be obtained from a representative sampling point downstream of the EGC unit.

6.5 SO_2 and CO_2 should be monitored using either in situ or extractive sample systems.

6.6 Extractive exhaust gas samples for SO_2 determination should be maintained at a sufficient temperature to avoid condensed water in the sampling system and hence loss of SO_2.

6.7 If an extractive exhaust gas sample for determination needs to be dried prior to analysis it should be done in a manner that does not result in loss of SO_2 in the sample as analysed.

6.8 The SO_2 and CO_2 values should be compared on the basis of the same residual water content (e.g. dry or with the same wetness fraction).

6.9 In justified cases where the CO_2 concentration is reduced by the EGC unit, the CO_2 concentration can be measured at the EGC unit inlet, provided that the correctness of such a methodology can be clearly demonstrated. In such cases the SO_2 and CO_2 values should be compared on a dry basis. If measured on a wet basis the water content in the exhaust gas stream at those points should also be determined in order to correct the readings to dry basis values. For calculation of the CO_2 value on a dry basis, the dry/wet correction factor may be calculated in accordance with paragraph 5.12.3.2.2 of the NO_X Technical Code 2008.

7 DATA RECORDING AND PROCESSING DEVICE

7.1 The recording and processing device should be of robust, tamper-proof design with read-only capability.

7.2 The recording and processing device should record the data required by sections 4.4.7, 5.4.2, and 10.3 against UTC and ships position by a Global Navigational Satellite System (GNSS).

7.3 The recording and processing device should be capable of preparing reports over specified time periods.

7.4 Data should be retained for a period of not less than 18 months from the date of recording. If the unit is changed over that period, the shipowner should ensure that the required data is retained on board and available as required.

7.5 The device should be capable of downloading a copy of the recorded data and reports in a readily useable format. Such copy of the data and reports should be available to the Administration or port State authority as requested.

8 ONBOARD MONITORING MANUAL (OMM)

8.1 An OMM should be prepared to cover each EGC unit installed in conjunction with fuel oil combustion equipment, which should be identified, for which compliance is to be demonstrated.

8.2 The OMM should, as a minimum, include:

.1 the sensors to be used in evaluating EGC system performance and washwater monitoring, their service, maintenance and calibration requirements;

.2 the positions from which exhaust emission measurements and washwater monitoring are to be taken together with details of any necessary ancillary services such as sample transfer lines and sample treatment units and any related service or maintenance requirements;

.3 the analysers to be used, their service, maintenance, and calibration requirements;

.4 analyser zero and span check procedures; and

.5 other information or data relevant to the correct functioning of the monitoring systems or its use in demonstrating compliance.

8.3 The OMM should specify how the monitoring is to be surveyed.

8.4 The OMM should be approved by the Administration.

9 SHIP COMPLIANCE

9.1 SO_X Emissions Compliance Plan (SECP)

9.1.1 For all ships which are to use an EGC unit, in part or in total, in order to comply with the requirements of regulations 14.1 and 14.4 of MARPOL Annex VI there should be an SECP for the ship, approved by the Administration.

9.1.2 The SECP should list each item of fuel oil combustion equipment which is to meet the requirements for operating in accordance with the requirements of regulations 14.1 and/or 14.4 of MARPOL Annex VI.

9.1.3 Under Scheme A, the SECP should present how continuous monitoring data will demonstrate that the parameters in paragraph 4.4.7 are maintained within the manufacturer's recommended specifications. Under Scheme B, this would be demonstrated using daily recordings of key parameters.

9.1.4 Under Scheme B, the SECP should present how continuous exhaust gas emissions monitoring will demonstrate that the ship total SO_2(ppm)/CO_2(%) ratio is comparable to the requirements of regulation 14.1 and/or 14.4 of MARPOL Annex VI or below as prescribed in paragraph 1.3. Under Scheme A, this would be demonstrated using daily exhaust gas emission recordings.

9.1.5 There may be some equipment such as small engines and boilers to which the fitting of EGC units would not be practical, particularly where such equipment is located in a position remote from the main machinery spaces. All such fuel oil combustion units should be listed in the SECP. For these fuel oil combustion units which are not to be fitted with EGC units, compliance may be achieved by means of regulations 14.1 and/or 14.4 of MARPOL Annex VI.

9.2 Demonstration of compliance

9.2.1 Scheme A

9.2.1.1 The SECP should refer to, not reproduce, the ETM-A, EGC Record Book or Engine-Room logger system and OMM as specified under Scheme A. It should be noted that as an alternative, the maintenance records may be recorded in the ship's planned maintenance record system, as allowed by the Administration.

9.2.1.2 For all fuel oil combustion equipment listed under paragraph 9.1.2, details should be provided demonstrating that the rating and restrictions for the EGC unit as approved, paragraph 4.2.2.1.2, are complied with.

