International Chamber of Shipping

Shaping the Future of Shipping

Provisional Guidance to Shipping Companies and Crews on Preparing for

Compliance with the 2020 'Global Sulphur Cap'

for Ships' Fuel Oil in Accordance with MARPOL Annex VI

Supported by

Asian Shipowners' Association

ECSA European Community Shipowners' Associations

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Published in September 2018 by
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The International Chamber of Shipping (ICS) is the global trade association representing national shipowners' associations from Asia, the Americas and Europe and more than 80% of the world merchant fleet.

Established in 1921, ICS is concerned with all aspects of maritime affairs particularly maritime safety, environmental protection, maritime law and employment affairs.

ICS enjoys consultative status with the UN International Maritime Organization (IMO).

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Introduction

From 1 January 2020, in accordance with MARPOL Annex VI[1], the sulphur content of fuel oil used on board commercial ships trading outside sulphur Emission Control Areas (ECAs)[2] must not exceed 0.50% m/m.

The 0.50% sulphur limit is a significant reduction from the current global limit of 3.50% m/m which has been in place since 2012. The worldwide implementation of this important new International Maritime Organization (IMO) requirement – referred to in this Guidance as the 'Global Sulphur Cap' – therefore represents a regulatory game changer.

Apart from the significant additional cost of compliant fuel, implementation will be far more complex than for the previous introduction of ECAs. This is because of the sheer magnitude of the switchover and the much larger quantities and different types of fuel involved, as well as continuing uncertainties about the availability of compliant fuels in every port worldwide immediately after 1 January 2020.

The only regular exception to the use of 0.50% sulphur fuel will be for the relatively small number of ships which elect to use the 'equivalent' compliance mechanisms in accordance with Regulation 4 of MARPOL Annex VI such as LNG fuel or the fitting of an exhaust gas cleaning system (EGCS).

This provisional ICS Guidance has been prepared for the vast majority of ships that will comply with the Global Sulphur Cap immediately after 1 January 2020 using fuel oils with a sulphur content of 0.50% m/m or less.

The 0.50% requirement will be strictly enforced globally by Port State Control (PSC) authorities, whose task will be assisted by the prohibition on the carriage of non-compliant fuels, which is expected to enter into force during 2020.[3] It is emphasised that IMO Member States have agreed there will be no 'transition' period after 1 January 2020 to allow for the burning of any non-compliant fuel remaining on board ships.

The 'transition' period is in reality the period up until midnight on 31 December 2019. Shipping companies and charterers, as well as ships' crews, need to fully prepare now.

As recommended by IMO, it is particularly important that shipping companies prepare a ship specific **Implementation Plan** for each of their ships, taking account of this ICS Guidance and the indicative format that has been developed by IMO, included at **Appendix 1** for ease of reference. Shipping companies need to prepare these Plans as soon as possible, especially as they will need to start purchasing and loading compliant fuels several months in advance of 1 January 2020.

If a ship has a suitably developed Implementation Plan, and corresponding records are maintained on board which demonstrate how the Plan has been followed, then the ship's crew should be in a better position to demonstrate to Port State Control (PSC) officers that they have acted in good faith and done everything that could be reasonably expected to achieve full compliance.

1 The International Convention for the Prevention of Pollution from Ships (MARPOL) Annex VI (Air Pollution).

2 In those ECAs so far established in North America and North West Europe, most ships must continue to use fuel with a sulphur content of 0.10% m/m.

3 Subject to confirmation by MEPC 73 in October 2018

This need to demonstrate good faith could be particularly important in the event that safe compliant fuels are unexpectedly unavailable in some ports during the initial weeks of implementation. It is important to note that IMO has agreed that Administrations and Port State Control authorities may take into account the ship's Implementation Plan when verifying compliance with the 0.50% sulphur limit.[4]

The following ICS Guidance is primarily intended to assist shipping companies with the significant task of planning in advance to ensure that they have an effective Implementation Plan in place, for each of their ships, which will facilitate full compliance with the Global Sulphur Cap.

Most importantly, the implementation process will need to address many practical issues that will require careful consideration, especially the possibility that some ships may need to carry and use more than one type of compliant fuel in order to operate globally. This is a factor which could introduce additional challenges such as compatibility between different available grades of fuel that could have significant implications for the safety of the ship as well as its commercial operation.

The full implementation picture is not yet complete. IMO is still in the process of developing important provisions and guidelines, for example, on a standard template for Fuel Oil Non-Availability Reporting (FONAR) and on sulphur verification procedures. Related work is also being conducted by various stakeholders to develop industry guidance on safe handling of 0.50% Smax fuels.

Recognising the importance of the output from these projects, it is envisaged that this provisional ICS Guidance will be updated in due course.

NB: The following ICS Guidance assumes that the owner/operator has chosen to achieve compliance with the Global Sulphur Cap through the use of compliant fuel oil with a sulphur content of 0.50% m/m or less (such as 0.50% blends or 0.10% distillate). It does not address alternative means of compliance such as LNG or EGCS. Additionally, this Guidance does not directly address the operation of ships within existing (or any future) sulphur ECAs as per Regulation 14.4 of MARPOL Annex VI.

In order to prepare for compliance on 1 January 2020, shipping companies may need to start ordering compliant fuels from as early as the middle of 2019. Notwithstanding the provisional nature of this ICS Guidance, shipping companies are strongly recommended to commence developing ship specific Implementation Plans as soon as possible.

September 2018

4 Subject to confirmation by MEPC 73 in October 2018

Contents

1 Regulations

Regulation 14.1.3 of MARPOL Annex VI stipulates that the sulphur content of any fuel oil used on board ships must not exceed 0.50% m/m from 1 January 2020, except for ships using 'equivalent' compliance mechanisms.

The 'equivalent' compliance mechanisms permitted by Annex VI, Regulation 4, include LNG or exhaust gas cleaning systems (ECGS) which are outside the scope of this Guidance. (ECGS will allow higher sulphur fuels (>0.50% m/m) to be burnt, with the excess sulphur 'scrubbed' out of the uptake exhaust gas.)

To assist global implementation of the Global Sulphur Cap and the maintenance of a 'level playing field', IMO has also approved prohibition on the carriage of non-compliant fuel oil.[5]

NB: Consistent with Regulation 4 of MARPOL Annex VI, the prohibition on the carriage of non-compliant fuel oil is not applicable to ships fitted with 'equivalent' means of compliance. Ships can continue to bunker and use high sulphur fuel oil in conjunction with EGCS (Scrubbers).

Regulation 18 of Annex VI stipulates requirements for the quality of fuel oil delivered for use on board ships. Regulation 18.3.1.3 specifically requires that fuel oil must not include any added substance or chemical waste which jeopardises the safety of ships or adversely affects the performance of machinery.

IMO has produced *Guidance on the Development of a Ship Implementation Plan for the Consistent Implementation of the 0.50% Sulphur Limit under MARPOL Annex VI* [6], along with an indicative template for the Implementation Plan which is reproduced at **Appendix 1** of this ICS Guidance.

SOLAS Chapter II-2, Regulation 4.2.1.1 requires that fuel oil with a flashpoint of less than 60°C must not be used in machinery spaces.

5 Amendments to Regulation 14 for prohibition on the carriage of non-compliant fuel oil are expected to enter into force earliest by March 2020 subject to adoption by MEPC 73.

