“IMO 2020” Sulphur limit - Regulations

Bangkok, Thailand
27 June 2019

Seminar on the regulations and reduction of air emissions from ships
**MARPOL Annex VI – Chapter 3**

- **Ozone Depleting Substances (ODS)**
  - *Regulation 12*

- **Nitrogen Oxides (NO\textsubscript{x})**
  - *Regulation 13*

- **Volatile Organic Compounds (VOCs)**
  - *Regulation 15*

- **Shipboard incineration & reception facilities**
  - *Regulations 16 and 17*

- **Sulphur Oxides (SO\textsubscript{x}) and PM**
  - *Regulation 14*

- **Fuel oil availability and quality**
  - *Regulation 18*
Content

- General information on SO$_x$ and ship-board fuel oil system

- MARPOL Annex VI – Regulation 14
  - MARPOL Annex VI sulphur regulations
  - Consistent implementation of the 0.50% sulphur limit

- MARPOL Annex VI – Regulation 18
  - Fuel oil availability
  - Fuel oil quality
General information on $\text{SO}_x$ and ship-board fuel oil system
How is $\text{SO}_x$ produced and what is its impact?

- $\text{SO}_x$ is normally Sulphur dioxide ($\text{SO}_2$) and to some extent Sulphur trioxide ($\text{SO}_3$).
- $\text{SO}_x$ is produced from combustion (oxidation) of sulphur contained in most fuel-oil.
- $\text{SO}_x$ causes:
  - acid rain
  - sea and soil acidification
  - human health issues
    • A study on the human health impacts of $\text{SO}_x$ emissions from ships, submitted to MEPC by Finland in 2016 estimated that by not reducing the $\text{SO}_x$ limit for ships from 2020, the air pollution from ships would contribute to more than 570,000 additional premature deaths worldwide between 2020-2025.

- $\text{PM}$ (Particulate Matter) is produced due to incomplete combustion of fuel.
- Level of $\text{PM}$ is dependent on fuel sulphur level.

$\Rightarrow$ reduction of fuel sulphur will reduce $\text{SO}_x$ but also $\text{PM}$.
Typical ship fuel oil system

- Storage tanks
- Transfer pumps
- Settling tanks
- Purifiers (centrifuge)
- Service tanks
- Flow meters
- Heaters
- Viscosity regulator


[https://www.youtube.com/watch?v=8FAAYzHCplA](https://www.youtube.com/watch?v=8FAAYzHCplA) (until 1:44 min)
Storage tanks

- Storage tanks are used to store bunkered fuel oil.
- A ship has a number of storage tanks.
- Depending on area of operation of the vessel and type of fuel oil the storage tank may need to be heated, in order to keep fuel oil stored in liquid form.
- Storage tank sizes are selected based on maximum travel range for the ship at design stage.
- If a ship is not intended to travel the full range, there may not be a need to fill all tanks completely at each bunkering.
Settling tank

The role of settling tank is to separate heavy residues and water from the fuel oil through the natural settling process. To provide best performance:

- Settling tank temperature should normally be maintained between 60-70°C for HFO.
- Transfer of fuel oil to the settling tank for top up should be in small quantities at frequent intervals to avoid major change in temperature or settling disturbances.
- Drain off water and sludge at the settling tank bottom drains at regular intervals.
- The drain valves should be checked on a regular basis (once a day).
- The settling tank should be cleaned once a year.
Service tanks

- Service tanks (day tanks or daily tanks) are used to store and supply treated fuel oil to main engine, auxiliary engine and boilers.

- The number of such tanks can be one or more. In modern ships and due to number of fuel oil used, more than one service tank is available.

- Functions of the service tank:
  - provide a final settling function for water and solids (as back up)
  - a heating function and a thermal stabilising function.
Harmful elements to the engine

- Sodium => Exhaust system corrosion
- Vanadium => Exhaust system corrosion
- Asphaltenes => Fouling
- Catalytic Fines => Erosion and corrosion
- Water, especially sea water

**ISO 8217:2017** specifies the requirements for fuels for use in marine diesel engines and boilers, prior to conventional onboard treatment (settling, centrifuging, filtration) before use.
Fuel oil treatment - Purification

- Works based on centrifugal principles
- Typical working principle and arrangement
- Water and other impurities are separated and together with some heavier fuels form the sludge.

http://www.marinediesels.info

http://www.marinediesels.info
Fuel oil treatment - Purification

• **Centrifugal separators** are used to separate sludge, water, cat fines, etc.

• The efficiency of a centrifugal separator is affected by:
  - Composition of the fuel oil
  - Quantity of fuel oil
  - Temperature of fuel oil
  - Cleanliness of the separator and its general working conditions

• For good purifier performance:
  - Operate purifiers in an optimum manner
  - Make sure purification system and its disks are working correctly
Fuel oil treatment - Purification

- What centrifugal machines can separate:
  - Water
  - Sodium
  - Al + Si
  - Iron + Magnesium
  - Ash + Calcium

- What centrifugal machines cannot change:
  - Density
  - Viscosity
  - C.C.A.I.
  - Flash point
  - Micro carbon residues
  - Sulphur
  - Vanadium
  - Asphaltenes
Incompatibility of fuel oils

- Fuel oils from different origins may chemically be incompatible and upon mixing can lead to sludge formation and precipitation.

- Effects on fuel oil filters and injectors:
  - Clogging of filters
  - Seizure of needle and plungers

- To avoid the above, the onboard activities should **identify incompatibility and avoid mixing** (“co-mingling”).