9.2.1.3 Required parameters should be monitored and recorded as required under paragraph 4.4.7 when the EGC is in operation in order to demonstrate compliance.

9.2.2 Scheme B

The SECP should refer to, not reproduce, the ETM-B, EGC Record Book or Engine-Room logger system and OMM as specified under Scheme B.

10 WASHWATER

10.1 Washwater discharge criteria[1]

10.1.1 When the EGC system is operated in ports, harbours, or estuaries, the washwater monitoring and recording should be continuous. The values monitored and recorded should include pH, PAH, turbidity and temperature. In other areas the continuous monitoring and recording equipment should also be in operation, whenever the EGC system is in operation, except for short periods of maintenance and cleaning of the equipment. The discharge water should comply with the following limits.

10.1.2 pH criteria

10.1.2.1 The washwater pH should comply with one of the following requirements which should be recorded in the ETM-A or ETM-B as applicable:

.1 The discharge washwater should have a pH of no less than 6.5 measured at the ship's overboard discharge with the exception that during manoeuvring and transit, the maximum difference between inlet and outlet of 2 pH units is allowed measured at the ship's inlet and overboard discharge.

.2 The pH discharge limit, at the overboard monitoring position, is the value that will achieve as a minimum pH 6.5 at 4 m from the overboard discharge point with the ship stationary, and which is to be recorded as the overboard pH discharge limit in the ETM-A or ETM-B. The overboard pH discharge limit can be determined either by means of direct measurement, or by using a calculation-based methodology (computational fluid dynamics or other equally scientifically established empirical formulae) to be left to the approval by the Administration, and in accordance with the following conditions to be recorded in the ETM-A or ETM-B:

.1 all EGC units connected to the same outlets are operating at their full loads (or highest practicable load) and with the fuel oil of a maximum sulphur content for which the units are to be certified (Scheme A) or used with (Scheme B);

[1] The washwater discharge criteria should be revised in the future as more data becomes available on the contents of the discharge and its effects, taking into account any advice given by GESAMP.

.2 if a test fuel with lower sulphur content, and/or test load lower than maximum, sufficient for demonstrating the behaviour of the washwater plume is used, the plume's mixing ratio must be established based on the titration curve of seawater. The mixing ratio would be used to demonstrate the behaviour of the washwater plume and that the overboard pH discharge limit has been met if the EGC system is operated at the highest fuel sulphur content and load for which the EGC system is certified (Scheme A) or used with (Scheme B);

.3 where the washwater flow rate is varied in accordance with the EGC system gas flow rate, the implications of this for the part load performance should also be evaluated to ensure that the overboard pH discharge limit is met under any load;

.4 reference should be made to a sea-water alkalinity of 2,200 µmol/litre and pH 8.2[2]; an amended titration curve should be applied where the testing conditions differ from the reference seawater, as agreed by the Administration; and

.5 if a calculation-based methodology is to be used, details to allow its verification such as but not limited to supporting scientific formulae, discharge point specification, washwater discharge flow rates, designed pH values at both the discharge and 4 m location, titration and dilution data should be submitted.

10.1.3 PAHs (Polycyclic Aromatic Hydrocarbons)

10.1.3.1 The washwater PAH should comply with the following requirements. The appropriate limit should be specified in the ETM-A or ETM-B.

10.1.3.2 The maximum continuous PAH concentration in the washwater should not be greater than 50 µg/L PAH_{phe} (phenanthrene equivalence) above the inlet water PAH concentration. For the purposes of this criteria, the PAH concentration in the washwater should be measured downstream of the water treatment equipment, but upstream of any washwater dilution or other reactant dosing unit, if used, prior to discharge.

10.1.3.3 The 50 µg/L limit described above is normalized for a washwater flow rate through the EGC unit of 45 t/MWh where the MW refers to the MCR or 80% of the power rating of the fuel oil combustion unit. This limit would have to be adjusted upward for lower washwater flow rates per MWh, and vice-versa, according to the table below.

Flow rate (t/MWh)	**Discharge concentration limit (µg/L PAH_{phe} equivalents)**	**Measurement technology**
0-1	2250	Ultraviolet light
2.5	900	– " –
5	450	Fluorescence[3]
11.25	200	– " –
22.5	100	– " –
45	50	– " –
90	25	– " –

[2] These values could be revised within two years for new installations following the adoption of these amended guidelines upon further inputs on the physical state of the seas resulting from the use of exhaust gas cleaning systems.

[3] For any Flow Rate > 2.5 t/MWh Fluorescence technology should be used.

10.1.3.4 For a 15-minute period in any 12-hour period, the continuous PAH_{phe} concentration limit may exceed the limit described above by up to 100%. This would allow for an abnormal start-up of the EGC unit.