6 This IMO Guidance is expected to be adopted at MEPC 73.

2 Selection of Compliant Fuel

Compliant fuel used after 1 January 2020 to meet the 0.5% Global Sulphur Cap could be a residual, distillate or blended fuel oil.

0.50% Smax blended fuel oil and 0.10% distillate (as currently used in ECAs) are expected to be the predominant compliant products that will be initially available. (In some trades, other types of fuel may also be available including 0.50% residual, 0.50% distillate and 0.10% blended fuels.) However, the availability and quantity of these different types of fuel are currently unknown, and immediately after 1 January 2020 these are likely to vary considerably between individual ports – a particular issue for ships operating in tramp trades.

During related discussions at IMO in July 2018, the International Organization for Standardization (ISO) delivered a statement which specified that "*General requirements of ISO 8217:2017*[7] *along with the characteristics included in Table 1 and 2 of ISO 8217: 2017 cover 2020 0.50% max. sulphur fuels in the same way as they cover today's fuels*."

Shipowners and operators are therefore recommended to ensure that ISO 8217:2017 is specified as the required standard when ordering 0.50% Smax fuels for use after 1 January 2020.

The selection of the type of fuel required to comply with the Global Sulphur Cap will primarily be a commercial decision for shipping companies and charterers. Nevertheless, it is assumed that compliant fuel will be considerably more expensive after January 2020 than residual fuel with a sulphur content above 0.50% m/m.

Importantly, it is also assumed that 0.50% Smax blended fuels (and, to the extent they are available, other new fuels) will be less expensive than 0.10% distillate fuels, such as those which are currently used in ECAs. However, the quantum of the price differential between 0.50% and 0.10% fuels is currently unknown. Initially this differential could be relatively small depending on local availability and demand considerations. But this price differential could also change significantly in the months immediately following 1 January 2020 if, as seems likely, the supply of 0.50% compliant fuels increases.

Decisions on which type of fuel to use in order to comply in January 2020 may vary considerably depending on the nature of the commercial trade in which the ship is operating. Against any cost saving that might result from using 0.50% sulphur fuels, shipping companies and charterers will have to balance the practicality and convenience of using, for example, new 0.50% sulphur blends as opposed to existing 0.10% sulphur distillate fuels.

Operators of ships which primarily operate within ECAs (where fuel with a sulphur content of 0.10% or less must already be used) may choose to make different decisions to companies whose vessels consume a much larger proportion of their fuel outside of ECAs.

Operators which opt to use 0.50% fuels will also need to make careful judgements as to the extent to which such fuels will be widely available for every voyage they are likely to undertake (particularly leading up to 1 January 2020 when available supply could be especially tight).

Companies should also bear in mind that in the event that the only compliant fuel available in a particular port is 0.10% distillate (because compliant or compatible 0.50% blends are not available) their ships will be required to use these in order to be compliant with MARPOL, regardless of any additional cost and inconvenience that might result from having to use or carry more than one type of compliant fuel.

7 ISO 8217:2017 - Petroleum products -- Fuels (class F) -- Specifications of marine fuels

Decisions on the type of compliant fuel preferred may well depend on the trading pattern of the individual ship and an assessment of what types of fuel are likely to be available (and at what price) as well as the extent to which the company has control over the destinations which the ship is likely to visit.

When selecting compliant fuels, shipping companies and charterers might also wish to differentiate between how best to ensure compliance with the Global Sulphur Cap on 1 January 2020 and the situation that might prevail shortly afterwards, when there should be greater certainty about the availability and specification of different types of fuel and their price differentials.

For example, in order to avoid potential difficulties during the first few months of the implementation period, some shipping companies might consider operating their ships on distillate fuel initially, subsequently changing over to 0.50% blended fuels once sufficient reliability is ensured with regard to availability and safety.

3 Properties of Blended Fuel Oil

It is anticipated that successful implementation of the new 0.50% sulphur limit will depend on the widespread availability and use of 0.50% Smax blended fuel oils.

Although (in 2018) 0.50% blended fuel oils are not yet widely available, the following parameters will be of critical importance when assessing the safety and usability of these new blended fuel oils. As such the fuel properties for blended fuels outlined below should be carefully considered when ordering and using this type of fuel. Further information on handling these fuels can be found in industry guidance from the International Council on Combustion Engines (CIMAC).[8]

The document can be accessed and downloaded at the following link:

https://www.cimac.com/publications/recommendations410/cimac-recommendation-no.-25.html

3.1 Stability

Stability is the ability of a fuel to keep asphaltenes in suspension. Asphaltenes are sticky molecules which, if not kept in suspension, agglomerate and eventually precipitate. When a fuel becomes unstable, it results in the precipitation of these asphaltenes which causes increased sludge formation inside filters and separators. If not rectified in time, this may lead, in worst cases, to loss of propulsion and power.

Stability of a given grade of fuel oil can be measured by laboratory analysis of the fuel in order to obtain its sediment potential. It is recommended that, wherever possible, the stability of any fuel to be stored and used on the ship should be verified before it is loaded on board. As fuel oil compliant with ISO 8217 is required to meet minimum stability requirements it is recommended that only fuels which meet this standard are ordered.

3.2 Compatibility

Compatibility is the suitability of two different fuels for mixing without leading to adverse effects. Two stable but incompatible fuels (even if compliant with the Global Sulphur Cap and ISO 8217) when mixed together may result in the precipitation of asphaltenes and increased sludge formation inside filters and separators. If not rectified in time, this may lead, in worst cases, to loss of propulsion and auxiliary power.

It is anticipated that the issue of compatibility will become more critical from 1 January 2020. This is because the components used for developing blended fuel oils will be so diverse that compliant fuel grades having the same sulphur content, but bunkered at different geographical locations, may not be compatible, even including fuels ordered from the same bunker supplier.

It is therefore important that, as far as practicable, these fuels are stored in segregated tanks to ensure minimum co-mingling (mixing with fuel oil of the same specification but from different sources) in the fuel system.

Compatibility of blended fuels can be checked using either of the following methods:

- By ship's personnel using an appropriate test kit on board. It is anticipated that the components of the new 0.50% Smax fuel blends could be so diverse that the existing compatibility test kits would, in many cases, show false negative results (i.e. the results might show that the fuel blends are not compatible when this is actually not the case). A revision on the approach to checking compatibility on board of these fuel blends is currently being developed by various industry stakeholders. Ship operators should ensure that, when available, any new procedures are provided to their ships in order to ensure a reliable testing regime; or

8 CIMAC recommendations concerning the design of heavy fuel treatment plants for diesel engines

- By an independent laboratory. However, the time involved in this method may mean that the results are not available before the intended mixing.

3.3 Viscosity

The viscosity of the fuel delivered for injection plays a major part in ensuring optimum combustion efficiency. If the viscosity is too high, it will result in improper atomisation and incomplete combustion. Conversely, if the viscosity is too low, in addition to incomplete combustion, it may also lead to inadequate lubrication of fuel pump plunger and barrel arrangements.

