



# Marpol 73/78 Annex VI

Regulations for the Prevention of Air Pollution from Ships

Technical and Operational implications

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Owners' Annex VI Checklist

MARPOL 73/78 Annex VI  
Regulations for the prevention  
of Air Pollution from ships entered  
into force on 19 May 2005.

This Annex includes many new  
aspects related to design of  
ships, but even more related to  
operational issues.

The intention with this paper is to highlight some of the most important aspects of **MARPOL Annex VI** for the guidance of Ship owners and Managers, as well as DNV surveyors.

# Annex VI in general

The adoption of MARPOL Annex VI has followed some years of debate within organisations. At the same time the Technical code on the Control of Emissions of Nitrogen Oxides from Marine Diesel Engines was adopted. MARPOL Annex VI and the Technical Code have retroactive requirements for the following:

Diesel engines of 130 KW and above installed on ships keel-laid on or after 1 January 2000

Diesel engines installed on ships keel-laid between 1 January 1990 and 1 January 2000

Incinerators installed onboard on or after 1 January 2000.

**MARPOL ANNEX VI** applies to all ships, fixed and floating drilling rigs and other platforms, but the certification requirements are depending on size of the vessel and when it is constructed. Ships of 400 gross tons and above engaged in international voyages involving countries that have ratified the conventions, or ships flying the flag of those countries, are required to have an International Air Pollution Prevention Certificate (IAPP Certificate).

The IAPP certificate will be issued following an initial survey carried out by the Flag Administration or by a recognised organization (e.g. Det Norske Veritas) on behalf of the Flag Administration, confirming compliance with MARPOL Annex VI. For ships with the flag of an Administration that have not yet ratified Annex VI, a Certificate of Compliance with Annex VI may be issued by DNV.

Annex VI also requires diesel engines (as described above) to carry individual certificates with regard to NO<sub>x</sub> emissions, named Engine International Air Pollution Prevention (EIAPP) Certificates.

Annex VI requires that every ship of 400 gross tonnage or above and every fixed and floating drilling rig and other platforms shall be subject to the following surveys:

- An initial survey before the ship is put

into service or before the IAPP Certificate is issued for the first time.

- Periodical surveys at intervals specified by the Administration, but not exceeding five years
- A minimum of one intermediate survey during the period of validity of the certificate.

In the case of ships of less than 400 gross tons, the Administration may establish appropriate measures in order to ensure that Annex VI is complied with.

The Administration shall arrange for unscheduled inspections during the period of validity of the certificate. If the Administration establishes mandatory annual surveys, these unscheduled inspections shall not be obligatory, and for this purpose DNV has so far considered that all Administrations will apply a system with mandatory annual surveys.

Annex VI has requirements to the following main issues, which will be highlighted more in detail in this paper.

- **Regulation 12** - Emissions from Ozone depleting substances from refrigerating plants and fire fighting equipment
- **Regulation 13** - Nitrogen Oxide (NO<sub>x</sub>) emissions from diesel engines
- **Regulation 14** - Sulphur Oxide (SO<sub>x</sub>) emissions from ships
- **Regulation 15** - Volatile Organic com-

pounds (VOC) emissions from cargo oil tanks of oil tankers

- **Regulation 16** - Emissions from shipboard incinerators
- **Regulation 18** - Fuel Oil quality.

# Ozone depleting substances

Annex VI prohibits any deliberate emissions of ozone-depleting substances.

**OZONE-DEPLETING SUBSTANCES**, and equipment containing such substances, shall be delivered to appropriate reception facilities when removed from a ship. Installations which contain ozone-depleting substances, other than hydrochlorofluorocarbons, are prohibited :

- On all ships constructed on or after 19.05.2005,
- In the case of ships constructed before 19 May 2005, which have a contractual delivery date of the equipment to the ship on or after 19 May 2005, or, in the absence of a contractual delivery date, the actual delivery of the equipment to the ship on or after 19 May 2005.

Installations containing hydrochlorofluorocarbons (HCFCs) are prohibited on ships constructed on or after 1.01.2020.

For the ships under regulation 12 of Marpol Annex VI, a list of equipment containing ozone depleting substances shall be maintained and in case a ship will have rechargeable systems containing ozone depleting substances, an Ozone depleting Substances Record Book shall be maintained on board.

The use of Halon in fire extinguishing systems and equipment is already prohibited for new buildings. For new buildings, this requirement in Annex VI will therefore always be complied with. More restrictive requirements for ozone depleting substances are in place regionally, e.g. in the European Union (EU). (E.g. EC 2037/2000)

According to EC No. 2037/2000, producers and importers shall not place HCFCs on the market after 31 December 2009. Virgin HCFCs will consequently not be available within the EU. However, the refrigerant system can utilize reclaimed HCFCs until 31 December 2014, after this date all HCFCs is prohibited.



All the ships subject to the requirements of Annex VI, shall maintain a list of equipment containing ozone depleting substances and in case a ship will have rechargeable systems containing ozone depleting substances, an Ozone depleting Substances Record Book shall be maintained on board.

# Nitrogen Oxides (NO<sub>x</sub>)

## 4.1 REGULATIONS/DEFINITIONS FROM ANNEX VI

Regulation 13 of Annex VI concerns NO<sub>x</sub>-emission from diesel engines and shall apply to:

- Each diesel engine with a power output of more than 130 kW which is installed on a ship constructed on or after 1 January 2000.

- Each diesel engine with a power output of more than 130 kW which undergoes a major conversion on or after 1 January 2000.
- Each diesel engine with a power output of more than 5000 kW and a per cylinder displacement at or above 90 litres which is installed on a ship constructed on or after 1 January 1990 but prior to 1 January 2000.

This regulation does not apply to:

- Emergency diesel engines, engines installed in life boats or for any equipment intended to be used solely in case of emergency.
- Engines used solely to drive machinery dedicated to exploration, exploitation and associated offshore processed of seabed mineral resources

The phrase “major conversion”, means a modification of an engine where:

- The engine is replaced by a new engine built on or after 1 January 2000, or
- Any substantial modification is made to the engine, as described in the NO<sub>x</sub> Technical Code 1.3.2 (e.g. changing camshaft, fuel injection system, or any other NO<sub>x</sub>-related settings or components), or
- The maximum continuous rating of the engine is increased by more than 10%

For this purpose, Substantial Modification is defined as follows:

- For engines installed on vessels constructed on or after 1 January 2000, a Substantial Modification means any modification to an engine that could potentially cause the engine to exceed the emission standards set out in Regulation 13 of Annex VI. Routine replacement of engine components by parts specified in the Technical File that do not alter emission characteristics shall not be considered a “Substantial Modification”, regardless of whether one part or many parts are replaced.
- For engines installed on vessels constructed before 1 January 2000, a Substantial Modification means any modification made to an engine which increases its existing emission characteristics established by the simplified measurement method as described in 6.3 in excess of the allowances set out in 6.3.11 (Ref. NO<sub>x</sub> Technical file.). These changes include, but are not limited to, changes in its operations or in its technical parameters (e.g. changing camshaft, fuel injection systems, air systems, combustion chamber configuration, or timing calibration of the engine)



### Regulation 13 contains further a 3-Tier approach as follows:

#### Tier I (current limits)

For diesel engines installed on ships constructed from 1 January 2000 to 1 January 2011 allowable emissions of total weighted NO<sub>x</sub> depending on engine speed, n, are:

- 17,0 g/kWh when n is less than 130 rpm
- $45,0 \times n^{(-0,2)} \text{ g/kWh}$  when n is 130 or more but less than 2000 rpm
- 9,8 g/kWh when n is 2000 rpm or more

#### Tier II

For diesel engines installed on ships constructed on or after 1 January 2011 allowable emissions of total weighted NO<sub>x</sub> depending on engine speed, n, are:

- 14,4 g/kWh when n is less than 130 rpm
- $44,0 \times n^{(-0,23)} \text{ g/kWh}$  when n is 130 or more but less than 2000 rpm
- 7,7 g/kWh when n is 2000 rpm or more