10.1.4 Turbidity/Suspended Particle Matter

10.1.4.1 The washwater turbidity should comply with the following requirements. The limit should be recorded in the ETM-A or ETM-B.

10.1.4.2 The washwater treatment system should be designed to minimize suspended particulate matter, including heavy metals and ash.

10.1.4.3 The maximum continuous turbidity in washwater should not be greater than 25 FNU (formazin nephlometric units) or 25 NTU (nephlometric turbidity units) or equivalent units, above the inlet water turbidity. However, during periods of high inlet turbidity, the precision of the measurement device and the time lapse between inlet measurement and outlet measurement are such that the use of a difference limit is unreliable. Therefore all turbidity difference readings should be a rolling average over a 15-minute period to a maximum of 25 FNU. For the purposes of this criteria the turbidity in the washwater should be measured downstream of the water treatment equipment but upstream of washwater dilution (or other reactant dosing) prior to discharge.

10.1.4.4 For a 15-minute period in any 12-hour period, the continuous turbidity discharge limit may be exceeded by 20%.

10.1.5 Nitrates

10.1.5.1 The washwater treatment system should prevent the discharge of nitrates beyond that associated with a 12% removal of NO_X from the exhaust, or beyond 60 mg/l normalized for washwater discharge rate of 45 tons/MWh whichever is greater.

10.1.5.2 At each renewal survey nitrate discharge data is to be available in respect of sample overboard discharge drawn from each EGC system with the previous three months prior to the survey. However, the Administration may require an additional sample to be drawn and analysed at their discretion. The nitrate discharge data and analysis certificate is to be retained on board the ship as part of the EGC Record Book and be available for inspection as required by port State control or other parties. Requirements in respect of sampling, storage, handling and analysis should be detailed in the ETM-A or ETM-B as applicable. To assure comparable nitrate discharge rate assessment, the sampling procedures should take into account paragraph 10.1.5.1, which specifies the need for washwater flow normalization. The test method for the analysis of nitrates should be according to standard seawater analysis as described in Grasshoff et al.

10.1.5.3 All systems should be tested for nitrates in the discharge water. If typical nitrate amounts are above 80% of the upper limit, it should be recorded in the ETM-A or ETM-B.

10.1.6 Washwater additives and other substances

An assessment of the washwater is required for those EGC technologies which make use of chemicals, additives, preparations or create relevant chemicals in situ. The assessment could take into account relevant guidelines such as the *Procedure for approval of ballast water management systems that make use of active substances (G9)* (resolution MEPC.126(53)), and, if necessary, additional washwater discharge criteria should be established.

10.2 Washwater monitoring

10.2.1 pH, oil content (as measured by PAH levels), and turbidity should be continuously monitored and recorded as recommended in section 7 of these guidelines. The monitoring equipment should also meet the performance criteria described below:

pH

10.2.2 The pH electrode and pH meter should have a resolution of 0.1 pH units and temperature compensation. The electrode should comply with the requirements defined in BS 2586 or of equivalent or better performance and the meter should meet or exceed BS EN ISO 60746-2:2003.

PAH

10.2.3 The PAH monitoring equipment should be capable to monitor PAH in water in a range to at least twice the discharge concentration limit given in the table above. The equipment should be demonstrated to operate correctly and not deviate more than 5% in washwater with turbidity within the working range of the application.

10.2.4 For those applications discharging at lower flow rates and higher PAH concentrations, ultraviolet light monitoring technology or equivalent, should be used due to its reliable operating range.

Turbidity

10.2.5 The turbidity monitoring equipment should meet requirements defined in ISO 7027:1999 or USEPA 180.1.

10.3 Washwater monitoring data recording

The data recording system should comply with the requirements of sections 7 and 8 and should continuously record pH, PAH and Turbidity as specified in the washwater criteria.

10.4 Washwater residue

10.4.1 Residues generated by the EGC unit should be delivered ashore to adequate reception facilities. Such residues should not be discharged to the sea or incinerated on board.

10.4.2 Each ship fitted with an EGC unit should record the storage and disposal of washwater residues in an EGC log, including the date, time and location of such storage and disposal. The EGC log may form a part of an existing log-book or electronic recording system as approved by the Administration.

APPENDIX 1

FORM OF SO_X EMISSION COMPLIANCE CERTIFICATE

Badge
or
Cipher

NAME OF ADMINISTRATION

SO_X EMISSION COMPLIANCE CERTIFICATE

CERTIFICATE OF UNIT APPROVAL FOR EXHAUST GAS CLEANING SYSTEMS

Issued under the provisions of the Protocol of 1997, as amended by resolution MEPC.176(58) in 2008, to amend the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 related thereto under the authority of the Government of:

.....
(full designation of the country)

by.....
(full designation of the competent person or organization authorized under the provisions of the Convention)

This is to certify that the exhaust gas cleaning (EGC) unit listed below has been surveyed in accordance with the requirements of the specifications contained under Scheme A in the *2015 Guidelines for exhaust gas cleaning systems* adopted by resolution MEPC.259(68).