In many cases fuel is heated to temperatures above 100°C in order to achieve its optimum viscosity for injection. It should be noted that at these temperatures the viscosity of 0.10% Smax is below the recommended minimum viscosity requirement for distillate fuels (ISO 8217:2017) of 2cSt (centistokes) at 40°C. This is especially important when considering changeover procedures for operating on 0.10% fuel oils in ECAs or if choosing to bunker and use 0.10% distillate as the compliant fuel oil option for the Global Sulphur Cap.

3.4 Sulphur Content

After 1 January 2020, a fuel with a sulphur content in excess of 0.50% will be regarded as non-compliant by Port State Control. While it is hoped that PSC officers will apply a pragmatic approach to blended fuels that might be found to have a sulphur content marginally in excess of 0.50% this should not be taken for granted.

It is expected that instances where PSC officers obtain and test samples taken directly from the fuel oil system of a ship will increase after 1 January 2020, for verification of compliance with the 0.50% sulphur limit. These samples (known as 'in use' or 'on board' samples) are separate from the statutory MARPOL (delivered) sample that is obtained during bunkering and retained on board as per Regulation 18.8.1 of MARPOL Annex VI. PSC may take this decision to obtain and verify in use fuel oil samples based on any evidence of non-compliance gauged from initial checks using portable sulphur content analysers, documentation checks or through direct emission testing of exhaust fumes using sniffers.

In this regard, it should be noted that IMO is considering amendments to Appendix VI of MARPOL Annex VI to ensure that a 95% confidence limit is applied to balance the testing variances associated with the testing of in use fuel oil samples. This means that when in use fuel oil samples are taken by PSC and analysed for compliance, a sulphur content of up to 0.53% could be accepted as compliant. This will help ensure that ship operators are not unfairly penalised for marginal exceedances in sulphur content due to factors beyond their control. Fuel oil supplied to ships by bunker suppliers must however be required not to exceed the 0.50% limit. This should help avoid potential scenarios where the sample taken during bunkering receives an acceptable test result only for the in use fuel to be found non-compliant.[9]

The sulphur content of fuel oil being bunkered is required by Regulation 18 of MARPOL Annex VI to be stated on the Bunker Deliver Note (BDN) and should be verified by independent laboratory analysis.

From 1 January 2019, bunker suppliers will also have to confirm on the BDN that if fuel oil with a sulphur content above the maximum stipulated by MARPOL Annex VI is to be supplied to any ship (i.e. currently 3.5% but changing to 0.5% on 1 January 2020) this has only been done based on the purchaser's notification that the fuel oil is:

9 The proposed amendments to Appendix VI of MARPOL Annex VI are expected to be considered for approval by MEPC 74 to be held in mid-2019.

- Intended to be used in combination with an equivalent means of compliance (e.g. scrubbers); or
- Is subject to a relevant exemption for a ship to conduct trials for sulphur oxide emission reduction and control technology research, in accordance with Regulation 3.2 of MARPOL Annex VI.

It should be noted that in addition to demonstrating compliance with the Global Sulphur Cap, the sulphur content of a fuel oil dictates the quantity and quality of cylinder lubrication that is required to optimally neutralize corrosive oxides produced as a result of combustion.

3.5 Acid Number

Acid number of a fuel is a measure of the quantity of acidic compounds present in a specified sample (acidity).

Fuel oil with a high acid number may cause accelerated damage to various parts of the combustion unit including the fuel injection equipment. Acid number can be measured by laboratory analysis of the fuel.

If the fuel oil bunkered is identified as having a significantly high acid number, then it is recommended that the fuel testing service providers be contacted for guidance and the fuel disposed of at the earliest available opportunity if required. If there is no other option and the fuel needs to be consumed, then close attention should be paid to the potential for accelerated corrosion and failure of combustion equipment.

3.6 Flashpoint

SOLAS Regulation II-2/4 requires that the minimum flashpoint of any fuel used by the vessel or carried in its tanks must not be less than 60°C. Fuels with a lower flashpoint do not comply with the requirements of SOLAS and, more importantly, create an increased risk of fire and explosion. Consequently, the flashpoint of a fuel supplied to the ship should be properly verified. If possible this should take place before bunkering operations commence.

3.7 Cat Fines

Excessive presence of catalyst particles of aluminium silicate (also known as cat fines) in fuel oil may lead to accelerated abrasive wear of engine fuel pumps, injectors and cylinder liners. The amount of cat fines in the fuel should be measured by laboratory analysis.

If the fuel bunkered is identified as having a significantly high value of cat fines, then it is recommended that the fuel testing service providers be contacted for guidance and the fuel disposed of at the earliest available opportunity if required. If there is no other option and the fuel needs to be consumed, then close attention should be paid to the potential for accelerated wear and failure of combustion equipment. In these situations, the following precautions are recommended to minimise these adverse effects:

- Maintain fuel oil storage, settling and service tanks at a sufficiently high temperature and ensure that settling and service tanks are drained of water at regular intervals;
- Closely observe the operation of fuel oil filters (especially auto backwash filters) to ensure that there is no rapid decrease in fuel pressure during the operation of engines. These filters should not be bypassed; and
- Contact manufacturers of on board purification machinery for advice on any possible measures that can be adopted such as purification on low throughput, parallel passes through purifier arrangements etc.

4 Properties of Distillate Fuels

If the use of distillate fuels is identified as the appropriate means to achieve compliance, then the following specific considerations are relevant:

4.1 Viscosity

Distillate fuels have lower viscosity than residual fuels. This becomes a challenge when changing over systems that have been operating with residual fuel oil for long periods of time which may start leaking if switched to continued operation on distillates with lower viscosity. The lower viscosity also becomes an issue that could cause internal leakages and decreased lubricity in fuel injection pumps causing loss of fuel pressure and increased wear respectively. It is therefore recommended that adequate sea trials on operation with these fuels are conducted to identify and rectify any issues before the date of changeover.

Shipowners and operators should take into account the average engine room ambient temperatures when planning for operation on distillate fuel oil.

4.2 Cold Flow Properties

Because of its lower viscosity, distillate fuels do not normally require heating. The following cold flow properties of distillate fuels should be considered when evaluating the flow requirements of these fuels:

- Cloud Point (CP) is the temperature at which the fuel becomes cloudy due to the formation of wax crystals;
- Cold Filter Plugging Point (CFPP) is the minimum temperature at which the fuel continues to flow through a standardised filter within a specified time. In other words, CFPP is the temperature below which fuel filters will start getting plugged; and
- Pour Point (PP) is the temperature below which the fuel ceases to flow.

The fuel should be:

- Stored at a temperature that is at least 10°C above PP;
- Kept at a temperature above its CFPP throughout its processing stages in filters and separators; and
- Maintained at a temperature which is high enough to aid the separation of water from the fuel when in settling and service tanks.

Ship operators should ensure that fuel with suitable Pour Point quality (summer or winter) is provided for the equipment on board, especially if the ship operates in cold climates.

Fuel suppliers are required to report CP and CFPP for winter grade distillate fuels. Requirements for these parameters are not normally specified when ordering fuels but it is recommended that these should be requested by the shipping company. These requirements should be based on any limitations that the ship might have in the area of cold flow management on board and considering the geographical area and expected ambient temperatures related to its current **and future trading patterns (if known)**.

It should be noted that significant operational issues have been experienced with fuels ordered and bunkered in warmer climates when ships have entered colder climates.