- There are some spot tests that can be performed onboard which predicts in few hours the compatibility between two fuel oils (ASTM D278)

- Potential safety issues listed in the *2019 Guidelines on consistent implementation of the 0.50% sulphur limit under MARPOL Annex VI* (resolution MEPC.320(74))
Fuel oil storage and transfer

Avoid co-mingling:

• Do not mix different batches of fuel oils to the extent possible.

• Incompatibility is the most common problem with the bunker fuel oil mixing that may lead to clogged filters, engine damage, etc.

Clogged fuel oil pipes due to poor quality of fuel oil
Fuel oil treatment – Viscosity control

• For use of fuel oil in engines, an **optimal fuel oil viscosity** at injectors is required.

• This is achieved via **fuel oil temperature control**.

• Incorrect injection viscosity results in poor atomisation which affects the engine efficiency and emissions.

*Fuel oil steam heating for viscosity control*
MARPOL Annex VI – Regulation 14

Sulphur Oxides (SO$_x$) and Particulate Matter
MARPOL Annex VI sulphur regulations
The 0.50% m/m sulphur limit was included in the 2008 amendments to MARPOL Annex VI, along with a review clause.

MEPC 70 (October 2016) considered and approved a report on “Assessment of Fuel Oil Availability” (documents MEPC 70/5/3 and MEPC 70/INF.6)

“In all scenarios, the supply of marine fuels with a sulphur content of 0.50% m/m or less and with a sulphur content of 0.10% m/m or less is projected to meet demand for these products.”

Following this review, MEPC 70 decided to retain the 1 January 2020 as the date of implementation for the 0.50% m/m sulphur limit for fuel oil used onboard ships (operating outside ECAs).
Sulphur content of fuel oil used on board ships (Regulation 14 of MARPOL Annex VI)

<table>
<thead>
<tr>
<th>Sulphur content in fuel oil (% m/m)</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.50</td>
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<tr>
<td>3.50</td>
<td>01/7/2010</td>
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<tr>
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<tr>
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<tr>
<td>0.50</td>
<td>01/1/2015</td>
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<tr>
<td>0.10</td>
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</table>

Review of fuel oil availability (2016)
Sulphur content of fuel oil used on board ships
(Regulation 14 of MARPOL Annex VI)

- More than 570,000 premature deaths avoided (2020-2025)
- 68% overall reduction in shipping’s negative effect on human health through air pollution

Significant reductions in:
- stroke
- asthma
- cardiovascular disease
- lung cancer
- pulmonary disease

Cutting sulphur emissions helps prevent acid rain, which means:
- less harm to crops, forests and aquatic species
- tackling ocean acidification
2020 Sulphur limit (Regulation 14.1.3 of MARPOL Annex VI) - overview

- “Carriage ban” on non-compliant fuel oil adopted at MEPC 73.

- This regulation applies to all ships, unless the ship has an equivalent compliance method as per regulation 4.1 (e.g. is fitted with and Exhaust Gas Cleaning System) or is delivered an exemption by the Administration to conduct trials for the development of ship emission reduction and control technologies and engine design programmes, as per regulation 3.2.

<table>
<thead>
<tr>
<th>Regulation 14.1 today</th>
<th>Regulation 14.1 expected to enter into force on 1 March 2020</th>
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<tr>
<td>“The sulphur content of any fuel oil used on board ships shall not exceed the following limits:</td>
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<tr>
<td>.1 4.50% m/m prior to 1 January 2012;</td>
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<tr>
<td>.2 3.50% m/m on and after 1 January 2012;</td>
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<tr>
<td>.3 0.50% m/m on and after 1 January 2020”</td>
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</tr>
<tr>
<td>“The sulphur content of any fuel oil used or carried for use on board ships shall not exceed 0.50% m/m”</td>
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</tbody>
</table>

- The carriage ban is not applicable to fuel oil carried as cargo
Emissions control areas (ECAs)

- **Emission control area** = “an area where the adoption of special mandatory measures for emissions from ships is required to prevent, reduce and control air pollution from NOx or SOx and particulate matter or all three types of emissions and their attendant adverse impacts on human health and the environment” (Regulation 2 of MARPOL Annex VI)

- Sulphur ECAs ruled by regulations 14.3 to 14.7 of MARPOL Annex VI.
  
  => While a ship is operating within an ECA, the sulphur content of fuel oil used on board that ship shall not exceed 0.10% m/m.

- **Procedure and criteria for designation of ECAs** set out in Appendix III to MARPOL Annex VI.

- Reg. 14.7: ships have to comply at least 12 months after designation of ECA

Sulphur ECAs designated under MARPOL Annex VI (Regulation 14.3)

North Sea and Baltic Sea ECAs
(also NO\textsubscript{x} ECA from 1 January 2019)

North American ECA
(also PM and NO\textsubscript{x} ECA)

U.S. Caribbean ECA
(also PM and NO\textsubscript{x} ECA)
Chinese Domestic Sulphur emission control areas for international shipping

- **Domestic ECA**: coastal area
  => 0.50% limit, from 1 January 2019

- **Inland water DECA**: Yangtse and Pearl Rivers
  => 0.10% limit, from 1 January 2020

- **Hainan DECA**: 12 nautical miles around the island (red line)
  => 0.10% limit, from 1 January 2022

- **Revision provision** to determine whether the 0.10% limit will be expanded to the entire coastal area from 2025

An EGCS is currently accepted as an equivalent measure for complying with the above requirements.

Source: DNV-GL, 2018
Regulation 14.6

• Ships using separate fuel oils and entering or leaving an ECA shall carry a written procedure showing how the fuel oil changeover is to be done, allowing sufficient time for the fuel oil service system to be fully flushed of all fuel oils exceeding the applicable sulphur content prior to entry into the ECA.