This Certificate is valid only for the EGC unit referred to below:

Unit manufacturer	Model/ type	Serial number	EGC System Unit and Technical Manual approval number

A copy of this Certificate, together with the EGC System Technical Manual, shall be carried on board the ship fitted with this EGC System unit at all times.

This Certificate is valid for the life of the EGC System unit, subject to surveys in accordance with section 4.2 of the guidelines and regulation 5 of MARPOL Annex VI, installed in ships under the authority of this Government.

Issued at .....
(place of issue of certificate)

dd/mm/yyyy

....
(date of issue) (*signature of duly authorized official issuing the certificate)*

(Seal or Stamp of the authority, as appropriate)

APPENDIX 2

PROOF OF THE SO_2/CO_2 RATIO METHOD

1 The SO_2/CO_2 ratio method enables direct monitoring of exhaust gas emissions to verify compliance with emissions limits set out in table 1 in paragraph 1.3 of these guidelines. In the case of EGC systems that absorb CO_2 during the exhaust gas cleaning process it is necessary to measure the CO_2 prior to the cleaning process and use the CO_2 concentration before cleaning with the SO_2 concentration after cleaning. For conventional low alkali cleaning systems virtually no CO_2 is absorbed during exhaust gas cleaning and therefore monitoring of both gases can be undertaken after the cleaning process.

2 Correspondence between the SO_2/CO_2 ratio can be determined by simple inspection of the respective carbon contents per unit mass of distillate and residual fuel. For this group of hydrocarbon fuels the carbon content as a percentage of mass remains closely similar, whereas the hydrogen content differs. Thus it can be concluded that for a given carbon consumption by combustion there will be a consumption of sulphur in proportion to the sulphur content of the fuel, or in other words a constant ratio between carbon and sulphur adjusted for the molecular weight of oxygen from combustion.

3 The first development of the SO_2/CO_2 ratio considered its use to verify compliance with emissions from 1.5% sulphur fuel. The limit of 65 (ppm[4]/%) SO_2/CO_2 for 1.5% sulphur in fuel can be demonstrated by first calculating the mass ratio of fuel sulphur to fuel carbon, which is tabulated in table 1 in this appendix for various fuels and fuel sulphur contents; including 1.5% sulphur for both distillate and residual fuels. These ratios were used to solve for the corresponding SO_2 and CO_2 concentrations in exhaust, which are tabulated in table 2 of this appendix. Molecular weights (MW) were taken into account to convert mass fractions to mole fractions. For the 1.5% sulphur fuels in table 2, the amount of CO_2 is set first at 8% and then changed to 0.5% to show that there is no effect due to changes in excess air. As expected, the absolute SO_2 concentration changes, but the SO_2/CO_2 ratio does not. This indicates that the SO_2/CO_2 ratio is independent of fuel-to-air ratios. Therefore, SO_2/CO_2 ratio can be used robustly at any point of operation, including operation where no brake power is produced.

3.1 Note that the SO_2/CO_2 ratio varies slightly from distillate to residual fuel. This occurs because of the very different atomic hydrogen-to-carbon ratios (H:C) of the two fuels. Figure 1 illustrates the extent of the SO_2/CO_2 ratios' sensitivity to H:C over a broad range of H:C and fuel sulphur concentrations. From Figure 1, it can be concluded that for fuel sulphur levels less than 3.0% sulphur, the difference in S/C ratios for distillate and residual fuel is less than 5.0%.

3.2 In the case of using non-petroleum fuel oils, the appropriate SO_2/CO_2 ratio applicable to the values given in regulations 14.1 and/or 14.4 of MARPOL Annex VI will be subject to approval by the Administration.

[4] ppm means "parts per million". It is assumed that ppm is measured by gas analysers on a molar basis, assuming ideal gas behaviour. The technically correct units are actually micro-moles of substance per mole of total amount (μmol/mol), but ppm is used in order to be consistent with units in the NO_x Technical Code.