It is recommended that if a ship is being prepared for long term operation on distillate fuels then the possibilities of heating arrangements should be reviewed. Although it is not a standard practice to provide heating arrangements to tanks holding distillate fuels, alternative options should be considered. For example, these fuels could be routed through fuel oil heaters, if required, in order to maintain the above mentioned cold flow properties at an optimum level.

4.3 Distillate Fuel with FAME Content

Regulation 18.3.1.1 of Marpol Annex VI requires that fuel oil for combustion purposes delivered and used on board ships must be blends of hydrocarbons derived from petroleum refining. Nevertheless, the anticipated increase in demand for compliant fuels may, in some locations, lead to bunker suppliers offering automotive diesel fuel containing biodiesel as the only available option (FAME - Fatty Acid Methyl Esters being the most predominant biodiesel). ISO 8217:2017 provides a marine biodiesel specification with up to 7.0% FAME that suppliers can offer when other grades are unavailable.

In preparation for these situations, it is recommended that shipowners and operators consult manufacturers of engines, boilers and other auxiliary equipment such as oily water separators, filters etc. in order to ensure their ability to handle these kinds of fuels.

Further information on handling these fuels can be found in industry guidance from CIMAC[10]. The document can be accessed and downloaded at the following link:

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

10 CIMAC guideline for ship owners and operators on managing distillate fuels up to 7.0% v/v FAME (biodiesel)

5 Ship Specific Implementation Plans

Ships must operate using compliant fuels of 0.50% sulphur or less from 1 January 2020 unless they are provided with an approved 'equivalent' means of compliance. This means that the effective period for transition ends at midnight on 31 December 2019. Shipping companies should keep this in mind when planning ahead to ensure compliance.

To facilitate compliance, IMO has developed Guidelines which include an indicative template for a ship specific **Implementation Plan**[11] – see **Appendix 1**, which shipping companies are recommended to use.

The development and adherence to a comprehensive and well-considered ship specific Implementation Plan is of the utmost importance for ensuring that the change to compliant fuel is achieved as smoothly as possible.

It is reiterated that there will be a significant increase in associated compliance checks by Port State Control (PSC) following the implementation date of the Global Sulphur Cap. If a ship has on board a suitably developed Implementation Plan, and corresponding records are maintained on board which demonstrate how the Plan has been followed, then a ship's crew should be in a better position to demonstrate during any PSC inspection that they have acted in good faith and done all that could be reasonably expected to ensure implementation by 1 January 2020.

It should be noted that IMO has agreed that Administrations and Port State Control authorities may take into account the Implementation Plan when verifying compliance with the 0.50% sulphur limit requirement.[12]

Given the short time available before 1 January 2020, shipowners and operators should develop ship specific Implementation Plans for each of their ships and implement these plans as soon as possible.

The following sections of this ICS Guidance set out some considerations that should be taken into account during the development of the ship specific Implementation Plan. Shipowners and operators should refer to those sections that are applicable to the ship under consideration and use the IMO template provided in **Appendix 1**.

As appropriate the ship specific Implementation Plan will need to consider when and where any new 0.5% Smax fuels will be bunkered and the designated tanks into which they will be loaded. Shipowners and operators will need to decide between:

- Cleaning tanks designated for the bunkering of compliant fuel; or
- Loading compliant fuel into designated tanks on top of the remnants of 3.5% Smax fuel as part of a dilution/flushing process, commencing this within an appropriate period of time before 1 January 2020 to ensure all non-compliant fuel is out of the system before this date. This process should be carried out carefully keeping in mind the possible associated risks resulting from incompatibility between the two fuel grades.

Once the Implementation Plan has been developed, shipping companies are recommended to approach the ship's flag State and classification society and request that it reviews the Plan for adequacy and completeness or as deemed appropriate by the flag State. This may prove helpful should problems emerge during any PSC inspections.

11 Subject to adoption at MEPC 73 in October 2018.

12 Subject to adoption at MEPC 73 in October 2018.

5.1 Risk Assessment and Mitigation Plan

The shipping company should conduct a detailed risk assessment of the available compliant fuels prior to deciding which option should be used on their ships.

The risk assessment should take into consideration the fuel oil properties detailed in Sections 3 and 4 of this ICS Guidance. Appropriate action plans should be developed in order to address and mitigate any specific safety risks identified. These plans could include the following examples:

- Procedures to segregate different types of fuels from different sources;
- Procedures for compatibility testing and segregating fuels from different sources until compatibility can be confirmed;
- Plans to address any mechanical constraints with respect to handling specific fuels, including ensuring that minimum/maximum characteristics of fuel oil as identified in fuel standards such as ISO 8217 can be safely handled on board the ship; and
- Procedures to verify machinery performance using fuel oil with characteristics with which the ship has no prior experience.

These action plans will be valid for the duration of the operation of the ship using 0.50% Smax blended fuels and should therefore be included in the ship's Safety Management System (SMS).

5.2 Fuel Oil System Modifications and Tank Cleaning

Shipowners, having identified the type of compliant fuel they envisage using and having considered and identified possible needs for segregating fuels bunkered, including modifications to fuel tanks and associated pumping and piping, should consult equipment manufacturers and classification societies in order to discuss their plans to ensure they are appropriate and complete, as well as identifying any approval requirements.

For identifying any required modifications, it is recommended to use information provided by the International Association of Classification Societies (IACS) – *Rec 151: Recommendation for petroleum fuel treatment systems for marine diesel engines*. The document can be accessed and downloaded at the following link:

http://www.iacs.org.uk/publications/recommendations/141-160/

Required modifications, particularly structural, need to be identified as early as possible, particularly if ship yard facilities will be required. The work schedule and details of modifications to ship structural configuration, systems and equipment should be included in the ship specific Implementation Plan.

Modifications to ship structure, systems and equipment should be appropriately documented with copies of associated approved drawings and certificates kept on board for future reference by the crew and potential inspection by Port State Control.

5.2.1 Fuel Storage System

Considering the anticipated compatibility issues explained in Section 3.2, it is recommended that in preparation for 1 January 2020 the feasibility of increasing the segregation of bunker/fuel tanks and associated piping and pumping arrangements on board the ship should be considered. This is to mitigate the risks associated with compatibility of fuels bunkered in different locations.

It is further recommended to consider increasing the dedicated distillate fuel oil storage capacity of the ship, in order to cover any periods of unavailability of suitable compliant blended fuel oils or other operational issues.

It is anticipated that there may be instances where ships will be required to bunker distillate fuels into tanks with heating coils. It is therefore recommended that the isolation arrangements for tank heating systems are tested and proven effective for all bunker tanks.

If it is intended to permanently convert tanks from residual fuels to distillate use then blanking, disconnection or removal of heating coils should be considered.

5.2.2 Fuel Transfer, Filtration and Delivery System

The ship's fuel system should be comprehensively reviewed to assess its suitability for operating on the intended grades of fuel oil. Particular focus should be paid to avoiding problems due to incompatibility of fuels bunkered from different locations.

Consideration should be given to the segregation of fuel tanks as well as the fuel oil transfer, processing and delivery systems in order to minimise as far as practical the mixing of different grades of fuels or the same grades of fuel bunkered in different locations. The fuel oil return system should be confirmed as being arranged so as to ensure minimum cross contamination. Return lines from residual fuel oil systems should not be routed to distillate fuel tanks.