• 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 prior to the entry into an ECA or commenced after exit from such an area shall be recorded in such logbook as prescribed by the Administration.
Changeover

- **Segregated systems** → close one tank, open other. However, care should be taken for temperature shock caused by hot and cold fuel oil.

- **Non-segregated systems** → care must be taken in such cases to ensure that the entire system is purged of any fuel oil with a sulphur content above 0.10 % m/m prior to entering the ECA. To aid this process, changeover procedures and flushing calculations may be contained in the ISM manual onboard the vessel.

⇒ recording procedure in logbook and monitoring (Regulation 14.6)
⇒ more complex system and therefore more vigorous “fuel management”
⇒ planning of voyages to ensure correct fuel onboard priori to entering an ECA
Typical changeover calculation programs provided by class societies

FOBAS Change-Over Calculator (Service System)

Version 5

At start of change over:
Rate of fuel consumption (engine) = 3.00 t/hr
Rate of oil consumption (engine) = 6.00 t

HSFO sulphur content: 3.50 % m/m
ULSMGO

LSFO sulphur content: ULSMGO 0.098 % m/m

Required sulphur content at engine inlet (i.e. ECA-SOx limit): 0.100 % m/m

Calculations are based on the assumption that the following setup is being used:

Diagram A

Frisnier LT 45 Ligl 10

Working together for a safer world

Lloyd’s Register Marine

International Maritime Organization
MARINE ENVIRONMENT DIVISION
Consistent implementation of the 0.50% sulphur limit
SOx compliance options

➢ Use **compliant fuel oil** (Regulation 14):
  - Ultra-low Sulphur fuel oil (ULSFO)
  - Marine Gas Oil, Marine Diesel Oil

➢ Use an **equivalent compliance method** which is at least as effective in terms of emissions reduction (Regulation 4):
  - Exhaust Gas Cleaning Systems (scrubbers)
  - *2015 Guidelines on Exhaust Gas Cleaning Systems* (resolution MEPC.259(68))

➢ Use **alternative fuels**

➢ At berth: use **Onshore Power Supply**
Issues related to the consistent implementation of the 0.50% sulphur limit

What to do in case of compliant fuel oil non-availability?

Which impact on fuel and machinery systems could result from the change of fuel?

Which verification and control mechanisms?

Which safety implications?

How to encourage ships and companies to be ready on time?

How to keep consistency between the relevant ISO standards on marine fuels?

=> Lot of work undertaken and achieved these past years!
Regulatory amendments approved by MEPC 74 (May 2019), for adoption at MEPC 75 (April 2020), expected to enter into force on 1 September 2021

• Draft definitions prepared as amendments to regulation 2 of MARPOL Annex VI:

51. Sulphur content of fuel oil = the concentration of sulphur in a fuel oil, measured in % m/m as tested in accordance with a standard acceptable to the Organization (refers to ISO 8754 in footnote);

52. Low-flashpoint fuel = gaseous or liquid fuel oil having a flashpoint lower than otherwise permitted under paragraph 2.1.1 of SOLAS regulation II-2/;

53. MARPOL delivered sample = the sample of fuel oil delivered in accordance with regulation 18.8.1 of MARPOL Annex VI;

54. In-use sample = the sample of fuel oil in use on a ship; and

55. On board sample = the sample of fuel oil intended to be used or carried for use on board that ship.

• Amendments related to verification procedure for a fuel oil sample:

- regulation 14, on in-use and on board fuel oil sampling and testing and on designation and utilization of oil sampling point by a competent authority of a Party.

- regulation 18.8.2 and appendix VI, on fuel oil sampling procedure by Parties

⚠️ Member States are invited to apply these amendments in advance of their entry into force (MEPC.1/Circ.882)
2019 Guidelines for consistent implementation of 0.50% sulphur limit under MARPOL Annex VI (resolution MEPC.320(74))

Guidelines intended for use by Administrations, port States, shipowners, shipbuilders and fuel oil suppliers. Main content:

1. **Definitions** (DM, RM, ULSFO, VLSFO, HSHFO)
2. **Ship implementation planning** for 2020 (cf: MEPC.1/Circ.878)
3. **Impact on fuel and machinery systems**: distillate fuels (including distillate fuel with FAME) / Residual fuels / Key technical considerations for shipowners and operators / ISO Standard for residual fuels / Cylinder lubrication
4. **Verification issues and control mechanism and actions**: Survey and certification by Administrations / Control measures by port States / Control on fuel oil suppliers / Information sharing related to non-compliances under MARPOL Annex VI
5. **Fuel oil non-availability**: Guidance and information sharing on fuel oil non-availability / Standard format for reporting fuel oil non-availability (FONAR) – Appendix 1
6. **Possible safety implications** relating to fuel oils meeting the 0.50% m/m sulphur limit – Appendix 2
Guidance on the development of a ship implementation plan for the consistent implementation of the 0.50% sulphur limit

- Guidance issued in November 2018 (MEPC.1/Circ.878)
- This guidance includes an indicative plan helping shipowners and operators preparing to comply comprising the following key elements:
  1. risk assessment and mitigation plan (impact of new fuels);
  2. fuel oil system modifications and tank cleaning (if needed);
  3. fuel oil capacity and segregation capability;
  4. procurement of compliant fuel;
  5. fuel oil changeover plan; and
  6. documentation and reporting.
- Additional guidance that could be taken into account is provided on impact on machinery systems and on tank cleaning.
Other Guidelines and Guidance issued to support consistent implementation of the 0.50% sulphur limit