#### Tier III

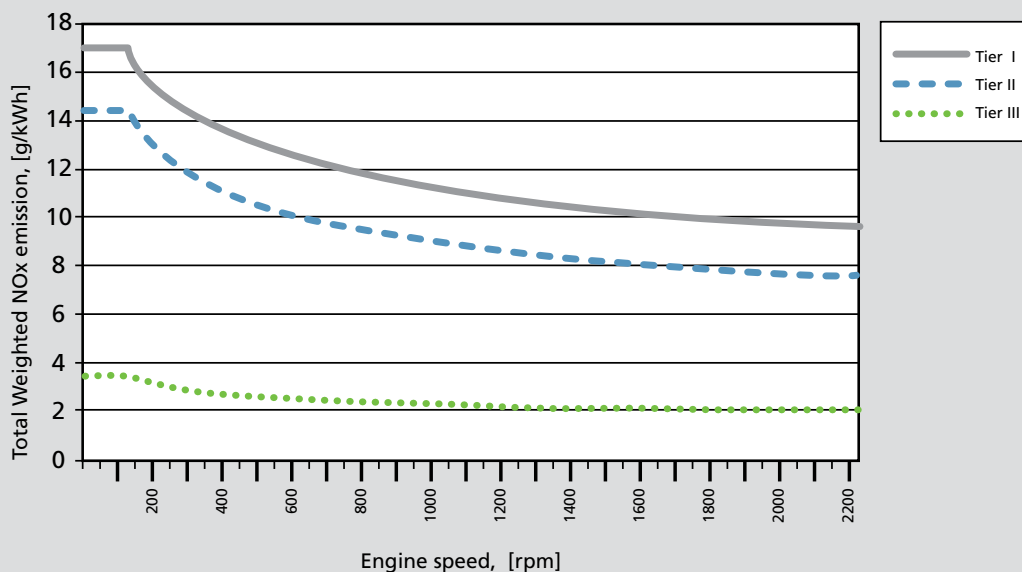
Ships constructed on or after 1 January 2016 will have additional limitations when operating in an Emission Control Area. For the purpose of NO<sub>x</sub> emissions no Emission Control Areas (ECAs) have yet been designated, but it is expected that both the Baltic Sea and the North Sea will be designated well ahead of 1 January 2016.

For Tier III ships operating in the NO<sub>x</sub> ECAs the allowable emissions of total weighted NO<sub>x</sub> depending on engine speed, n, are:

- 3,4 g/kWh when n is less than 130 rpm
- $9,0 \times n^{(-0,2)} \text{ g/kWh}$  when n is 130 or more but less than 2000 rpm
- 2,0 g/kWh when n is 2000 rpm or more

Tier III limits will not apply to engines installed on a ship with a length of less than 24 metres when it is designed and used solely for recreational purposes, or an engine installed on a ship with a combined nameplate diesel engine propulsion power of less than 750 kW if it is demonstrated that the ship cannot comply with the standards set forth in paragraph 5.1.1 of this regulation because of design or construction limitations of the ship.

The below graph illustrates the allowable NO<sub>x</sub> emissions from diesel engines:



### NOx Emission Limits for Engines Installed on Ships Constructed Prior to 1 January 2000

Ships constructed on or after 1 January 1990 but prior to 1 January 2000 shall comply with the Tier I NOx emission limits. However, the requirement is limited to engines with a power output of more than 5000 kW and a per cylinder displacement at or above 90 litres.

Moreover, compliance is only required if an Approved Method for obtaining the necessary NOx reduction is available for the engine(s) in question. There is also a mechanism in the regulation to ensure that an Approved Method should meet a cost effectiveness criterion which will set a maximum cost for purchasing and installation of a method.

Necessary engine adjustments or fitting of NOx reducing kits shall take place no later than the first renewal survey that occurs 12 months or more after approval of a method applicable. However, if the supplier of an Approved Method is not able to deliver at this renewal survey installation may take place at the following annual survey. Detail requirements for approval of NOx reducing methods have been included in the revised NOx Technical Code.

#### 4.2 CERTIFICATION AND ONBOARD VERIFICATION

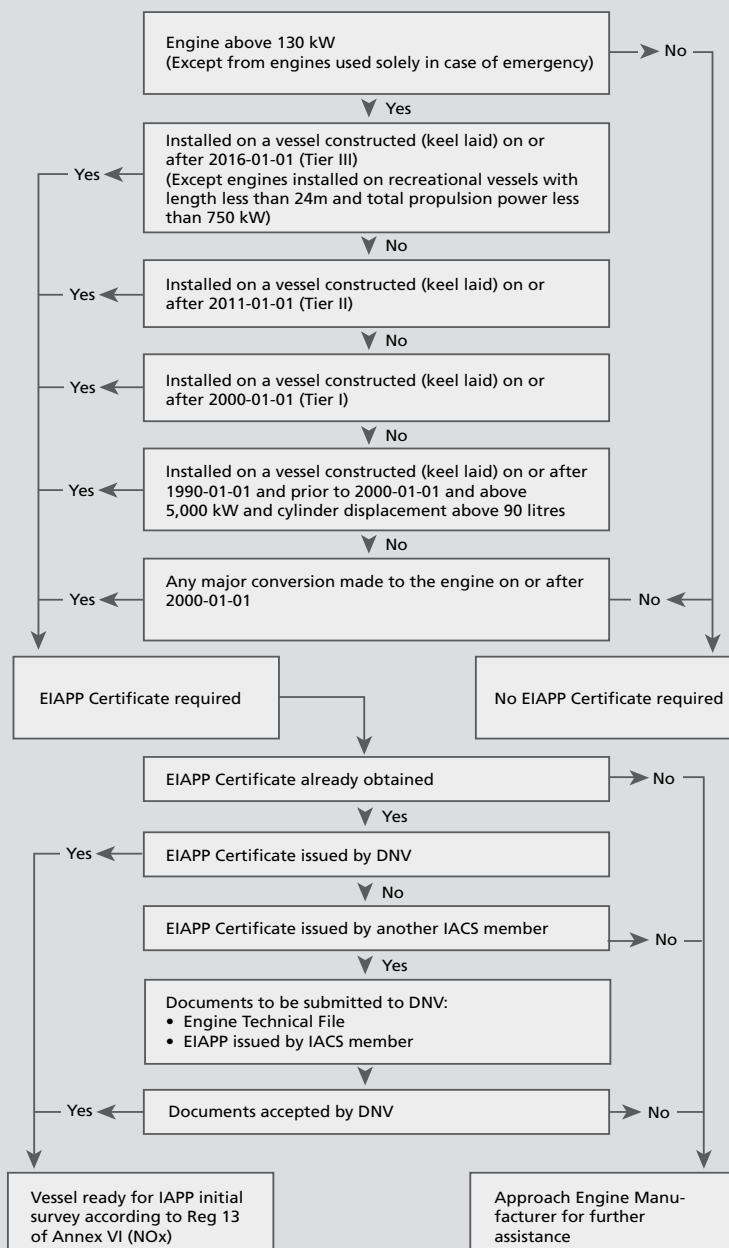
The EIAPP (Engine International Air Pollution Prevention) certificate is required for all diesel engines as described above, and will be issued for marine diesel engines after demonstrating compliance with NOx emission limits. The certification process is to be carried out in accordance with the NOx Technical Code (2008) issued by IMO.

In order to decide whether your engine needs an EIAPP Certificate or not, we can advise you to consider the following for your vessels and engines:

- Engine power output above 130 kW?
- Is the vessel constructed (keel laid) after 1 January 1990 (Tier I)?
  - Is the power output from the engine above 5000 kW and is the cylinder displacement above 90 litres?
  - Is there an Approved Method available for that engine?
- Is the vessel constructed (keel laid) before 1 January 2000?
- Is the vessel constructed (keel laid) after 1 January 2000 (Tier I)?
- Is the vessel constructed (keel laid) after 1 January 2011 (Tier II)?

- Is the vessel constructed (keel laid) after 1 January 2016 (Tier III)?
- Major conversion of the engine on or after 1 January 2000?