It should be noted that fuel systems that have been operating with residual fuel oil for long periods of time might start leaking if switched to continued operation on fuels with lower viscosity, in particular at:

- Flanged joints due to hardened gaskets; and
- Pump glands, seals and machinery components due to clearances which are satisfactory when operating with relatively viscous HFO, but which will result in leaks when low viscosity distillate fuel is used for extended periods.

Any potential issues with the integrity of the fuel system should be identified and addressed before any planned changeover in order to prevent possible machinery space fires caused by fuel leaks.

The temperature of fuel at its different locations in the fuel system needs to be carefully considered and appropriate temperatures maintained during transfer, filtration and delivery to combustion units. The fuel should be maintained at the temperatures required to meet the various criteria described in Section 3.3 of this ICS Guidance.

If a ship's fuel oil injection system is not designed to handle low viscosity fuel, it may result in issues such as deterioration in combustion quality and lubricity.

During the operation of marine engines, a quantity of fuel in excess of that required for combustion will be provided by the fuel pumps. The excess fuel is recirculated or transferred back to the storage tanks through return lines. The fuel in these return lines may be at a considerably higher temperature than the inlet to the engine. In cases where low viscosity distillate fuels are used, this may lead to fuel system vapour locks and other issues such as loss of pressure. It is therefore recommended that shipowners and operators should consider the need to install coolers and, in some cases, chillers on fuel systems that have been operating on high viscosity residual fuel oil in preparation for long term operation using low viscosity compliant fuels after 1 January 2020.

Ship specific fuel oil changeover procedures should be made readily available to ships' crews.

Fuel system drawings, verified as accurate, and including any modifications relating to the fuel oil storage, transfer, processing and delivery systems should also be made readily available.

It is recommended that all fuel lines should be traced and the drawings verified as accurate with updates made if necessary. Additionally, all valves associated with the fuel oil changeover procedures should be clearly marked and labelled stating the origin and the destination of the fuel oil in the respective lines.

Verifying and making available accurate system drawings, as well as marking valves, will aid crews when changing over fuels, and assist in addressing contingencies in a timely manner. For example, this could include situations where a particular combustion unit or transfer system needs to be isolated due to leaks or other issues while maintaining the operation of the rest of the system.

5.2.3 Combustion Equipment

Manufacturers of internal combustion engines (IC engines) and boilers should be consulted regarding the suitability of the combustion units to burn the grades of fuel anticipated to be used. In the case of IC engines, this includes any special requirements for:

- Minimum viscosity at engine inlet;
- Lubrication and cylinder oils; and
- Changes to the fuel injection system etc. in order to counter any reduction in energy density for these fuels.

Having identified the 0.50% Smax compliant fuel to be used (blended, distillate or residual) on board each of the ships in their fleets, shipowners and operators should confirm that the fuel to be used meets the fuel quality parameters specified by the engine builder. Where this is not the case then it will be necessary to obtain a 'Letter of No Objection' for use of the selected compliant fuel from the manufacturer of each engine (type and model) with which the fuel is to be used.

If there are technical constraints that prevent any engine installed on board a ship from burning a particular type or grade of fuel, then these constraints should be documented in the Implementation Plan.

5.2.3.1 Modifications to IC Engines

Any modifications to an installed IC engine or its components, settings and operating values which influence its NOx emissions, including any NOx reducing device or system, should be carried out in accordance with the provisions of the IMO NOx Technical Code.

The NOx Technical File for the specific engine sets out the full range of allowable adjustments or alternatives for the components of the engine. Provided that adjustments and alternative components are allowable, the Engine International Air Pollution Prevention (EIAPP) certificate remains valid.

Shipowners and operators are strongly advised to contact the Recognized Organization (RO) that issued the EIAPP certificate if in any doubt regarding an adjustment or alternative component being in compliance with the engine's NOx Technical File.

5.2.3.2 Main and Auxiliary Boilers

Main and auxiliary boilers should also be assessed, in consultation with the boiler manufacturer, in order to ascertain suitability for continuous operation using the type of 0.50% Smax compliant fuel which the ship intends to use, and any necessary modifications should be identified.

For example, if a boiler was originally designed to burn residual fuel while using distillate fuel only during start up and shutdown, then the manufacturer should be consulted on the following:

- Necessity to modify burner arrangement, including consideration of the method of atomization (steam or air);
- Sensitivity of flame detectors; and
- Modifications needed to the fuel heating system including the trace heating system if fitted.

Any modifications to a boiler's fuel system, including boiler burners, will require approval by the ship's classification society.

If there are technical constraints that prevent any boiler installed on board a ship from burning a particular type or grade of fuel, then these constraints should be documented in the Implementation Plan.

5.2.4 Tank Cleaning

The decision to clean tanks designated for bunkering of compliant fuel will depend on many factors including but not limited to:

- The expected type and grade of compliant fuel to be bunkered;
- Extent of tank contamination;
- The date of scheduled dry dockings;
- Yard availability;
- Type of charter;
- Type of ship;
- Trade routes;
- Bunkering arrangements;
- Current fuel; and
- Anticipated compliant fuel compatibility.

There remains considerable uncertainty regarding the worldwide availability of compliant fuel after 1 January 2020 and allowances should be made for possible non-availability of compliant fuel in some locations from and before 1 January 2020. This introduces uncertainty when considering the timing of bunker tank cleaning before this date.

Development of a ship specific Implementation Plan should include careful consideration of the scheduling of bunker operations and the reliability of sources of compliant fuel to avoid situations where ships are forced to load non-compliant fuel into cleaned tanks. This situation is most likely to occur when a ship requires bunkers to complete a voyage from a port with an unexpected non-availability of compliant fuel.

Shipowners and operators might therefore wish to consider including provisions for operation on compliant 0.1% distillate fuel in their ship specific Implementation Plans until the global fuel market transitions and availability improves or there is a reliable global supply of 0.5% Smax compliant fuel.

5.3 Procurement of Compliant Fuel Oil

Having identified the 0.50% Smax compliant fuels to be used (blended, distillate or residual) as the intended compliance option, the required fuels should be ordered well in advance of 1 January 2020, taking into consideration the ship's Fuel Oil Changeover Plan.

Fuel oil suppliers are unlikely to produce and make available large quantities of 0.5% Smax compliant fuels until there is demand for them. It is therefore recommended that owner/operators discuss their needs with suppliers and start ordering compliant fuels from as early as the middle of 2019.

For those ships operating on an existing charter that will extend beyond 1 January 2020 and where fuel is provided or paid for by the charterer, then the owner/operator should, **as a matter of urgency**, discuss compliance with the Global Sulphur Cap and how compliance will be achieved with charterers.

The owner/operator should present to the charterer the ship's Implementation Plan and seek agreement/assurances from the charterer that fuel will be supplied in accordance with the ship's Fuel Oil Changeover Plan contained within the Implementation Plan.

Where an owner/operator is considering a new charter (where the ship's fuel will be provided by the charterer) which will extend over the entire period, or part thereof, identified in the Fuel Oil Changeover Plan for the ship, then the owner/operator should insist that an appropriately worded clause is included in the Charter Party agreement. This should require that fuel supplied by the charterer should be provided to the ship in accordance with the Fuel Oil Changeover Plan as contained in the ship's Implementation Plan (see 5.4 below)[13].