Table 1: Fuel properties for marine distillate and residual fuel*

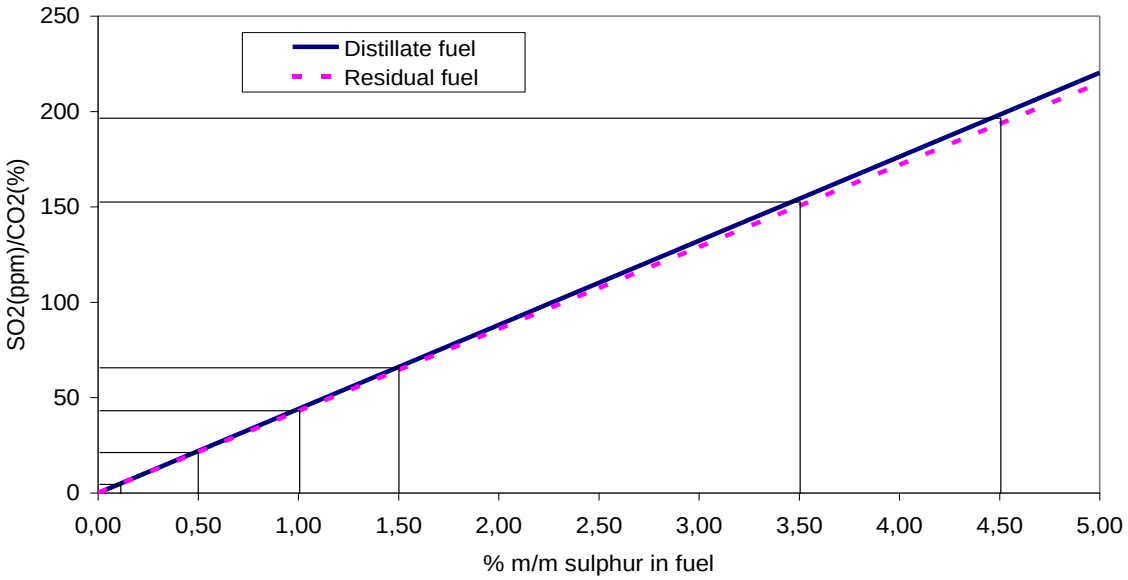
	Carbon	Hydrogen	Sulphur	Other	C	H	S	Fuel S/C	Exh SO_2/CO_2
Fuel Type	%(m/m)	%(m/m)	%(m/m)	%(m/m)	mol/kg	mol/kg	mol/kg	mol/mol	ppm/%(v/v)
Distillate	86.20	13.60	0.17	0.03	71.8333	136	0.0531	0.00074	7.39559
Residual	86.10	10.90	2.70	0.30	71.7500	109	0.8438	0.01176	117.5958
Distillate	85.05	13.42	1.50	0.03	70.8750	134.2	0.4688	0.006614	66.1376
Residual	87.17	11.03	1.50	0.30	72.6417	110.3	0.4688	0.006453	64.5291

* Based on properties in the IMO NO_x Monitoring Guidelines, resolution MEPC.103(49).

Table 2: Emissions calculations corresponding to 1.5 % fuel sulphur

	CO_2	SO_2	Exh SO_2/CO_2	Exh S/C
	%	ppm[4]	ppm[4]/%	m/m
Distillate 0.17% S	8	59.1	7.4	0.00197
Residual 2.70% S	8	939.7	117.5	0.03136
Distillate 1.5% S	8	528.5	66.1	0.01764
Residual 1.5% S	8	515.7	64.5	0.01721
Distillate 1.5% S	0.5	33.0	66.1	0.01764
Residual 1.5% S	0.5	32.2	64.5	0.01721

SO_2/CO_2 ratio vs % sulphur in fuel



4 Correspondence between 65 (ppm[4]/%) SO_2/CO_2 and 6.0 g/kWh is demonstrated by showing that their S/C ratios are similar. This requires the additional assumption of a brake-specified fuel consumption value of 200 g/kWh. This is an appropriate average for marine diesel engines. The calculation is as follows:

$$S/C_{fuel} = \frac{\text{brake-specific } SO_2 \times (MW_S / MW_{SO2})}{BSFC \times (\text{\% carbon in fuel} / 100)}$$

brake-specific SO_2 = 6.0 g/kW-hr

MW_S = 32.065 g/mol

MW_{SO2} = 64.064 g/mol

BSFC = 200 g/kW-hr

% carbon in 1.5% sulphur fuel (from table 1) = 85.05% (distillate) or 87.17% (residual)

$$S/C_{residual\ fuel} = \frac{6.0 \times (32.065 / 64.064)}{200 \times (87.17\% / 100)} = 0.01723$$

$$S/C_{distillate\ fuel} = \frac{6.0 \times (32.065 / 64.064)}{200 \times (85.05\% / 100)} = 0.01765$$

Note 1: The S/C mass ratios calculated above, based on 6.0 g/kWh and 200 g/kWh BSFC, are both within 0.10% of the S/C mass ratios in the emissions table (Table 2). Therefore, 65 (ppm[4]/%) SO_2/CO_2 corresponds well to 6.0 g/kWh.

Note 2: The value of 6.0 g/kWh, hence the 200g/kWh brake-specified fuel consumption is taken from MARPOL Annex VI as adopted by the 1997 MARPOL Conference.