As a general guidance, see the flow chart below.



The flow chart above is meant as a general guidance indicating the necessary steps for you to consider regarding the NOx requirements of Annex VI. Please note that the flow chart is only concerning the NOx requirements to the diesel engines, and this is also what the EIAPP certificate is covering. If you find that your engines are required to carry an EIAPP certificate, but for some reason they don't have this, our advice is for you to approach the engine manufacturer for further assistance.

Even if DNV holds copies of the EIAPP Certificate and the Technical File, these have been issued and approved as a service to the engine manufacturer and hence is the engine manufacturer's property. In order to get hold of required EIAPP documentation, the request should always go through the engine manufacturer. DNV may be contacted for assistance in order to facilitate the dialogue.

The certification process includes an emission test for compliance with the NOx requirements on the manufacturer's test bed, and approval of the Technical File. All certified engines are delivered with an individual Technical File that contains the engine's specifications for compliance with the NOx regulation, and the applicable onboard verification procedure.

The NOx Technical Code opens for 3 different onboard verification procedures:

- Engine parameter check method
- Simplified measurement method
- Direct measurement and monitoring method

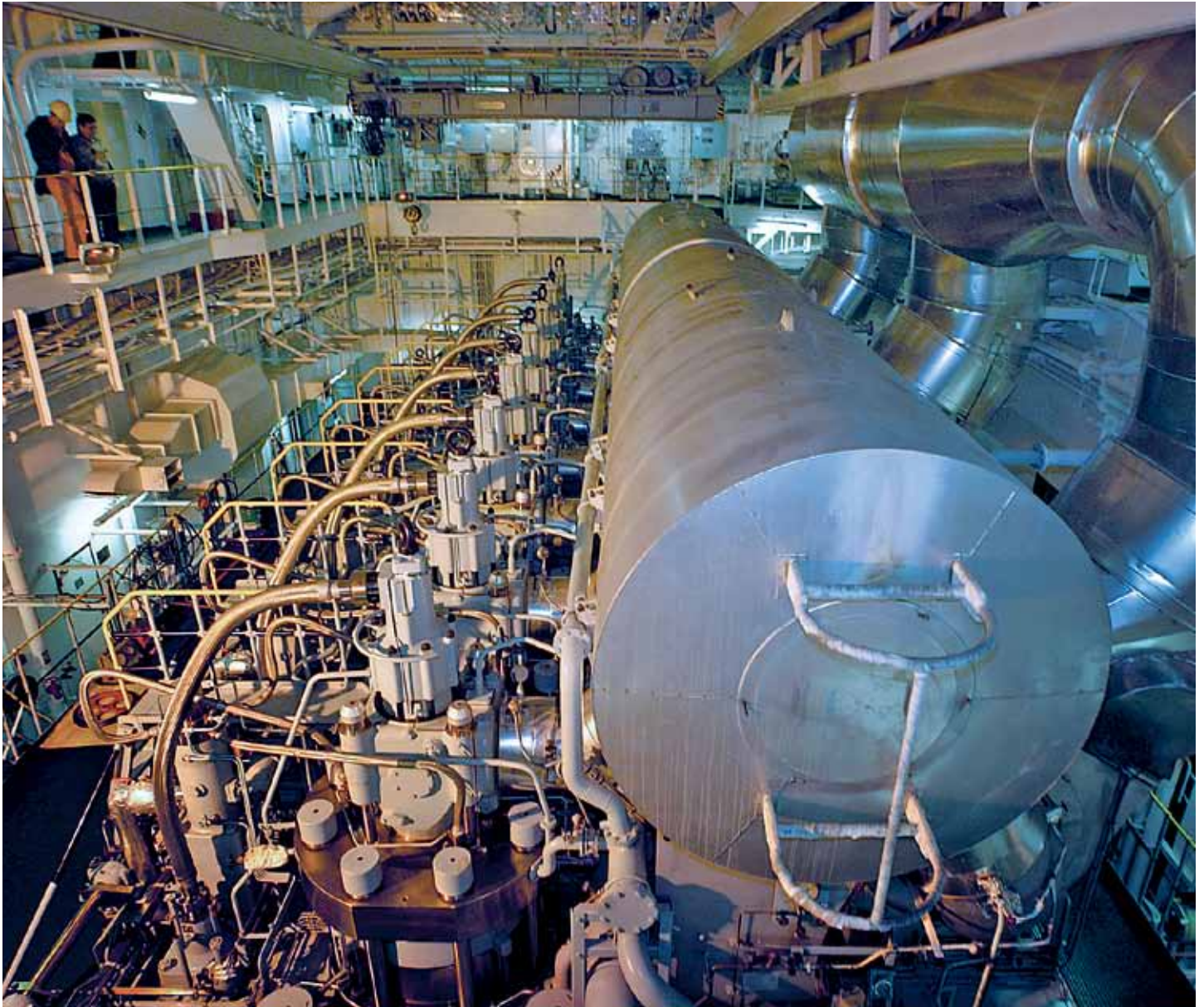
The applicable onboard verification procedure is initially decided by the engine manufacturer, and is usually a specific chapter in the engine's Technical File. The by far most common method is the Engine parameter check method, but the ship owner is free to use the method they prefer. If they wish to change to another method than the one specified in the Technical File, the new onboard verification procedure must be submitted to the Administration (or DNV on behalf of the Administration when authorised) for approval before taken into use.

In order to have existing engines certified, installed on vessels keel laid between 1 January 1990 and 1 January 2000, the process is either of the two following:

1. An Approved Method need to be commercially available. This means the Approved Method is certified by an Administration (class) and installation of the method is verified by a survey using the procedure as specified in the Approved Method File. In addition, the installation cost of the Approved Method shall not exceed 375 Ce given the formula below:

$$C_e = \frac{\text{Cost of Approved Method} \times 10^6}{P(\text{kW}) \times 0,768 \times 6000(\text{hours/year}) \times 5(\text{years}) \times \Delta\text{NOx}(\text{g/kWh})}$$

2. The engine is verified to be included in an already existing engine group.



#### 4.2.1 ENGINE PARAMETER CHECK METHOD

For the purpose of assessing compliance with Regulation 13 of Annex VI, it is not always necessary to measure the NOx level to know that an engine is likely to comply with the NOx emission limits. It will be sufficient to know that the present state of the engine corresponds to the specified components, calibration or parameter-adjustment state at the time of initial certification.

The engine's Technical File is identifying its components, settings and operating values that influences the exhaust emissions, and these must be checked to ensure compliance during surveys and inspections. Ship owners or people responsible for vessels equipped with diesel engines required to undergo an engine parameter check method shall ensure that the following documentation is at all times kept onboard and updated as applicable:

- Original Technical File including the onboard verification procedure.
- Record book of engine parameters for recording all of the changes made relative to an engine's components and settings. Also to include technical documentation in case of modification of any of the engine's designated components. This may be a print-out from the Planned Maintenance System on-board. We recommend to include all changes potentially affecting the NOx emission characteristics of the engine as Flag States and Port States may have different interpretations of what to be included.
- Original EIAPP certificate (or Certificate/Statement of Compliance) for each applicable engine.

The NOx-influencing components and settings depend on the design of the particular engine, and shall be listed in the engine's Technical File. The below list shows typical NOx-influencing parameters, but are not limited to:

- Injection timing
- Injection system components (nozzle, injector, fuel pump)
- Software no, checksums, or other identification of software version
- Hardware for fuel injection control
- Camshaft components (fuel cam, inlet- and exhaust cam)
- Valve timing
- Combustion chamber (piston, cylinder head, cylinder liner)
- Compression ratio (connecting rod, piston rod, shim, gaskets)
- Turbocharger type and build (internal components)

- Charge air cooler/charge air pre-heater
- Auxiliary blower
- NOx reducing equipment "water injection"
- NOx reducing equipment "emulsified fuel" (fuel/water emulsion)
- NOx reducing equipment "exhaust gas recirculation"
- NOx reducing equipment "selective catalytic reduction"

The actual Technical File of an engine may include less components and/or parameters other than the list above, depending on the particular engine and the specific engine design.