- **Guidance on best practice for fuel oil purchasers/users for assuring the quality of fuel oil used on board ships** (MEPC.1/Circ.875), addressing in particular:
  - Choice of fuel oil supplier
  - Contracting issues
  - Documentation
  - Fuel oil receiving on board, sampling and testing
  - Dispute resolution

- **Guidance on best practice for fuel oil suppliers for assuring the quality of fuel oil delivered to ships** (MEPC.1/Circ.875/Add.1), addressing in particular:
  - Quality control during production of bunkers
  - Quality control in the supply chain
  - Bunker transport, storage and transfer
  - Delivery to ship (bunkering operations)
  - Representative sampling
  - Testing and interpretation of test results in the supply chain
  - Documentation (e.g. bunker delivery note – BDN)
  - Contracting issues
  - Dispute resolution
Other Guidelines and Guidance issued to support consistent implementation of the 0.50% sulphur limit

• *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), establishing an agreed method for in-use fuel oil sampling:
  - Sampling location (designated fuel oil sampling point(s))
  - Sample handling (collection, identification)

PPR 7 will further consider document MEPC 74/10/2 (IMarEST) and prepare draft amendments to the 2019 guidelines on the verification of the sulphur content of fuel oil that is not in-use on board (“on board sampling”)

• *Guidance on indication of ongoing compliance in the case of the failure of a single monitoring instrument, and recommended actions to take if the Exhaust Gas Cleaning System (EGCS) fails to meet the provisions of the Guidelines* (MEPC.1/Circ.883):
  - System malfunction
  - Short-term exceedances
  - Interim indication of ongoing compliance in the case of sensor failure
  - Notification to relevant Authorities
Potential safety implications of 0.50% compliant fuel oil

- The 2019 Guidelines on consistent implementation of the 0.50% sulphur limit under MARPOL Annex VI (resolution MEPC.320(74)) provide in Appendix 2 a Technical review of the following potential safety implications:
  - stability of blended fuel oil;
  - compatibility issues, including new tests and metrics appropriate for future fuels;
  - cold flow properties;
  - acid number;
  - flashpoint;
  - ignition and combustion quality;
  - cat fines;
  - low viscosity; and
  - unusual components.

- MEPC 74 approved, subject to concurrent approval by MSC 101, the draft MSC-MEPC circular on delivery of compliant fuel oil by suppliers
Other related activities

- In September 2018, the International Chamber of Shipping (ICS) produced a “Guidance to Shipping Companies and Crews on Preparing for Compliance with the Global Sulphur Cap”

- Joint Industry Guidance (OCIMF, IPIECA, IBIA, etc.) on potential safety and operational issues related to the implementation of the 0.50% sulphur limit due to be issued mid-2019

- Related E-learning course should be developed and available by the end of 2019

- Publicly Available Specification (PAS) 23263 providing guidance as to the application of the existing ISO 8217:2017 marine fuel standard to 0.50% compliant fuel oils due to be issued by ISO in mid-2019
MARPOL Annex VI – Regulation 18

Fuel oil availability and quality
Guidance for best practice for Member State/coastal State

➢ Guidance issued May 2019 (MEPC.1/Circ.884), to ensure effective implementation and enforcement of MARPOL Annex VI, in particular regulation 18

➢ **Goals** of these best practices:

- ensure that existing requirements under MARPOL Annex VI (including port State control guidelines) are effectively applied;
- address the reliability of the local bunker suppliers under the domestic legal authority of the State;
- provide practical information on the implementation of Member State’s obligations under MARPOL Annex VI and encourage the use of guidance provided by IMO.

➢ These best practices are not intended to create any responsibilities for States beyond what is required in MARPOL Annex VI.

Non-Parties are also encouraged to make use of these best practices
Fuel oil availability
Regulation 18 – Fuel oil availability

- Parties to **promote availability** of compliant fuel oils (Reg.18.1)
- Ships found **not to be in compliance** (Reg.18.2.1)
  - record of actions taken to achieve compliance
  - need to demonstrate “**best efforts**” to obtain compliant fuel oil
- Ship should **not be required to deviate or delay unduly** the voyage in order to achieve compliance (Reg.18.2.2).
- Party required to take into account **all relevant circumstances** to determine action (Reg.18.2.3).
- Ship required to **notify Administration and port of destination** when unable to purchase compliant fuel (Reg.18.2.4).
- Party required to **notify the Organization** when ship presents evidence of non-availability (Reg.18.2.5)
Regulation 18.1 – How to promote fuel oil availability

- Member States should promote the availability of compliant fuel oils and require suppliers under their jurisdiction to provide compliant fuel oils.
  - This should be done without leading to distortion of competition => let suppliers make investments decisions

- Member States should provide timely information on upcoming regulations to suppliers under their jurisdiction, including revisions of the information required on the bunker delivery note.

Member States are also invited to inform IMO of the availability of compliant fuel oil in the national ports and terminals through MARPOL Annex VI GISIS module (MEPC.1/Circ.880)
Regulation 18.2 – Fuel oil non-availability

➢ In the case a ship is found by a Party not to be in compliance, the Party can request:

• a **record of actions** taken to attempt to bunker compliant fuel oil *and*

• **provide evidence**:
  - of an attempt to purchase compliant fuel 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 oil *and*
  - that despite best efforts to obtain compliant fuel no such fuel was made available for purchase.

➢ The master may have to provide evidence such as:

  - Copy of the ship’s voyage plan;
  - Description of the action taken, including investigation of alternate sources of fuel oil prior commencing the voyage;
  - Description of the reason why compliant fuel was not available (e.g. fuel oil supply disruptions at port, etc.).