5 Thus, the working formulas are as follows:

$$\text{For complete combustion} = \frac{SO_2\ (ppm^*)}{CO_2\ (\%^*)} \leq 65$$

$$\text{For complete combustion} = \frac{SO_2\ (ppm^*)}{CO_2\ (\%^*) + (CO(ppm^*)/10000) + (THC(ppm^*)/10000)} \leq 65$$

* Note: gas concentrations must be sampled or converted to the same residual water content (e.g., fully wet, fully dry).

6 The following is the basis of using the (ppm[4]/%) SO_2/CO_2 as the limit for determining compliance with regulation 14.1 or 14.4 of MARPOL Annex VI:

.1 This limit can be used to determine compliance from fuel oil burners that do not produce mechanical power.

.2 This limit can be used to determine compliance at any power output, including idle.

.3 This limit only requires two gas concentration measurements at one sampling location.

.4 There is no need to measure any engine parameters such as engine speed, engine torque, engine exhaust flow, or engine fuel flow.

.5 If both gas concentration measurements are made at the same residual water content in the sample (e.g., fully wet, fully dry), no dry-to-wet conversion factors are required in the calculation.

.6 This limit completely decouples the thermal efficiency of the fuel oil combustion unit from the EGC unit.

.7 No fuel properties need to be known.

.8 Because only two measurements are made at a single location, transient engine or EGCS unit effects can be minimized by aligning signals from just these two analysers. (Note that the most appropriate points to align are the points where each analyser responds to a step change in emissions at the sample probe by 50% of the steady-state value.)

.9 This limit is independent of the amount of exhaust gas dilution. Dilution may occur due to evaporation of water in an EGC unit, and as part of an exhaust sampler's preconditioning system.

APPENDIX 3

WASHWATER DATA COLLECTION

1 The washwater discharge criteria are intended to act as initial guidance for implementing EGC system designs. The criteria should be revised in the future as more data becomes available on the contents of the discharge and its effects, taking into account any advice given by GESAMP.

2 Administrations should therefore provide for collection of relevant data. To this end, shipowners in conjunction with the EGC manufacturer are requested to sample and analyse samples of:

- inlet water (for background);
- water after the scrubber (but before any treatment system); and
- discharge water.

3 This sampling could be made during approval testing or shortly after commissioning and at about twelve-month intervals for a period of two years of operation (minimum of three samples). Sampling guidance and analysis should be undertaken by laboratories using EPA or ISO test procedures for the following parameters:

- pH
- PAH and oil (detailed GC-MS analysis)
- Nitrate
- Nitrite
- Cd
- Cu
- Ni
- Pb
- Zn
- As
- Cr
- V

4 The extent of laboratory testing may be varied or enhanced in the light of developing knowledge.

5 When submitting sample data to the Administration, information should also be included on washwater discharge flow rates, dilution of discharge, if applicable, and engine power should be included as well as specifications of the fuel used from the bunker delivery note as a minimum.

6 It is recommended that the ship that has provided this information to the satisfaction of the Administration should be granted a waiver for compliance of the existing installation(s) to possible future stricter washwater discharge standards. The Administration should forward information submitted on this issue to the Organization for dissemination by the appropriate mechanisms.

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Frequently Asked Questions

The 2020 global sulphur limit

For ships operating outside designated Emission Control Areas, IMO has set a limit for sulphur in fuel oil used on board ships of 0.50% m/m (mass by mass) from 1 January 2020. This will significantly reduce the amount of sulphur oxide emanating from ships and should have major health and environmental benefits for the world, particularly for populations living close to ports and coasts.

- **When did IMO adopt regulations to control air pollution form ships?**

IMO has been working to reduce harmful impacts of shipping on the environment since the 1960s. Annex VI to the International Convention for the Prevention of Pollution from Ships (MARPOL Convention) was adopted in 1997, to address air pollution from shipping.

The regulations for the Prevention of Air Pollution from Ships (Annex VI) seek to control airborne emissions from ships (sulphur oxides (SO_x), nitrogen oxides (NO_x), ozone depleting substances (ODS), volatile organic compounds (VOC) and shipboard incineration) and their contribution to local and global air pollution, human health issues and environmental problems.

Annex VI entered into force on 19 May 2005 and a revised Annex VI with significantly strengthened requirements was adopted in October 2008. These regulations entered into force on 1 July 2010.

The regulations to reduce sulphur oxide emissions introduced a global limit for sulphur content of ships' fuel oil, with tighter restrictions in designated emission control areas.

Since 2010, further amendments to Annex VI have been adopted, including amendments to introduce further Emission Control Areas. Energy efficiency requirements entered into force in 2013.

- **What are the limits on sulphur in the regulations?**

Until 31 December 2019, for ships operating outside Emission Control Areas, the limit for sulphur content of ships' fuel oil is 3.50% m/m (mass by mass).

The 0.50% m/m limit will apply on and after 1 January 2020.