#### 4.2.2 SIMPLIFIED MEASUREMENT METHOD

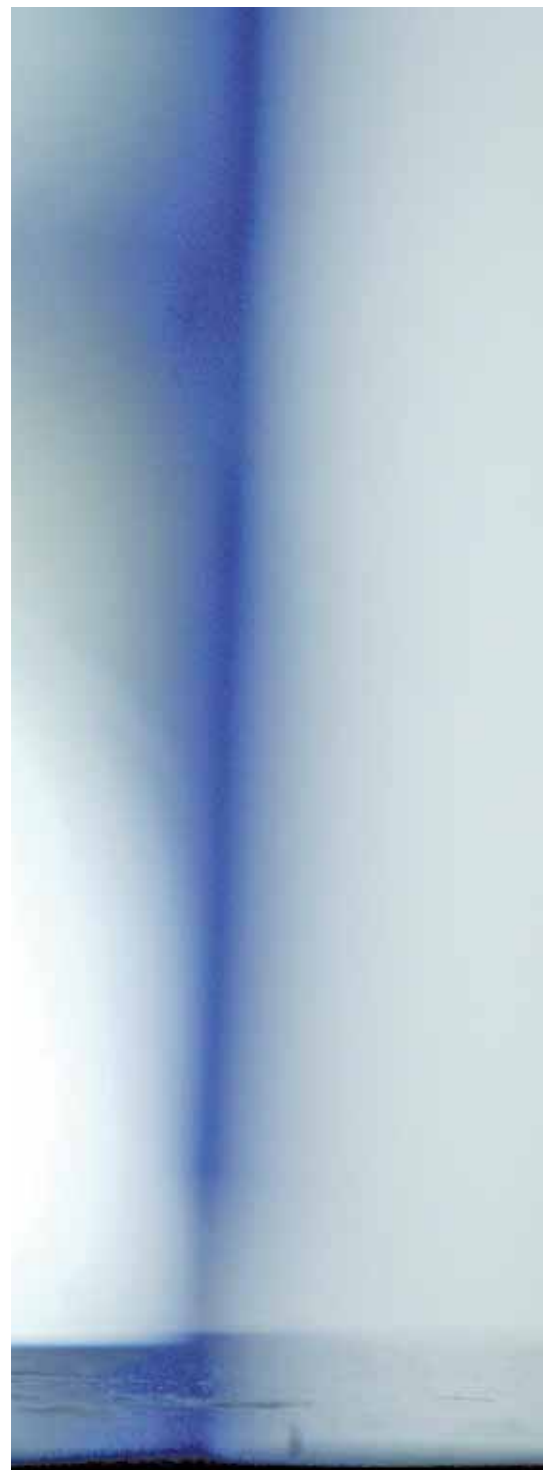
For onboard verification tests during periodical and intermediate surveys, the NOx Technical Code opens for a simplified measurement method. Note that every first engine test for certification shall be performed on the engine maker's test-bed.

The simplified measurement method is to be performed more or less like the parent testing at the engine manufacturer's test-bed, but simplifications according to the NOx Technical Code 6.3 are accepted. However, the testing shall be performed in accordance with the applicable test cycle as specified in the engine's Technical File. This involves full load running of the engine for about 20 minutes, and will in most cases require a test trial.

Due to the possible deviations when applying the simplified measurement method, an allowance of 10% of the applicable NOx limit value given in Regulation 13 in the NOx Technical Code is accepted for confirmation tests and during periodical and intermediate surveys. Another 10% deviation is permitted when using heavy fuel oil during the on-board test. However, in no case the total allowable deviation is to exceed 15%.

#### 4.2.3 DIRECT MEASUREMENT AND MONITORING METHOD

The ship-owner will have the option of direct measurement of the NOx emissions during the engine operation. Such data can either take the form of spot checks logged with other engine operating data on a regular basis and over the full range of engine operation, or they can result from continuous monitoring and data storage. Data must be taken within the



last 30 days, and must have been acquired using the test procedures given in the NOx Technical Code. These monitoring records are to be kept onboard for at least three months for verification purposes. We would however recommend maintaining the documents, on board or in shore office, for a longer period of time. To demonstrate the compliance by the direct measurement method, sufficient data shall be collected to calculate the



weighed average NO<sub>x</sub> emissions in accordance with the NO<sub>x</sub> Technical Code. The procedure to follow in order to use the direct measurement and monitoring method is outlined in MEPC Resolution 103(49) 'Guidelines for On-Board NO<sub>x</sub> Verification Procedure'.

DNV requires that the system for direct measurements is approved and holds a valid DNV Type Approval Certificate.

If the direct measurement and monitoring method is the preferred On-Board Verification procedure, an initial survey has to be carried out in order to verify the installation and the use of the system. Prior to the initial survey, a ship specific On-board Monitoring Manual has to be submitted to DNV Høvik, MGGNO894, for approval. In case the engine is to be adjusted outside the limits specified in the Technical File, the fuel consumption and load have to be

measured. Procedures describing how this is intended handled have to be submitted for approval. However, the engine can not be adjusted before the On-Board Monitoring Manual has been approved and new EIAPP Certificates issued and confirmed available on-board. All changes to the engine shall be logged in the record book of engine parameters. If any adjustment to the engine is made, new NO<sub>x</sub> measurements have to be taken at earliest convenience.

The operation of the NOx continuous monitoring system to be performed according to the approved On-Board Monitoring Manual. If any measurement of NOx is above the allowable limits, required adjustments have to be made immediately and new measurements taken. If further information about how to proceed in order to change to the direct measurement and monitoring method, DNV Høvik, MGGNO894 Machinery Systems can be contacted for assistance.

It should be noted that the two methods that involve measurements of the exhaust emissions do not include any kind of identification markings of the NOx-influencing components. However, components should only be changed in accordance with applicable Class requirements. In addition, if the engine's NOx emissions are no longer to be verified according to the Direct Measurement and Monitoring method, the engine has to be adjusted as per its original Technical File.