⚠️ Cost of compliant fuel is not considered to be a valid basis for claiming non-availability of fuel.
When a ship cannot purchase compliant fuel oil, it should notify this information to its Administration and the port of destination (port State control authorities), using the *Fuel oil non-availability report* (FONAR) provided in appendix 1 of the 2019 Guidelines for consistent implementation of 0.50% sulphur limit under MARPOL Annex VI.

The FONAR should be sent as soon as it is determined or becomes aware that it will not be able to procure compliant fuel oil.

A FONAR is not an exemption or a “free-pass”: it is the responsibility of the PSC authority to scrutinize the information provided and take action.
Regulation 18.2.5 – How to handle notifications of the non-availability of compliant fuel oil

- When notifying to other Parties evidence of the non-availability of compliant fuel oil, Member States should follow the procedure for reporting compliant fuel oil non-availability using the related **standard format** developed by IMO on GISIS.

- A Party should **investigate** the reports of non-availability in order to:
  - ensure a consistent supply of compliant fuel to industry;
  - prevent incentives for ships to use ports where it is known that compliant fuel is not available.

- Enforcement on fuel suppliers **by warning, penalties or even temporarily prohibition** of deliveries for sea going ships.
**Regulation 18.2.5 – How to handle notifications of the non-availability of compliant fuel oil**

### Regulation 18.2.5

**Evidence of non-availability of compliant fuel oil**

Display notifications from: -- Please select --

- **Showing 1-25 of 85**

<table>
<thead>
<tr>
<th>Notifying Party</th>
<th>Name of ship</th>
<th>Flag Administration</th>
<th>Date of non-availability</th>
<th>Port/terminal</th>
<th>Fuel type</th>
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<td>Bahamas</td>
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Regulation 18.2.5 – How to handle notifications of the non-availability of compliant fuel oil

• MEPC 74 established a Correspondence Group on Data Collection and Analysis under Regulation 18 of MARPOL Annex VI, to be coordinated by the Secretariat, to investigate:
  - the reporting of additional items on GISIS;
  - further usability improvements, if feasible and as appropriate.
Oil majors plans to supply 0.50% compliant fuels readily for 2020

IMO 2020 – Chevron plans to offer 0.5% sulphur fuels in Q3 2019

Oil major Chevron has revealed that it will offer the IMO 2020-compliant 0.5% sulphur bunker fuel by the end of the third quarter, reports said.

Chevron Fuels Technologist Monique Vermeire said: “If the shipping company is willing to try it out we can make it available, but not for continuous purchase.

“I think it will be available by the end of the third quarter,” she told

IMO 2020: A CLEAR VISION INTO 2020 WITH OUR SUITE OF FUEL SOLUTIONS

Interview: Total Marine Fuels Global Solutions readies for IMO 2020: MD

IMO 2020 - BP unveils supply locations for 0.5% marine fuels

Oil major BP has announced that it will begin to sell very low sulphur fuel oil (VLSFO) with a maximum sulphur content of 0.5% that meets the upcoming IMO 2020 regulation, following successful sea trials in the Amsterdam/Rotterdam/Antwerp (ARA) and Singapore hubs.

IMO 2020 – ExxonMobil confirms 0.5% fuel supplies by Q3 2019

Oil major ExxonMobil has announced that it will make IMO 2020 compliant low sulphur fuels available by the third quarter of 2019.

The current bunker fuel sulphur content capped at 3.5% for ocean-going vessels will need to be reduced to 0.5% from 1 January 2020 under IMO’s Marpol Annex VI global regulation.

“We will be ready with the products and point of sales by the third quarter of 2019. That’s when we expect marine customers will start to bunker as the deadline of 1 January 2020 approaches,”

Luca Volta, marine fuels venture manager at ExxonMobil, was quoted saying.
Fuel oil quality
Regulation 18 – Fuel oil quality

- **Required properties of fuel oil** (Reg.18.3).
- **Excludes** coal, nuclear and gas fuels from some of the provisions (Reg. 18.4).
- Requirement to receive a **Bunker Delivery Note (BDN)** when bunkering fuel oil (Reg. 18.5).
- BDN to be **retained for 3 three years** and be **available** for inspection (Reg. 18.6).
- BDN accompanied by **representative sample** for 12 months at least (Reg.18.8.1).
- **Verification of bunker sample** to be done in accordance with Appendix VI (Reg.18.8.2).
- Inspection and verification by **PSC** (Reg.18.7.1 & Reg.18.7.2).
- Relations with **local suppliers** of fuel oil (Reg. 18.9)
- Actions in case of **delivery of non-compliant fuel oil** (Reg. 18.10)
Regulation 18 – Fuel oil quality – related guidance

- Guidance on best practice for fuel oil purchasers/users for assuring the quality of fuel oil used on board ships (MEPC.1/Circ.875)
- Guidance on best practice for fuel oil suppliers for assuring the quality of fuel oil delivered to ships (MEPC.1/Circ.875/Add.1)
- 2009 Guidelines for the sampling of fuel oil for determination of compliance with the revised MARPOL Annex VI (resolution MEPC.182(59))
- 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)
Regulation 18.3: Fuel oil quality requirements

Fuel oil shall:

• be blends of hydrocarbons;
• be free from inorganic acid;
• not include any added substance or chemical waste that:
  - jeopardizes safety of ship or performance machinery;
  - is harmful for personnel;
  - contributes overall to additional air pollution
Regulation 18.4: Coal, nuclear and gas fuels

- Regulation 18 does not apply to coal, nuclear and gas fuels (such as LNG)
- However the sulphur content of gas fuel should be documented by the supplier
Regulations 18.5 to 18.7.2 – Bunker Delivery Note (BDN)

BDN to include the following information (Appendix V to MARPOL Annex VI):

- Name and IMO number of receiving ship
- Port and Date of commencement of delivery
- Name, address and telephone number of fuel supplier
- Product name and Quantity
- Density
- Sulphur content (actual)
- Declaration signed by supplier that the fuel oil conforms with Annex VI (specifying the limit value and if the fuel oil will be used in combination with an equivalent means of compliance (e.g. scrubbers))
BDN should be kept on board during at least 3 years and should be readily available for inspection at all reasonable times.