- **Can this date be changed?**

No. The date is set in the MARPOL treaty. So it can only be changed by an amendment to the MARPOL Annex VI. This would require a proposal for an amendment to be put forward by a Member State that is a Party to Annex VI, that proposal then circulated and finally adopted by MEPC. An amendment to MARPOL is required to be circulated for a minimum of

six months prior to adoption and then can only enter into force a minimum of 16 months after adoption.

Parties to MARPOL Annex VI decided in October 2016 to implement the 2020 date.

- **So can there be a delay in implementation?**

No, legally, there can be no change in the 1 January 2020 implementation date, as it is too late now to amend the date and for any revised date to enter into force before 1 January 2020.

However, IMO Member States will work in the relevant IMO technical bodies to address any issues that might arise with regards to ensuring consistent implementation.

- **When was the date of 1 January 2020 decided?**

The date of 1 January 2020 was set in the regulations adopted in 2008. However, a provision was adopted, requiring IMO to review the availability of low sulphur fuel oil for use by ships, to help Member States determine whether the new lower global limit on sulphur emissions from international shipping shall come into effect on 1 January 2020 or be deferred until 1 January 2025. The "Assessment of fuel oil availability" study can be downloaded here.

IMO's Marine Environment Protection Committee (MEPC 70), in October 2016, decided that the 0.50% limit shall apply from 1 January 2020.

- **What will the new limit mean for ships?**

Under the new sulphur limit, ships will have to use fuel oil on board with a sulphur content of no more than 0.50% m/m, against the current limit of 3.50%, which has been in effect since 1 January 2012.

The interpretation of "fuel oil used on board" includes use in main and auxiliary engines and boilers.

Exemptions are provided for situations involving the safety of the ship or saving life at sea, or if a ship or its equipment is damaged.

Another exemption allows for a ship to conduct trials for the development of ship emission reduction and control technologies and engine design programmes. This would require a special permit from the Administration(s) (flag State(s)).

- **How can ships meet lower sulphur emission standards?**

Ships can meet the requirement by using low-sulphur compliant fuel oil.

An increasing number of ships are also using gas as a fuel as when ignited it leads to negligible sulphur oxide emissions. This has been recognised in the development by IMO of the International Code for Ships using Gases and other Low Flashpoint Fuels (the IGF Code), which was adopted in 2015. Another alternative fuel is methanol which is being used on some short sea services.

Ships may also meet the SOx emission requirements by using approved equivalent methods, such as exhaust gas cleaning systems or “scrubbers”, which “clean” the emissions before they are released into the atmosphere. In this case, the equivalent arrangement must be approved by the ship’s Administration (the flag State).

- **What controls will there be once the new global limit takes effect?**

Ships taking on fuel oil for use on board must obtain a bunker delivery note, which states the sulphur content of the fuel oil supplied. Samples may be taken for verification.

Ships must be issued with an International Air Pollution Prevention (IAPP) Certificate by their Flag State. This certificate includes a section stating that the ship uses fuel oil with a sulphur content that does not exceed the applicable limit value as documented by bunker delivery notes or uses an approved equivalent arrangement.

Port and coastal States can use port State control to verify that the ship is compliant. They could also use surveillance, for example air surveillance to assess smoke plumes, and other techniques to identify potential violations.

- **What sanctions will there be for not complying?**

Sanctions are established by individual Parties to MARPOL, as flag and port States. IMO does not set fines of sanctions - it is down to the individual State Party.

- **What additional measures have been or are being developed to promote consistent implementation?**

Implementation is the remit and responsibility of the Administrations (flag States and port/coastal States). Ensuring the consistent and effective implementation of the 2020 0.50% m/m sulphur limit is a high priority.

IMO’S Sub-Committee on Pollution Prevention and Response (PPR) has been developing guidance to ensure consistent implementation of the 0.50% m/m sulphur limit.

In October 2018**,** the MEPC approved guidance on ship implementation planning. The guidance is part of a set of guidelines being developed by IMO for consistent implementation of the MARPOL regulation coming into effect from 1 January 2020. Download MEPC.1/Circ.878 here.

The ship implementation planning guidance includes sections on:

- risk assessment and mitigation plan (impact of new fuels);
- fuel oil system modifications and tank cleaning (if needed);
- fuel oil capacity and segregation capability;
- procurement of compliant fuel;
- fuel oil changeover plan (conventional residual fuel oils to 0.50% sulphur compliant fuel oil); and
- documentation and reporting.

The PPR Sub-Committee has prepared, for adoption by MEPC 74 in May 2019, draft Guidelines for consistent implementation of the 0.50% sulphur limit under MARPOL Annex

VI, together with other relevant guidelines, forming a comprehensive package of new and updated instruments that will assist industry and Administrations to effectively and uniformly implement the 0.50% sulphur limit.

Read more here.