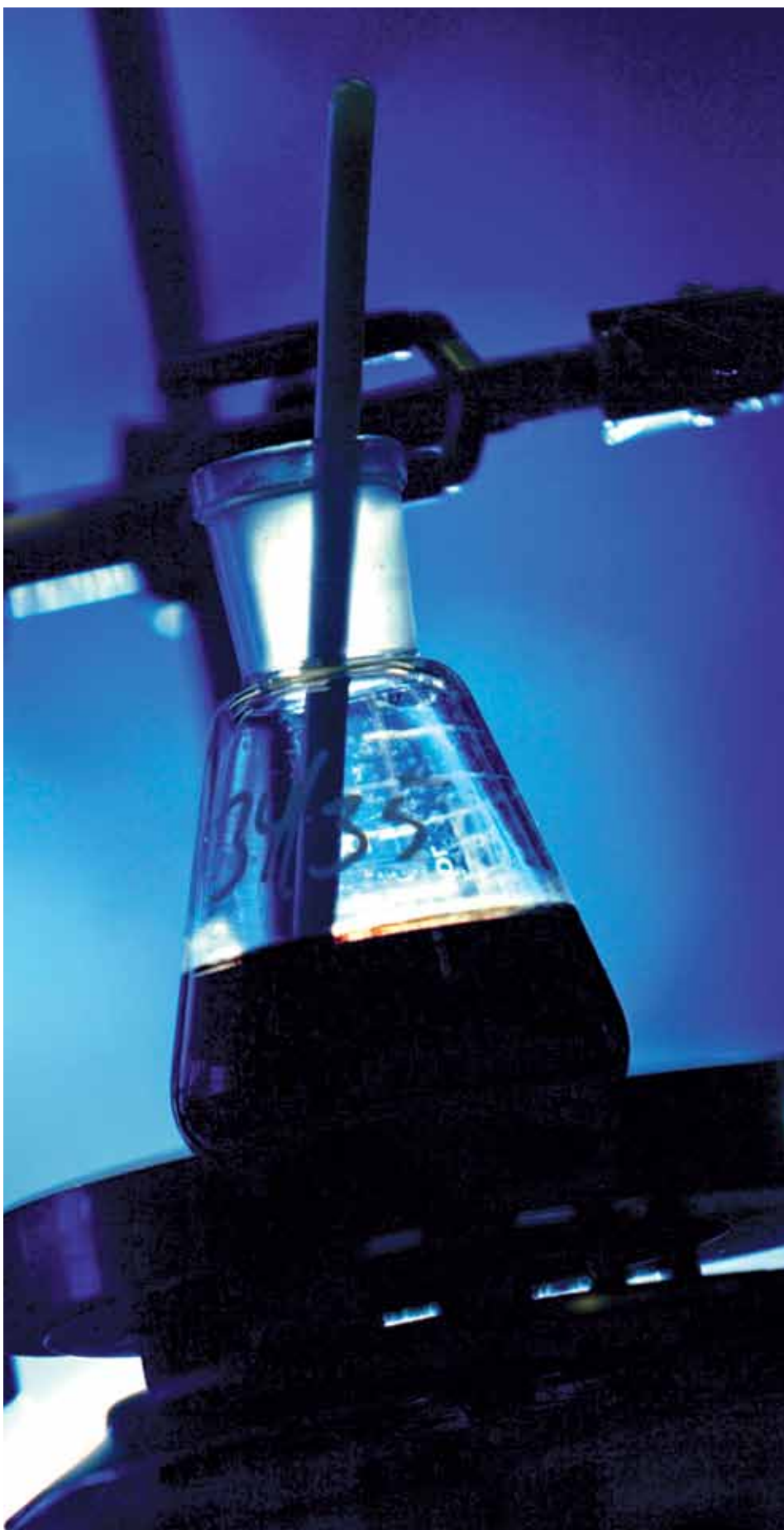
#### 4.3 SPARE PARTS AND IMO-MARKING

One of the main consequences of MARPOL Annex VI is that the onboard verification procedure "Engine parameter check method" requires identification markings on the NOx influencing components. These components are typically those specified in the above list, see 3.2.1.

All the components listed are to be fitted with identification markings according to the Technical File, normally referred to as IMO-marking. Please note that these markings may not be the same as the article no's usually found on the engine components.

DNV, on behalf of the Flag Administration, can not accept components with IMO-marking other than those stated in the Technical File. Manufacturer's producing engines/components on licensee from an engine designer, usually have their own Id Numbers on the engine components. It is advisable to always verify that the purchased spare part has the same IMO-marking as in the applicable Technical File. In order to make the purchasing easier, it could be an idea to keep a copy of the Technical Files in the purchasing section.

There may be situations where the engine maker comes up with a new design for one of the NOx-influencing components, with a different Id No/IMO marking from the one stated in the Technical File. The new design should then be approved by



the Administration (or DNV on behalf of a Flag Administration when authorised) and the change is to be documented in the “Record book of engine parameters”. In such a case, the Technical File has to be amended and the engine manufacturer will have to document that the NOx emissions do not increase with the new design. The same is applicable for all other changes the engine may be approved for during its lifetime.

#### 4.4 SURVEYS AND INSPECTIONS

Following the regime of the IAPP certificate, the diesel engines will also be subject for the following surveys:

- An initial survey before the ship is put into service or before the IAPP Certificate is issued for the first time.
- Periodical surveys at intervals specified by the Administration, but not exceeding five years,
- A minimum of one intermediate survey during the period of validity of the certificate.
- Annual Surveys (or a Flag Administration may instead implement unscheduled inspections as an alternative to Annual surveys)
- An initial survey if the manager wants to change to an other onboard verification procedure than the one stated in the Technical File (the most common method is the “Engine Parameter Check Method”)

If the “Engine Parameter Check Method” is the selected onboard verification procedure, the surveyor will typically want to see during initial and periodical surveys:

- EIAPP Certificates (or Certificates/Statements of Compliance) for all applicable diesel engines onboard
- Approved Technical Files including “Onboard verification procedure” for all the applicable diesel engines onboard
- Record Book of Engine parameters for all the applicable diesel engines onboard
- One or all of the identified components, settings or operating values specified in the engines’ Technical File. Available spare parts may be used as an alternative to opening up the engine in order to verify the IMO-markings on the NOx-influencing components.

If the “Simplified Measurement Method” is the selected onboard verification procedure, the surveyor will witness the testing in addition to review the following documentation during initial and periodical surveys:

- EIAPP Certificates (or Certificates/Statements of Compliance) for all appli-

cable diesel engines onboard

- Approved Technical Files including “Onboard verification procedure” for all the applicable diesel engines onboard
- All recommendations from engine manufacturer and approvals from the Administration concerning the “Simplified Measurement Method”
- Test results

If the “Direct Monitoring and Measurement Method” is the selected onboard verification procedure, the surveyor will typically want to see during initial and periodical surveys:

- EIAPP Certificates (or Certificates/Statements of Compliance) for all applicable diesel engines onboard
- Approved Technical Files including “Onboard Monitoring Manual” for all the applicable diesel engines onboard
- Approval of the installed measuring equipment (DNV Type Approval Certificate)
- Logged measurement results in order to verify that the engines comply with the NOx Technical Code (in no case older than 30 days).

Regardless of what onboard verification procedure the Ship-Owner chooses, the IAPP Certificate for the vessel will be issued if all other requirements are found to comply with the applicable requirements.

#### 4.5 ENGINES WITH TECHNICAL FILE AND EIAPP CERTIFICATES APPROVED AND ISSUED BY ANOTHER COMPANY

There are a number of different companies that are certifying diesel engines with regards to NOx-emissions. DNV, on behalf of the Flag Administration, can only accept certification from companies that are authorised by the applicable flag to perform certification on their behalf. Documentation from another IACS member is normally accepted as is. For other organisations, the applicable Flag Administration has to be contacted for acceptance. In both cases the certification procedure will be on a case-by-case approval.

The EIAPP Certificates and Technical Files, including all possible updates, are to be submitted to DNV for review and filing.

#### 4.6 CHANGE OF FLAG

If the vessel changes flag, both IAPP Certificate and EIAPP Certificates have to be re-issued.

# Sulphur Oxides (SO<sub>x</sub>) and Particulate Matter

## 5.1 GENERAL

19 May 2005 Annex VI to MARPOL entered into force. The revised Annex VI to MARPOL was adopted by IMO on 10 October 2008. The sulphur oxide (SO<sub>x</sub>) and Particulate Matter emissions from ships will in general be controlled by setting a limit on the sulphur content of marine fuel oils as follows. The sulphur content of any fuel oil used on board ships shall not exceed the following limits:

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

### Requirements within Emission Control Areas

For the purpose of the regulation, Emission Control Areas shall include:

- The Baltic Sea area as defined in regulation 1.11.2 of Annex I, the North Sea as defined in regulation 5(1)(f) of Annex V

- Any other sea area, including port areas, designated by the Organization in accordance with criteria and procedures set forth in appendix III to this Annex
- While ships are operating within an Emission Control Area, the sulphur content of fuel oil used on board ships shall not exceed the following limits:
- 1.50% m/m prior to 1 July 2010
  - 1.00% m/m on and after 1 July 2010
  - 0.10% m/m on and after 1 January 2015