Inspections of BDN by Parties:

- Possibility to take certified copies;
- Possibility to verify the contents of each BDN through consultations with the port where the note was issued.

The inspection of the BDN “shall be performed as expeditiously as possible without causing the ship to be unduly delayed”
Regulations 18.8.1 and 18.8.2 – MARPOL sample

➢ BDN must be accompanied by a **representative sample** of the fuel oil (Reg. 18.8.1). Samples must be taken during bunkering, other samples are not valid.

➢ The **2009 Guidelines for the sampling of fuel oil for determination of compliance with the revised MARPOL Annex VI** provide information on:
  
  • the sampling methods and attention to give to the sample integrity;
  • sampling location: at the receiving ship’s inlet bunker manifold and should be drawn continuously throughout the bunker delivery period;
  • sample handling (not less than 400 ml);
  • sealing (in presence of a representative of the ship) and labelling of the sample. Breaking the seal makes the sample invalid.
  • conditions of storage on board

⚠️ The sample should be kept on board at least 12 months from the time of delivery
Regulation 18.8.2 – Use of MARPOL sample for disputes

- A verification procedure for a MARPOL Annex VI fuel oil sample is to be found in Appendix VI.
- MEPC.1/Circ.882 provides text for new appendix VI (early application)
  - Part 1: sample of fuel oil delivered in accordance with regulation 18.8.1, referred to as the 'MARPOL delivered sample'
    - Average of 2 test results (Sulphur content test: ISO 8754:2003) used (X), 95% confidence interval removed, no stage 2 verification
  - Part 2: sample of fuel oil in use, intended to be used or carried for use on board in accordance with regulation 14.8, referred to as the 'in-use sample' and 'on board sample'
    - Average of 2 test results (Sulphur content test: ISO 8754:2003) used (Z), 95% confidence interval retained, no stage 2 verification

<table>
<thead>
<tr>
<th>Limit (V)</th>
<th>Test Margin (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.10</td>
<td>0.11</td>
</tr>
<tr>
<td>0.50</td>
<td>0.53</td>
</tr>
</tbody>
</table>

- The laboratories responsible for the verification procedure must be accredited.
- The final results obtained from this verification procedure shall be evaluated by the competent authority
Complaints in relation to bunker suppliers

- Complaints about bunkering, according to regulations 11 and 18, go from the flag State to the relevant port State, which can take steps against the supplier who has committed an offence. The information is communicated to Member States of IMO.

- In shipping the complaints are submitted as a Note of Protest established by the Master.
Regulation 18.9 – Duties of authorities

Parties are required to:

• Maintain a **register of local suppliers** of fuel oil (Reg.18.9.1) for seagoing vessels of more than 400 GT.
  - This list is a means to be able to trace the supplier involved in case of *non-compliance*. It does not indicate ‘certificated supplier’.
  - When the supplied fuel is not compliant, the master must report this to the flag State, **which subsequently** informs the port State (and the supplier).

• Require local suppliers of fuel oil to provide **certified BDN and samples** (Reg.18.9.2), and **retain a copy** of the BDN for 3 years for possible inspection (Reg.18.9.3)

• **Take action against** local suppliers of fuel oil that does not comply with that stated on BDN (Reg.18.9.4)

• **Inform the Administration of a ship** when the ship is found to be non-compliant (Reg.18.9.5)

• **Inform IMO** of all cases of non-compliant fuel oil being supplied (Reg.18.9.6)
All up-to-date regulatory information available from:

Port State Control issues
• Guidelines adopted at MEPC 74
• Goal: provide basic guidance and consistency in the conduct of PSC inspections for compliance with chapter 3.

2019 GUIDELINES FOR PORT STATE CONTROL UNDER MARPOL ANNEX VI
CHAPTER 3

Chapter 1 GENERAL

1.1 This document is intended to provide basic guidance on the conduct of port State control inspections for compliance with MARPOL Annex VI (hereinafter referred to as "the Annex") and afford consistency in the conduct of these inspections, the recognition of deficiencies and the application of control procedures.

1.2 Chapters 1 (General), 4 (Contravention and detention), 5 (Reporting requirements) and 6 (Review procedures) of the Procedures for Port State Control, as adopted by the Organization, as may be amended, also applies to these Guidelines.

Chapter 2 INSPECTIONS OF SHIPS REQUIRED TO CARRY THE IAPP CERTIFICATE

2.1 Initial inspections

2.1.1 The PSCO should ascertain the date of ship construction and the date of installation of equipment on board which are subject to the provisions of the Annex, in order to confirm which regulations of the Annex are applicable.