It should be recognised in such an agreement that compliance with the MARPOL Regulations is a shared responsibility between owners and charterers, whereby the charterers agree to supply compatible fuels with specifications and grades that comply with Regulations 14 and 18 of MARPOL Annex VI. Provided that the charterers have fulfilled their obligations in respect of the supply of such fuels, the shipowner should confirm that the vessel complies with Regulations 14 and 18 of MARPOL Annex VI and that the vessel is therefore able to consume fuels of the required sulphur content.

For operators of ships in tramp trades, working closely with charterers will be particularly important, as will be making provision for periods between charters.

13 BIMCO has announced it is developing an all-encompassing "2020 Clause" for charter parties, which it hopes to publish before the end of 2018.

Delaying the changeover from 3.5% Smax fuel to the more expensive 2020 0.5% Smax compliant fuel until the last minute might at first sight seem to make economic sense. **Nevertheless, it is recommended that ships consider completing the changeover well before 1 January 2020 in order to address any operational and supply issues that could arise before the Global Sulphur Cap enters into force.**

It is recommended that the ship specific Implementation Plan should include allowances for the following prior to 1 January 2020:

- Identification and response to operational and supply issues;
- Conduct of machinery trials; and
- Controlled changeover and stabilisation of systems, including avoiding changing over during periods of increased safety risk e.g. when navigating in high traffic areas, when manoeuvring or when visibility is restricted etc.

5.4 Fuel Oil Changeover Plan

All ships should have a robust, ship specific Fuel Oil Changeover Plan that ensures that only compliant fuel is being burnt on and after 1 January 2020. The plan should consist of step by step changeover procedures from bunker tanks through to injection.

The Fuel Oil Changeover Plan should include, as a minimum, the following:

- The date and time for commencement of the changeover procedure. This should be based on considerations including the time needed to clean the fuel oil system (if required as per the ship's Implementation Plan), and the date of bunkering of the 0.50% Smax compliant fuels etc;
- The identification of bunker tanks designated to receive and store the 0.50% Smax compliant fuel that will be used for the changeover procedure;
- Procedures and schedule for checking remote indication, transmitters, alarm and shutdown systems for fuel oil storage, settling, service and overflow tanks, and for checking the availability of standby machinery to promptly start in case of any issues. These checks should be carried out before initiating the changeover procedure;
- The time that would be required to changeover the fuel oil system to compliant fuel based on the maximum volume of fuel in the system to be flushed. It is recommended that the changeover calculators provided by many classification societies be used for this purpose;
- Detailed description of the navigational and operational safety considerations during the expected time of commencement of the changeover procedure. This includes the sea traffic conditions, visibility, proximity to land, load on the running engines, availability of standby engines etc;
- Detailed description of the complete changeover procedure including the sequence of operation, location of valves, pumps and heaters etc;
- Associated changes in auxiliary systems. For example, purifier gravity discs for different viscosities, cylinder oil with different base numbers etc;
- Procedure for detailed checks of the system for leaks from pipes, flanges, glands, seals etc. during every step of the changeover procedure;

- Continued checks on system parameters such as pressure, temperature, viscosity etc;
- Procedures for operational checks on propulsion machinery which includes operation ahead and astern;
- Any required inspection or maintenance schedules; and
- Availability of a sufficient number of adequately trained and competent personnel to carry out the changeover procedure. In addition to being familiar with the ship's fuel system and its changeover procedure, the crew involved should be adequately trained in contingency measures during any resultant emergencies such as fuel leaks, fire, loss of power, local control of propulsion, and emergency manoeuvring.

The Fuel Oil Changeover Plan should also include measures to offload or consume any remaining non-compliant fuel. Ships are expected to be prohibited from carrying non-compliant fuel oil for combustion purposes for propulsion or operation on board the ship from as early as March 2020.

5.5 Sampling Arrangements for In Use Fuel Oil

It is anticipated that as a result of the implementation of the 2020 Global Sulphur Cap the frequency of occasions that Port State Control (PSC) will take samples of in use fuel oil from ships, in order to verify compliance, will increase significantly. It is therefore important to ensure that there is a uniform approach to PSC sampling which will ensure both the safety of the ship and crew, and that a representative sample is obtained which is free from external contamination and impurities.

It is expected that IMO will agree to require ships to fit an appropriate number of designated sampling points, for the purpose of taking representative samples of the fuel oil being used on board the ship ('in use' or 'on board' samples).[14]

The number and location of the sampling points required will be dependent on the ship's fuel system taking into consideration the number of consumer units, number of tanks with potential to provide fuel and the pumping and piping arrangements including crossovers. It will need to be shown that the location of the designated sampling point ensures that fuel collected is the fuel that is being used by the consumer units on board the ship. This requirement is expected to come into effect in the autumn of 2021.

It is therefore recommended that shipowners/operators investigate possible locations for designated safe sampling points keeping the number of points to the required minimum.

The arrangements for designated sampling points should be in accordance with the IMO Guidelines for On Board Sampling for the Verification of the Sulphur Content of the Fuel Oil Used On Board (MEPC.1/Circ.864) and confirmed by the RO acting on behalf of the ship's flag State.

These sampling points should fulfil all of the following conditions:

- Be easily and safely accessible;
- Take into account different fuel oil grades being used for the fuel oil combustion machinery item;
- Be downstream of the in use fuel oil service tank;
- Be as close to the fuel oil combustion machinery as **safely** feasible, taking into account the type of fuel oil, flow rate, temperature, and pressure behind the selected sampling point;
- Be clearly marked for easy identification and described in relevant documents such as system drawings;

14 Subject to approval by MEPC 73 in October 2018

- Located in a position shielded from any heated surface or electrical equipment, and the shielding device construction should be sturdy enough to endure leaks, splashes or spray under design pressure of the fuel oil supply line so as to preclude impingement of fuel oil onto such surfaces or equipment; and
- The sampling arrangement should be provided with suitable drainage to the drain tank or other safe location.

5.6 Documentation and Reporting

In addition to the documentation and reports normally required for the routine operation of the ship, it is recommended that the following documentation related to the implementation of the Global Sulphur Cap should be maintained on board all ships:

- The ship's Implementation Plan together with appropriate records demonstrating how the Plan has been followed;
- Where modifications have been carried out (see Section 5.2) related documents including relevant approved drawings. It should be noted that if tank arrangements have been modified then the trim and stability booklet will need to be revised and re-approved;
- Oil Record Book Part 1, providing details of all bunkering operations including the location, date, time, details of tank contents and fuel types (including sulphur content) and grades bunkered;
- A fuel changeover log book approved by the flag State of the ship that records the volume of low sulphur fuel oils in each tank as well as the date, time, and position of the ship when any fuel oil changeover operation is completed;
- A ship specific Fuel Oil Changeover Plan (see Section 5.4) that demonstrates how the ship calculated the time required for complete changeover and which provides evidence of compliance. The ship's log books should also contain the details of the changeover procedure;
- Records of the ship's planned maintenance system, especially related to the fuel oil system and propulsion and auxiliary engines, can be used to demonstrate actions related to achieving compliance, e.g. cleaning the fuel system to remove high sulphur fuel residues, changing purifier gravity disks to process low viscosity compliant fuels etc;
- Records showing ship specific familiarisation and training of crew with the Fuel Oil Changeover Plan, relevant procedures and related ship's systems; and
- Copies of any Fuel Oil Non-Availability Reports (FONARs) sent to the ship's flag State and all the supporting documents (to be retained on board for inspection for at least 12 months). It should be noted that a FONAR is required to be sent to the ship's flag State and the next arrival port.