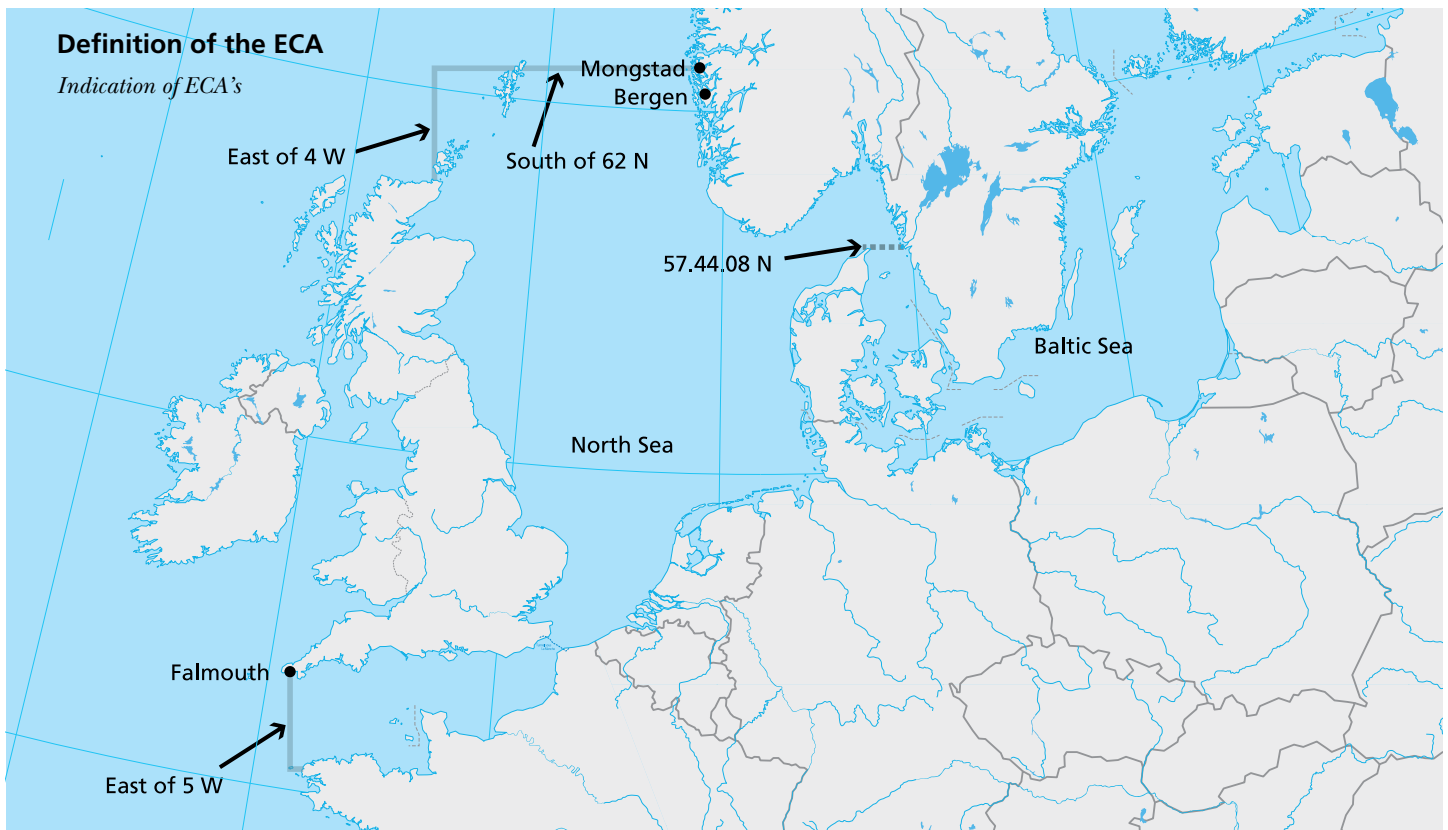
The sulphur content of fuel oil referred to in paragraph 1 and paragraph 4 of this regulation shall be documented by its supplier as required by regulation 18 of this Annex.

Those ships using separate fuel oils to comply with paragraph 4 of the regulation and entering or leaving an Emission Control

Area set forth in paragraph 3 of the regulation shall carry a written procedure showing how the fuel oil change-over 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 specified in paragraph 4 of the regulation prior to entry into an Emission Control Area. 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-change-over operation is completed prior to the entry into an Emission Control Area or commenced after exit from such an area, shall be recorded in such log-book as prescribed by the Administration.

### Review Provision

A review of the standard set forth in subparagraph 1.3 of this regulation shall be completed by 2018 to determine the avail-



ability of fuel oil to comply with the fuel oil standard set forth in that paragraph and shall take into account the following elements:

- The global market supply and demand for fuel oil to comply with paragraph 1.3 of this regulation that exist at the time that the review is conducted.
- An analysis of the trends in fuel oil markets.
- Any other relevant issue.

The Parties, based on the information developed by the group of experts, may decide whether it is possible for ships to comply with the date in paragraph 1.3 of this regulation. If a decision is taken that it is not possible for ships to comply, then the standard in that subparagraph shall become effective on 1 January 2025.

It should be noted that the limitations in sulphur content applies to all fuel oils (heavy fuel oils, marine diesel oils and gas oils) and regardless of use on board (i.e. in combustion engines, boilers, gas turbines etc.).

Currently, the 3 year average sulphur content in fuel oils reported by IMO based on numbers of samples tested from fuel bunkered is 2.46%. Results of the comprehensive number of fuel samples tested by DNV Petroleum Services and others reported to

IMO in 2008 indicate that only 0.02% of the fuel oils tested have a sulphur content exceeding the maximum limit of 4.50%, further that 24.1% of the fuel oils supplied in 2008 had a sulphur content of 1.50% or less compared to 20.6% the year before.

The 2nd IMO 2009 GHG Study estimated a reduction in SO<sub>x</sub> of 42% in 2008. The first year in which both sulphur emission control areas (ECAs) have been fully in force. It has been estimated that the low sulphur fuel oil demand in the SO<sub>x</sub> ECA's is in the range of 20 million tons per year (2007).

While certain owners with a high environmental profile already have had a sulphur limit of 1.50% in their fuel specifications, the sulphur content of the fuel is generally dependent on the composition of the crude oil from which it is refined. Increasing the output of low sulphur fuel oil can be obtained through the following:

- Refining of naturally occurring low sulphur crude oils.
- Re-direct/blend inland grade fuel to the marine fuel market.
- Re-blending of residual fuel oils down to the required specification.
- Residue de-sulphurisation (Note that large scale investments in residue de-sulphurisation units are not expected to be made until a substantial price difference between high and low sulphur fuels are achieved).

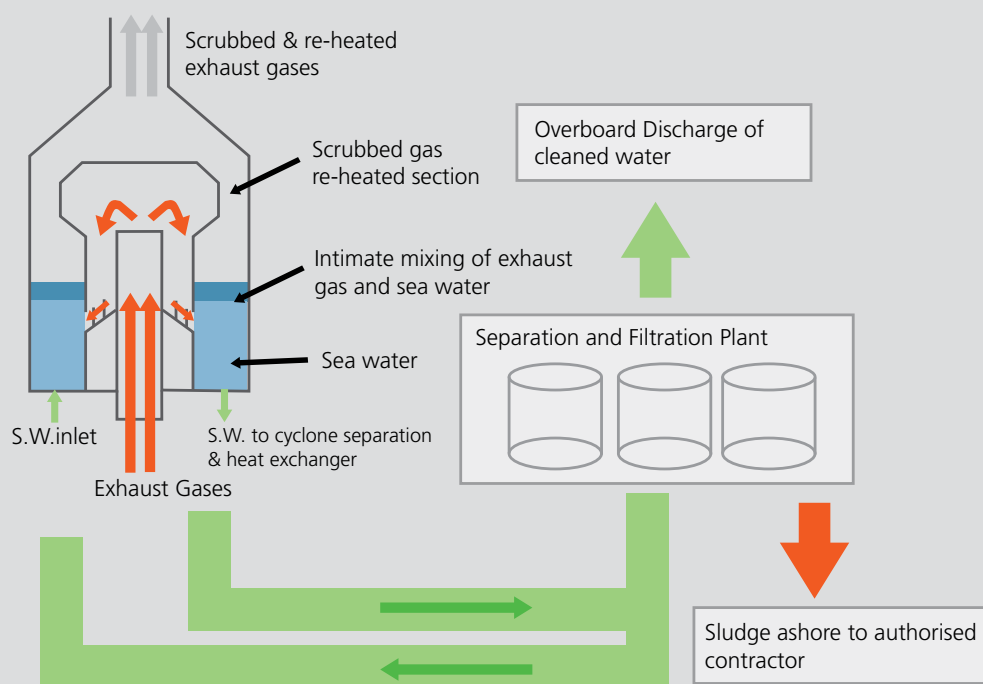
It is generally acknowledged that the above will lead to increased prices for low sulphur fuel oils depending on method of production and market availability/demand.