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- **What additional measures are being or have been developed to support the implementation of the 0.50% sulphur limit?**

IMO has adopted a MARPOL amendment to prohibit the carriage of non-compliant fuel oil for combustion purposes for propulsion or operation on board a ship - unless the ship has an exhaust gas cleaning system ("scrubber") fitted. Read more here.

The PPR Sub-Committee has prepared further draft amendments to MARPOL Annex VI, for approval at MEPC 74, including amendments covering fuel oil sampling and testing.

This will be for the IMO Member States to decide, through the work in the PPR Sub-Committee, which in turn will report to the MEPC.

- **What is IMO doing to ensure fuel oil availability?**

Implementation is the responsibility of the Member States who are contracting Parties to MARPOL Annex VI. The decision by MEPC in October 2016 to affirm the effective date of 1 January 2020 (more than three years before entry into effect of the 0.50% limit) is intended, in part, to provide sufficient time for Member States and industry to prepare for the new requirement,

Regulation 18 of MARPOL Annex VI covers both fuel oil availability and quality.

On fuel oil availability, the regulation requires each Party to “take all reasonable steps to promote the availability of fuel oils which comply with this Annex and inform the Organization of the availability of compliant fuel oils in its ports and terminals”. Parties are also required to notify IMO when a ship has presented evidence of the non-availability of compliant fuel oil.

Notifications received where there has been evidence of non-availability of compliant fuel oil are available on the IMO Global Integrated Shipping Information System (GISIS) Module (public users can register for free to access this module): https://gisis.imo.org/Public/MARPOL6/Notifications.aspx?Reg=18.2.5.

MEPC 73 urged Parties to MARPOL Annex VI to inform the Organization of the availability of compliant fuel oils in its ports and terminals via the IMO Global Integrated Shipping Information System (GISIS) MARPOL Annex VI module well in advance of 1 January 2020, in accordance with regulation 18.1 of MARPOL Annex VI.

- **What is IMO doing to ensure fuel oil quality?**

Implementation and monitoring falls to Parties to MARPOL Annex VI. MARPOL Annex VI regulation 18.3 specifies the requirements in terms of fuel oil quality, for fuel oil for combustion purposes delivered to and used on board ships.

Notifications received where fuel oil suppliers have failed to meet the requirements are available to view on GISIS: https://gisis.imo.org/Public/MARPOL6/Notifications.aspx?Reg=18.9.6

IMO has issued MEPC.1/Circ.875 Guidance on best practice for fuel oil purchasers/users for assuring the quality of fuel oil used on board ships; and MEPC.1/Circ.875/Add.1 Guidance on best practice for fuel oil suppliers for assuring the quality of fuel oil delivered to ships.

The former is intended to assist fuel oil purchasers/users in assuring the quality of fuel oil delivered to and used on board ships, with respect to both compliance with the MARPOL requirements and the safe and efficient operation of the ship. The guidance pertains to aspects of the fuel oil purchase up to the loading of the purchased fuel oil on board.

A draft joint MSC-MEPC circular addressing the delivery of compliant fuel oil by suppliers has been prepared, for approval at MEPC 74 and at the Maritime Safety Committee (MSC 101). The draft circular says that Members States should urge fuel oil suppliers to take into account the above guidance.

- **What is the current average sulphur content of fuel oil used on ships?**

IMO monitors the sulphur content of fuel oil used on ships globally. Samples are taken of residual fuel oil – the "heavy" fuel oil commonly used on ships – as well as distillate fuel oil ("light", low sulphur fuel oil, which is more commonly used in emission control areas which have stricter limits on sulphur emissions).

The latest figures showed that the yearly average sulphur content of the residual fuel oils tested in 2017 was 2.54%. The worldwide average sulphur content for distillate fuel in 2017 was 0.08%.

- **Have there been any studies into the feasibility of using LNG as fuel oil?**

Yes, IMO has commissioned and published studies on the feasibility and use of LNG as a fuel for shipping (2016). The publication includes a feasibility study on the use of LNG as a fuel for international shipping in the North America ECA, a pilot study on the use of LNG as a fuel for a high speed passenger ship from the Port of Spain ferry terminal in Trinidad and Tobago and a feasibility study on LNG-fuelled short sea and coastal shipping in the wider Caribbean region.

- **What about the sulphur limit in Emission Control areas (ECAs)?**

Since 1 January 2015, the sulphur limit for fuel oil used by ships operating in Emission Control Areas (ECAs) designated by IMO for the control of sulphur oxides (SO_X) has been 0.10% m/m.

The ECAs established under MARPOL Annex VI for SOx are: the Baltic Sea area; the North Sea area; the North American area (covering designated coastal areas off the United States and Canada); and the United States Caribbean Sea area (waters around Puerto Rico and the United States Virgin Islands).

- **Where can I find out more about the sulphur regulations?**

Read more here.

Download MEPC Resolutions and Guidelines related to MARPOL Annex VI here.