6 Bunkering

It is expected that blended fuel oil will make up a large proportion of the compliant fuel available after 1 January 2020.

Even though in most cases these will meet the relevant standards (e.g. ISO 8217) there is still a possibility that the fuel may contain impurities that may not show up in standard tests and may require further detailed analysis. It is therefore essential that in all cases the ship operator seeks to ensure that appropriate bunkering procedures and sampling practices are followed.

In addition to the standard procedures normally followed during bunkering, the following best practices relevant to the implementation of the Global Sulphur Cap, and the anticipated new grades of fuels to be used, should be followed:

- As far as possible, two different grades of fuel oil should never be bunkered into the same bunker tank;
- If fuels of more than one sulphur grade are to be loaded through the same bunker hose/line, it is recommended that the fuel grade with the lowest sulphur content be loaded first followed by other grades in ascending order of sulphur content;
- Ensure that after the delivery of each grade of fuel oil, the bunker hose and lines are properly blown through. Sounding/ullage pipes of the bunker tank being blown through should be kept closed to avoid any spills during blow through;
- Ship's crew should be trained in relation to the harmful nature and effects on human health of fuel oil constituents and potential contaminants. The appropriate PPE, as identified by the company's procedures, should be worn by those persons involved in bunkering operations and the handling of the fuels. In this regard, it should be ensured that material safety data sheets (MSDS) relevant to the grade of fuel oil to be bunkered are provided by the bunker supplier and that any specified additional safety requirements in the MSDS are addressed by the ship prior to the commencement of bunkering;
- In case of disputes or PSC inspections, the MARPOL sample will be used to verify the sulphur content of the fuel oil supplied to the ship. It is therefore very important that ship operators ensure that, as per the Guidelines for the Sampling of Fuel Oil adopted by IMO (MEPC.96(47)), the MARPOL sample is always drawn from the receiving ship's bunker inlet manifold. If a bunker supplier refuses this arrangement, then a letter of protest should be issued to the supplier and the ship should independently take and store its own MARPOL sample drawn from the ship's manifold. Copies of the letter of protest should be sent to the Port State Control authority and the ship's flag State. A copy of the letter of protest should also be kept on board for potential inspections; and
- Where possible, it is recommended that a bunkered fuel oil should not be used until its laboratory analysis is completed and the results are known and confirmed to be in order.

7 Fuel Oil Non-Availability

It is anticipated that as the demand for 2020 compliant low sulphur fuels increases, new grades of fuels will enter the market in the form of distillates, blends and other streams such as vacuum gas oil (VGO).

As explained in Section 2 of this ICS Guidance, on the selection of compliant fuel, ISO has confirmed that the general requirements of ISO 8217:2017 cover the anticipated 0.50% Smax fuels in the same way as they cover existing fuels. However, at this stage it is not possible to predict adequate global availability for these 0.50% Smax fuels that meet ISO 8217:2017. Therefore, the possibility exists that shipowners and operators may face situations where fuel delivered could be compliant with the 0.5% Smax limit but not compliant with other fuel parameters such as those described in Section 3 of this ICS Guidance.

Whenever a ship is compelled to bunker and use non-compliant fuel due to the non-availability of compliant fuel or the unsuitability of available compliant fuels, this should be reported to the ship's flag State and the relevant port of destination using a Fuel Oil Non-Availability Report (FONAR).

According to Regulation 18.2.2 of MARPOL Annex VI, ships should not be required to deviate from their planned voyage or to delay unduly their voyage in order to obtain compliant fuel. **Ships are, however, required to make every best effort to obtain compliant fuel.**

IMO is developing a standard format for reporting fuel oil non-availability. It is expected that the related work will be completed by mid-2019.

The following factors should be considered before deciding whether to bunker non-compliant fuels:

- In order for flag States and/or Port State Control to verify the attempts made to obtain compliant fuel, documentary evidence of communications between the ship and fuel suppliers should be retained on board. If the charterer is responsible for providing the ship's compliant fuel, then copies of the communications between the charterer and bunker suppliers should be provided to the ship and should also be retained on board;
- Shipowners, operators and charterers are expected to take into account any logistical constraints, including the availability of compliant fuel at berths within the port, as well as terminal or port policies when planning for bunker delivery. It should be noted that having to change berth or moving to anchor within a port in order to obtain compliant fuel is very unlikely to be considered by Administrations/PSC as undue delay to the ship;
- The higher cost of compliant fuel (including 0.1% distillates if these are the only fuels available) will not be considered as a valid basis for claiming non-availability. In any case, the cost difference between compliant and non-compliant fuels may be relatively small compared to the cost and effort that may be involved in cleaning a fuel tank and associated systems after a voyage using non-compliant high sulphur fuel;
- Ships will be expected to bunker and use other compliant fuels including 0.10% Smax distillates in cases where 0.50% Smax fuels are unavailable. Exceptions to this option may be accepted by Port State Control authorities following consideration of the ability of the ship's fuel oil system to safely store, process and consume the other compliant fuels and the need for cleaning out the tanks of all remaining fuel residue prior to loading non-compatible alternatives into the same tank. In such cases, ship operators should ensure the availability of documentary evidence on board to prove the above limitations during the subsequent inspections following the issuance of a FONAR report;

- Shipowners and operators should give careful consideration to the quantity of non-compliant fuel bunkered where there is non-availability of compliant fuel. In these situations, the minimum possible quantity should be bunkered as it is possible that any remaining non-compliant fuel will be required to be debunkered once compliant fuel has been obtained.
- A FONAR should not be considered as exemption from the relevant sulphur limit requirements. According to Regulation 18.2 of MARPOL Annex VI, it is up to those Administrations that receive the FONAR to take into account all relevant circumstances and the evidence presented to determine the appropriate action to take, including not taking control measures.
- Whilst considering an individual FONAR report, Administrations may take into consideration the following:
  - The number of FONARs a ship has submitted in the past 12 months;
  - The number of FONARs the shipowner or operator has submitted for other ships in their fleet in the past 12 months;
  - Whether the quantity of non-compliant fuel bunkered is unreasonably excessive when compared to the quantity that would be expected necessary to complete the intended voyage;
  - Whether other ships on similar voyages have submitted similar FONAR reports; and
  - Any other evidence that would indicate the shipowner or operator has not planned effectively and taken all reasonable steps to ensure compliant bunkers will be available in the planned bunkering port.
- A FONAR should be prepared and sent to the ship's flag State and to the competent authorities in the relevant port of destination as soon as the ship's Master becomes aware that the ship will be unable to procure and use compliant fuel, but in all cases before the ship departs the bunker port.