Although it has been indicated that the total world wide availability of low sulphur fuel is adequate with the current SECA's and associated low sulphur limit (1.50%), it is highly uncertain as to whether the availability will be adequate in world wide ports. It should further be noted that currently, low sulphur fuel is in general only available to operators with contract agreements with Oil Majors. Future spot availability is thus dependent on the developments in market demand and price after entry into force of ECA's.

### 5.1.1 EQUIVALENTS

The revised Annex VI to MARPOL has introduced a new regulation 4 Equivalents where the Administration of a Party may allow any fitting, material, appliance or apparatus to be fitted in a ship or other procedures, alternative fuel oils, or compliance methods used as an alternative to that required by this Annex if such fitting, material, appliance or apparatus or other procedures, alternative fuel oils, or compliance methods are at least as effective in terms of emissions reductions as that required by this Annex, including any of the standards set forth in regulations 13 and 14.

### Exhaust gas cleaning system



Thus as an alternative to using marine fuel oil with low sulphur content in Emission Control Areas an exhaust gas cleaning system or other equivalent system may be allowed to be used (abatement technologies).

Development of a type approval standard for such systems is ongoing in IMO. Some of the current available abatement technology is based on seawater scrubbing principles.

There is however a few concerns related to these types of scrubber type systems:

- Annex VI states that port states may prohibit discharge of scrubber effluent overboard in ports within ECA's unless it can be documented that the effluent complies with criteria set by that port state. A mitigating measure is installation of filtration/treatment systems.
- It has been indicated that conventional scrubber technology may be struggling to meet the emission criteria at high exhaust gas discharge flows.
- It has been indicated that there is a risk of blue-sheen originating from the scrubber overboard discharge. Although, not necessarily constituting an environmental hazard, the mere risk of such occurrences is to some operators unacceptable.
- There are space considerations in the engine room and more specifically the funnel. Although it has been indicated that the more advanced scrubber types can replace standard silencers, the associated piping systems may represent a challenge. Pressure drop in scrubbers has also been indicated as a limitation, particular in way of main engines uptakes.
- Tanker owners have had mixed experiences with corrosion of inert gas scrubbers and associated piping systems.
- The EU has been reluctant to accept scrubbers. However, in the latest proposed amendments to the EU directive, they have opened for "trials of ship emission abatement technologies". Based on such trials they have indicated that they may accept abatement technology as an equivalent to low sulphur fuel. Note that EU has indicated that it will develop criteria for resulting waste streams in their ports.

Regrettably, the number of development projects related to new scrubber technology appears to be limited. However, some projects currently in the prototype phase show promising results in terms of overcoming the above indicated constraints. It should also be taken into account that exhaust gas cleaning alternatives will reduce the emission of particulate matter (PM). Particulate matter is considered to be the next focal

point of IMO and this increases the future relevance of exhaust gas cleaning systems.

Despite the indicated installation costs of 1-2 mill USD, future legislation, and elimination of the problems associated with low sulphur fuel bunker management and operation, may lead to exhaust gas cleaning systems becoming a cost-beneficial alternative worthwhile exploring.

## 5.2 EU DIRECTIVE 1999/32/EC AND 2005/33/EC AMENDMENTS

In connection with MARPOL Annex VI one cannot disregard ongoing low-sulphur fuel developments in the EU. EU directive 1999/32/EC has been amended by 2005/33/EC and in force today is the following:

- A 1.5% sulphur limit for fuels used by all ships in the Baltic Sea, North Sea & Channel in accordance with the implementation dates of Annex VI to MARPOL (i.e. starting in 19 May 2006 for the Baltic Sea Area). As of 19th May 2006, EU member states shall ensure that the sulphur content in marine diesel oils (ISO 8217 grades DMB and DMC) supplied within their territory does not exceed 1.5%.
- A 1.5% sulphur limit for fuels used by passenger vessels on regular services between EU ports as of 19 May 2006.
- From 1 January 2008 until 31 December 2009, a 0.10% sulphur limit applies to marine gas oils used in EU territory with a viscosity or density falling within the ranges of viscosity or density defined for DMX and DMA grades under ISO 8217. The exemption for Greece and the outermost regions continues to apply.
- From 1 January 2010, the provisions originating from directive 1999/32 and relating to the use of marine gas oils in EU territory are now deleted. Instead a 0.1% sulphur limit is introduced for marine gas oils placed on the market in EU Member States' territory, and a 0.1% sulphur limit starts to apply to all types of marine fuel used by ships at berth in EU ports and by inland waterway vessels. This applies to any use of the fuel e.g. in auxiliary engines, main engines, boilers. There are the following exemptions: for ships which spend less than 2 hours at berth according to published timetables, for hybrid sea-river vessels while they are at sea, and for ships which switch off all engines and use shore-side electricity. The outermost regions continue to be exempt from this provision, but Greece does not, apart from a 2-year derogation for 16 named Greek vessels until 2012.

## 5.3 LOW SULPHUR HEAVY FUEL

The experience in terms of low sulphur residual (or heavy) fuel oil blending is varying. DNV Petroleum Services has already seen indications that the blending of low sulphur fuel oils may lead to additional quality problems such as instability, incompatibility, ignition and combustion difficulties and an increase of Aluminium+Silicon levels due to use of different low sulphur blend components. Regrettably one has also seen cases where chemical waste has been introduced in such fuel. In light of the required demand for low sulphur fuel oils, there have also been concerns over the potential increase of sulphur content in high sulphur fuel oils.



### 5.3.1 FUEL TANK/SYSTEM CONFIGURATION

It should be noted that when approaching an ECA the fuel must be changed over to the required sulphur content fuel oil e.g. 1.50% m/m and completed before entering the ECA. For ships with standard fuel oil system configurations (one service and settling tank), this will involve filling of settling tanks with low sulphur fuel oil, adequate fuel treatment of same and subsequent filling of service tank, as well as flushing of the fuel service piping systems of high sulphur fuel oil.

The problems with incompatibility between heavy fuel oils, and between heavy fuel oils and marine diesels have not disappeared with increased demands for low sulphur heavy fuel oils (excessive sedimentation/sludging and separator and filter prob-

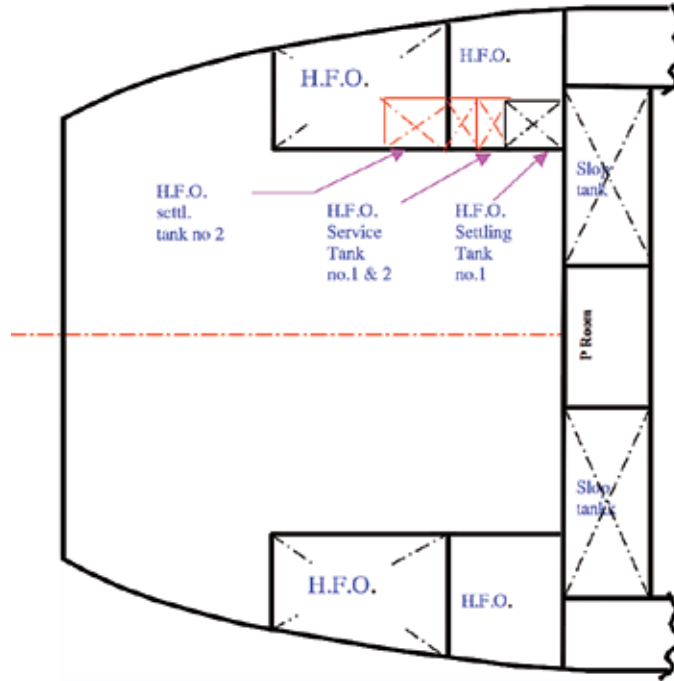
lems). Considering the differences in cost, some owners are installing an additional set of service and settling tanks for low sulphur fuel oils. Additional bunker tanks are considered installed for the same reasons. Such measures would also simplify change-over procedures and bunker management. Inadequate availability of low sulphur heavy fuel oils may force owners to increase the consumption of low sulphur diesel oils within ECA's. Owners will therefore have to assess whether the diesel oil tank capacity needs to be upgraded. Taking into account the current EU requirements to use of ultra low sulphur distillates within its territories, and not to mention ultra low sulphur fuel at berth in EU ports, there is also an issue of whether to allocate or convert existing fuel tanks to tanks for marine gas oil. The differences in cost between low and high sulphur heavy fuel oils as well as be-

tween heavy fuel oils and low sulphur diesel oils, has led some owners to consider separating fuel treatment and service piping systems. This is increasingly important with respect to the requirements to use of ultra low sulphur fuels in EU ports (Auxiliary engines and boilers).