2.1.2 On boarding and introduction to the master or responsible ship’s officer, the port State control officer (PSCO) should examine the following documents, where applicable:
Initial inspection of documents/certificates

- **IAPP certificate** including its “supplement” (Reg. 6)
  ➞ to verify that the Certificate is properly completed and signed, and that required surveys have been performed

- **Documentation related to Exhaust Gas Cleaning Systems** (and EGCS monitoring records) if applicable

- **Bunker delivery note (BDN) and representative samples** (Reg. 18)

- In case of non-availability of fuel oil:
  - **Record of actions** (Reg. 18.2.1.1)
  - Copy of the **Fuel oil non-availability report** (Reg. 18.2.4)
Initial inspection of documents/certificates

- Additional documents for **ECA compliance** (Reg. 14.6):
  - *Written changeover procedure* (not required to be in English) and *record of changeover* to fuel with sulphur content < 0.10 % m/m before entering ECA;
  - Relevant *logbook*, recording volume of LSF oils in each tank, date, time and position at the time that the fuel changeover operation has been completed prior to entering the ECA.
Initial inspection on ships not equipped with EGCS

- Things to check:
  - Evidence that the sulphur content of the fuel oil is in accordance with regulation 14, through the BDNs and appropriate on board records including records of bunkering operations (Oil Record Book)
Initial inspection on ships equipped with EGCS

• Things to check:
  - Evidence that the ship has received an **appropriate approval** for EGCS (approved, under trial or being commissioned)
  - Evidence that the ship **is using it** and that compliant fuel oil is used in equipment not covered by it
  - **BDN on board** indicating that the fuel oil is intended to be used in combination with an equivalent means of SOx compliance.
  - Approved documentation according to Guidelines MEPC.184(59) for EGCS:
    - Approved SO\textsubscript{x} emissions compliance plan (SECP)
    - EGCS Record book
    - On board monitoring manual
    - Washwater criteria (Guideline and/or country specific rules)
Initial inspection on ships equipped with EGCS

- In case an **EGCS is not compliant or a monitoring instrument fails**, check the master’s actions: notification to the ship’s flag Administration, corrective actions to rectify the situation in accordance with the EGCS Technical Manual.

Refer to the *Guidance on indication of ongoing compliance in the case of the failure of a single monitoring instrument, and recommended actions to take if the EGCS fails to meet the provisions of the 2015 EGCS Guidelines* (MEPC.1/Circ.883)
Initial inspection within an ECA

- Things to check:
  - **Evidence of delivery and use of compliant fuel oil** (0.10% m/m), through the BDNs and appropriate on board records, including records of bunkering operations (Oil Record Book)
  - For ships using separate fuel oils, evidence of a **written procedure** and **records of changeover** (including in the first port after transiting an ECA)
“Clear grounds” leading to a more detailed inspection

- **Certificates** and/or **documents** missing or invalid
- Absence or presence of **equipment** (not) mentioned in the documents
- **Serious deficiencies** in equipment or arrangements specified in certificates and documents
- **Master or crew not familiar** with essential related shipboard operations
- Inconsistency between information in the **BDN** and the **IAPP Certificate**
- **EGCS not used** as required
- **Insufficient quantity** of bunkered compliant fuel oil
- Receipt of a **report or complaint** that the ship fuel appears to be substandard (including information from remote sensing surveillance or portable fuel oil sulphur content measurement devices)
# How to detect non-compliant ships

## High Risk vs Low Risk ships regarding fuel related deficiencies of SOx non-compliance

<table>
<thead>
<tr>
<th>High Risk</th>
<th>Low Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entering ECA first time or regularly entering ECA</td>
<td>Always sailing within ECA</td>
</tr>
<tr>
<td>Only visiting ports in States with poor enforcement</td>
<td>Visiting ports with adequate enforcement</td>
</tr>
<tr>
<td>Only sailing through ECA without visiting ports</td>
<td>Visiting ECA areas in which air surveillance on sulphur is present</td>
</tr>
<tr>
<td>Two or more types of fuel on board</td>
<td>One type of fuel on board</td>
</tr>
<tr>
<td>High sulphur content determined with remote sensing systems</td>
<td>Low sulphur content determined with remote sensing systems</td>
</tr>
<tr>
<td>History of ship with fuel related deficiencies</td>
<td>No history of ship with fuel related deficiencies</td>
</tr>
</tbody>
</table>
PSC: More detailed inspections

- **Quality of fuel**, taking into account regulations 14 and 18
- Check on proper **changeover procedures**
- If appropriate, proper **use of EGCS**, together with its monitoring system
- Procedures to check the **familiarity of the master or crew** with related shipboard operations
Sampling on board for PSC purposes
Sampling on board

- Based on Reg. 11 “Detection of Violations and Enforcement”
- Sample procedure has to be fit for criminal justice in order to penalize ship if necessary.
- Sample should be sent to laboratory and preferably analyses result within few hours (before ship leaves the port in order to take action against the ship)
- Sample must prove quality of fuel used (In practice only check on % of sulphur)
- Possible actions if non compliance detected:
  - Warning
  - Detention
  - Non conformity (ISM Code)
  - Penalty
## Reminder on recent amendments regarding fuel oil sampling for sulphur compliance verification

<table>
<thead>
<tr>
<th>MARPOL delivered sample</th>
<th>In-use sample</th>
<th>On board sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reg. 18.8.1</td>
<td>Future Reg. 14.8</td>
<td>Future Reg. 14.8</td>
</tr>
<tr>
<td>2009 Guidelines</td>
<td>2019 Guidelines</td>
<td>Guidelines to be developed</td>
</tr>
<tr>
<td>In case of dispute with bunker supplier or non compliance (PSC)</td>
<td>For verification of compliance of fuel oil used (PSC)</td>
<td>In application of the carriage ban (PSC)</td>
</tr>
<tr>
<td>Verification procedure set out in Part 1 Appendix VI</td>
<td>Verification procedure set out in Part 2 Appendix VI</td>
<td></td>
</tr>
</tbody>
</table>
The 2019 Guidelines for on board sampling for the verification of the Sulphur content of the fuel oils used on board ships provide information on:

• Sampling point location:
  - easily and safely accessible;
  - take into account different fuel grades;
  - downstream of the in-use fuel oil service tank;
  - close to the fuel oil combustion machinery;
  - marked for easy identification;
  - shielded from any heated surface or electrical equipment;
  - suitable drainage

The number and location of designated sampling points should be **confirmed by the flag State Administration** following consideration of possible fuel oil cross-contamination and service tank arrangements.
PSC in-use sampling of fuel oil (MEPC.1/Circ.864/Rev.1)

- **Sample handling:**
  - take the sample in a steady flow;
  - flush through before sampling;
  - sampling container / sealed by the inspector with a unique means of identification;
  - label containing minimum information: sampling point location, date and port of sampling, ship identification, seal identification, inspector and ship’s representative identification

A receipt should be provided to the ships, and the ship should be given the option of retaining a sample
Sampling
Sampling
Verification procedure (Appendix VI of MARPOL Annex VI)

- MEPC.1/Circ.882 provides text for new appendix VI (early application):
  - Part 2: procedure for in-use and on board fuel oil sample in accordance with regulation 14.8
    - Average of 2 subsamples test results (Sulphur content test: ISO 8754:2003) used (Z), 95% confidence interval retained:
      - Limit (V)  |  Test Margin (W)
      - 0.10       |  0.11
      - 0.50       |  0.53
    - no stage 2 verification
  
- The laboratories responsible for the verification procedure must be accredited (ISO/IEC 17025:2017 or an equivalent standard)

- The final results obtained from this verification procedure shall be evaluated by the competent authority and advised to the ship for its records.

⚠️ All possible efforts should be made to avoid a ship being unduly detained or delayed
Detention, contingency measures and penalties
PSC detainable deficiencies

- Absence of certificates

- Sulphur content too high
  - If the master claims that it was not possible to bunker compliant fuel the PSCO should ask for evidence as in Reg. 18.2.2

- Non compliance of EGCS:
  - Approved documentation is missing
  - Monitored exhaust gas or water quality are above limits

- Non-familiarity with essential procedures from master or crew

In any case, the PSCO should use professional judgement to decide whether the deficiencies reported are detainable or not, taking into account all relevant circumstances (Reg. 18.2.3) and elements such as the ship implementation plan.
Guidance for PSC on contingency measures for addressing non-compliant fuel oil (MEPC.1/Circ.881)

- Guidance adopted at MEPC 74

**List of possible contingency measures:**

- actions predetermined in the Ship implementation plan (if available);
- discharging non-compliant fuel oil;
- managing the non-compliant fuel oil;
- operation actions: modifying sailing or bunkering schedules and/or retention of non-compliant fuel oil on board the ships. Consider safety issues.

- The non-compliant fuel oil may be **discharged** to the port or **retained on board** (if so, subject to any conditions of the port State).

- After discharge: cleaning and/or flushing through or dilution of remaining residues.

Importance to **communicate and cooperate** to agree on the most appropriate solution.
Penalties

- In general not given by PSC action but performed by police officers.
- Level of fine to be determined by prosecutor based on guidelines as provided by the local authorities.
- No guidelines from IMO, but:
  - UNCLOS (Art 217.8): Penalties provided for by the laws and regulations of States for vessels flying their flag shall be adequate in severity to discourage violations wherever they occur;
  - MARPOL (Art 4.4): The penalties specified under the law of a Party pursuant to the present article shall be adequate in severity to discourage violations of the present Convention and shall be equally severe irrespective of where the violations occur.

Level of sanctions should depend on damage to the environment and profits made by ship.
Example (EU sulphur directive)

The penalties determined:

- must be **effective, proportionate and dissuasive**;
- and may include fines calculated in such a way as to ensure that the fines at least deprive those responsible of the economic benefits derived from their infringement and that those fines gradually increase for repeated infringements.
Penalties

Some countries, such as Denmark, have taken the approach that penalty should be equal to the cost advantage that carrier had on that voyage.

Compensatory damage and/or administrative sanction may also occur in some countries.

<table>
<thead>
<tr>
<th>Country</th>
<th>Maximum financial penalty for non-compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>EUR 6 million</td>
</tr>
<tr>
<td>Canada</td>
<td>CAD 25 000</td>
</tr>
<tr>
<td>Denmark</td>
<td>No maximum</td>
</tr>
<tr>
<td>Finland</td>
<td>EUR 800 000</td>
</tr>
<tr>
<td>France</td>
<td>EUR 200 000</td>
</tr>
<tr>
<td>Germany</td>
<td>EUR 22 000</td>
</tr>
<tr>
<td>Latvia</td>
<td>EUR 2 900</td>
</tr>
<tr>
<td>Lithuania</td>
<td>EUR 14 481</td>
</tr>
<tr>
<td>Netherlands</td>
<td>EUR 81 000 + gains</td>
</tr>
<tr>
<td>Norway</td>
<td>No maximum</td>
</tr>
<tr>
<td>Sweden</td>
<td>SEK 10 million</td>
</tr>
<tr>
<td>UK</td>
<td>GBP 3 million</td>
</tr>
<tr>
<td>USA</td>
<td>USD 25 000 per day</td>
</tr>
</tbody>
</table>

Source: data provided by Trident Alliance