Appendix 1

Recommended IMO Template for Ship Implementation Plan for Achieving Compliance with the 0.50% Sulphur Limit Entering into Force on 1 January 2020[15]

Particulars of ship

1. **Name of ship:**
2. **Distinctive number or letters:**
3. **IMO Number:**

Planning and preparation (before 1 January 2020)

1. **Risk assessment and mitigation plan**

   1.1 Risk assessment (impact of new fuels): YES/NO

   1.2 Linked to on board SMS: YES/NO

2. **Fuel oil system modifications and tank cleaning (if needed)**

   2.1 Schedule for meeting with makers and/or classification societies:

   2.2 Structural Modifications (installation of fuel oil systems/tankage) required: YES/NO/NOT APPLICABLE

   If YES, then:

   2.2.1 Fuel storage system:

   Description of modification:

   Details of yard booking (as applicable), time schedules etc.:

   Estimated date of completion of modification:

15 Subject to adoption by MEPC 73 in October 2018

2.2.2 Fuel transfer, filtration and delivery systems:

Description of modification:

Details of yard booking (as applicable), time schedules etc.:

Estimated date of completion of modification:

2.2.3 Combustion equipment:

Description of modification:

Details of yard booking (as applicable), time schedules etc.:

Estimated date of completion of modification:

2.3 Tank cleaning required: YES/NO/NOT APPLICABLE

If YES, then:

Details of cleaning schedule (including yard booking, time schedules etc., if applicable):

Estimated date of completion of cleaning:

3. Fuel oil capacity and segregation capability:

Following required modifications as per Section 2:

3.1 Expected number of bunker tanks designated to store 0.50% sulphur compliant fuel oil:

3.2 Expected total storage capacity (m^3) for 0.50% sulphur compliant fuel oil:

3.3 Expected number of bunker tanks designated to store 0.10% sulphur compliant fuel oil:

3.4 Expected total storage capacity (m^3) for 0.10% sulphur compliant fuel oil:

3.5 Approximate total fuel oil content (m^3) in the fuel oil transfer, purification and delivery systems:

4. Procurement of compliant fuel oil

4.1 Details of fuel purchasing procedure to source compliant fuels, including procedures in cases where compliant fuel is not readily available

4.2 Estimated date for bunkering compliant fuel oil, not later than 24:00hrs 31 December 2019:

4.3 If fuel arranged by charterer, is there an intention to accept charter party contracts that do not have a specified obligation to provide compliant fuel after 1 June 2019 or other date to be identified: YES/NO

If YES, then:

Details of alternate steps taken to ensure that the charter party provides timely delivery of compliant fuel:

4.4 Is there confirmation from bunker supplier(s) to provide compliant fuel on the specified date: YES/NO

If NO, then

Details of alternate steps taken to ensure timely availability of compliant fuel oil:

4.5 Details of arrangements (if any planned) to dispose of any remaining non-compliant fuel:

5. Fuel oil changeover plan

5.1 Ensure that a ship specific Fuel Changeover Plan is available. The plan should include measures to offload or consume any remaining non-compliant fuel. The plan should also demonstrate how the ship intends to ensure that all its combustion units will be burning compliant fuel no later than 1 January 2020.

5.2 As per the ship specific Fuel Changeover Plan, the maximum time period required to changeover the ship's fuel oil system to use compliant fuel oil at all combustion units:

5.3 Expected date and approximate time of completion of the above mentioned changeover procedure:

5.4 Consider availability of adequately trained officers and crew familiar with the ship's fuel system and fuel changeover procedures to carry out the fuel changeover procedure. If this cannot be confirmed, then consider whether there is a sufficient amount of time dedicated for ship specific familiarization and training of new officers and crew.

6. Documentation and reporting

6.1 If there are modifications planned as per Section 2, related documents including the shipboard fuel oil tank management plans and stability and trim booklets should be consequently updated.

6.2 The Implementation Plan should be kept on board and updated as applicable.

6.3 If following the Implementation Plan, the ship has to bunker and use non-compliant fuel oil due to unavailability of compliant fuel oil safe for use on board the ship, steps to limit the impact of using non-compliant fuel oil could be:

6.4 The ship should have a procedure for Fuel Oil Non-Availability Reporting (FONAR). The Master and chief engineer should be conversant about when and how FONAR should be used and who it should be reported to.

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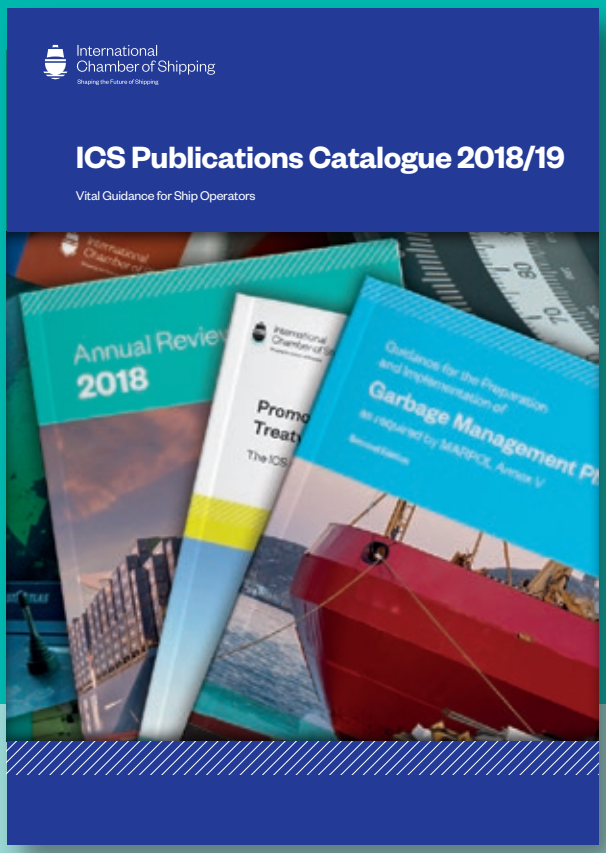

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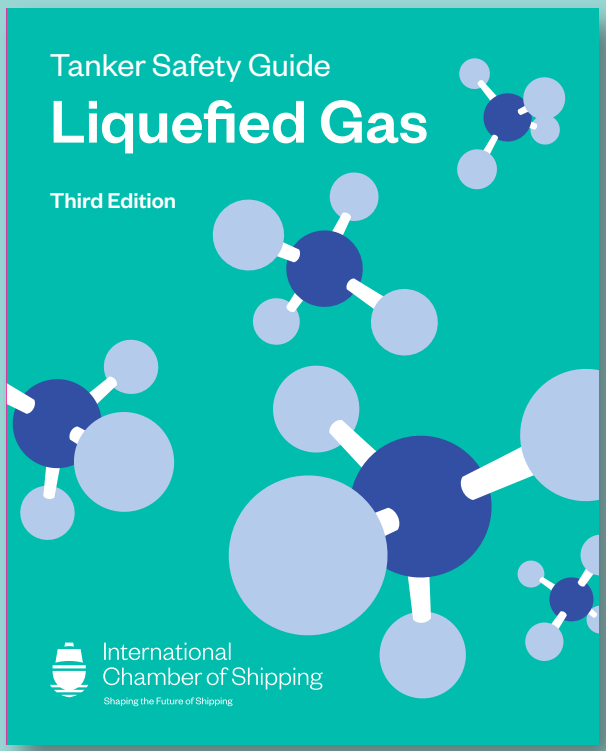

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