In order to facilitate safe and simple change-over, the installation of separate marine gas oil/diesel oil supply piping with heating capabilities should be considered. (While separate direct diesel oil supply lines are often arranged for auxiliary diesel engines, the same is less frequently encountered for boilers and main engines.) The below serves as examples of proposed modifications regarding duplicated heavy fuel oil service and settling tanks and piping systems.

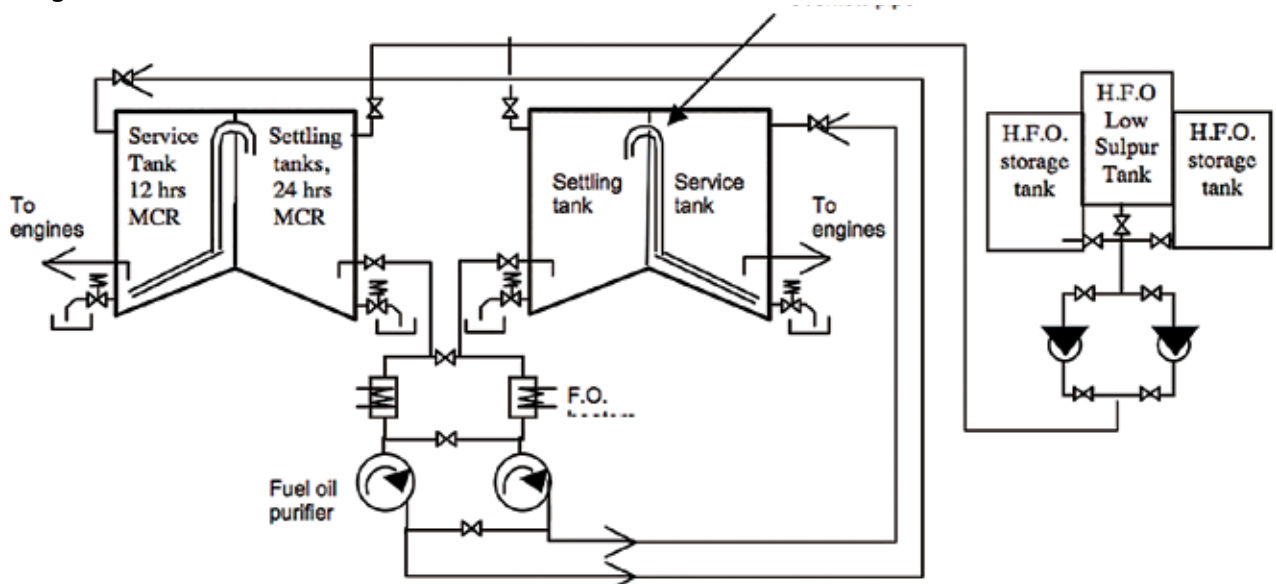


Possible arrangement for additional fuel oil tanks



The below shows the arrangement of fuel oil tank piping arrangement as per the optional DNV class notation FUEL, which enables handling of different fuel qualities.

Handling of different fuels



It should be noted that the United States Coastguard has recently issued policy letter " Guidelines for ensuring compliance with Annex VI of MARPOL 73/78" as Annex VI became effective for the United States on 8 January 2009 for foreign flagged ships operating in U.S. waters as well as U.S. flag ships and has included fuel tanks as inspection item if separate fuel tanks are used and where it should be verified that "high" & "low" sulphur fuels cannot be blended/mixed

### 5.3.2 CHANGE-OVER PROCEDURES

Change-over between heavy fuel oil grades is standard practice and so is change-over from heavy fuel oil to marine diesel oil in connection with e.g. dry-dockings.

Change-over from heavy fuel oil to marine gas oil is however completely different and clearly not common standard. If gas oil is mixed in while the fuel temperature is still very high, there is a high probability of gassing in the fuel oil service system with subsequent loss of power. It should be acknowledged that the frequency and timing of such change-over may increase and become far more essential upon entry into force of ECA's and the EU proposed amendments.

Additionally, the time, ship's positions at the start and completion of change-over to and from compliant Low Sulphur fuel oil must be recorded in a logbook (e.g. ER logbook), together with details of the tanks involved and fuel used. It can be anticipated that the same will be applicable with respect to the EU proposal upon entry into force.

### 5.3.3 BUNKER MANAGEMENT

In view of the change-over requirements, bunker grade segregation constraints, uncertainty in terms of low-sulphur fuel oil availability and potential quality problems, the flexibility in bunker management may be impaired. In addition to the potential increase in fuel oil cost, it could also result in increased frequency of bunkering. Further, owners/managers and charterers may need to amend their bunker specifications, fuel supply agreements as well as charter parties to take the new requirements into account.

### 5.3.4 CHARTS

Due to the introduction of ECA's and associated change-over procedures, it need be ensured that onboard charts are upgraded with respect to ECA borders.



# Volatile Organic Compounds

Volatile organic compounds (VOC) Emissions from tankers can be regulated by each party to Annex VI in specific ports and terminals. IMO shall be notified of such requirements min. 6 months before they enter into force and IMO is to circulate a list of such ports and terminals. The list shall include the notification date on which the requirements become effective, as well as specification of size of tankers and which cargoes that requires vapour emission control systems.

All tankers which are subject to vapour emission control in accordance with above requirements shall be provided with an approved vapour collection system, and shall use such system during the loading of such cargoes. The vapour collecting system shall comply with IMO Guideline MSC/Circ.585.

Existing tankers which are not fitted with vapour collection systems may be accepted for a period of three years after the date of which the respective terminal and port requirements became effective.

DNV has developed class notations for vapour control & recovery systems. Class notation VCS-1 implies compliance with IMO Guideline MSC/Circ.585, and VCS-2 implies compliance with USCG regulation 46 CFR Part 33. Any vessel with class notations VCS-1 or VCS-2 will comply with regulation 15.

Regulation 15 shall only apply to gas carriers when the type of loading and containment systems allow safe retention of non-methane VOC on board, or their safe return ashore.

The revision of Annex VI to MARPOL which will enter into force in July 2010 will also require crude oil tankers above 400 grt to implement and keep onboard a VOC management plan upon entry into force date of the revision. The plan has to be approved by the Administration (i.e. the Class Societies provided they have been Authorised to do so on behalf of the respective Administrations).

The plan is to be ship specific, is to take into account Guidelines developed by IMO and shall as a minimum contain the following:

- Provide written procedures for minimizing VOC emissions during the loading and sea passage.
- Give consideration to the additional VOC generated during Crude Oil Washing;
- Identify a person responsible for implementing the plan.
- Be written in the working language of the master and officers and, if the working language is not English, French or Spanish, include a translation to one of these languages.

DNV and Intertanko have developed a model VOC management plan. The guideline was submitted to IMO Bulk Liquid & Gases sub-committee 13th meeting. Upon their review the guideline will be issued as a joint publication to DNV clients.

# Shipboard Incineration

Incineration of Annex I, II and III cargo residues, of PCB's (Polychlorinated biphenyls), of garbage containing more than traces of heavy metals and of refined petroleum products containing halogen compounds is always prohibited.

For all the ships to which Regulation 16 will be applicable, also incineration of exhaust gas cleaning systems residues will be always prohibited.

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For all the ships to which Regulation 16 will be applicable, also incineration of exhaust gas cleaning systems residues will be always prohibited.

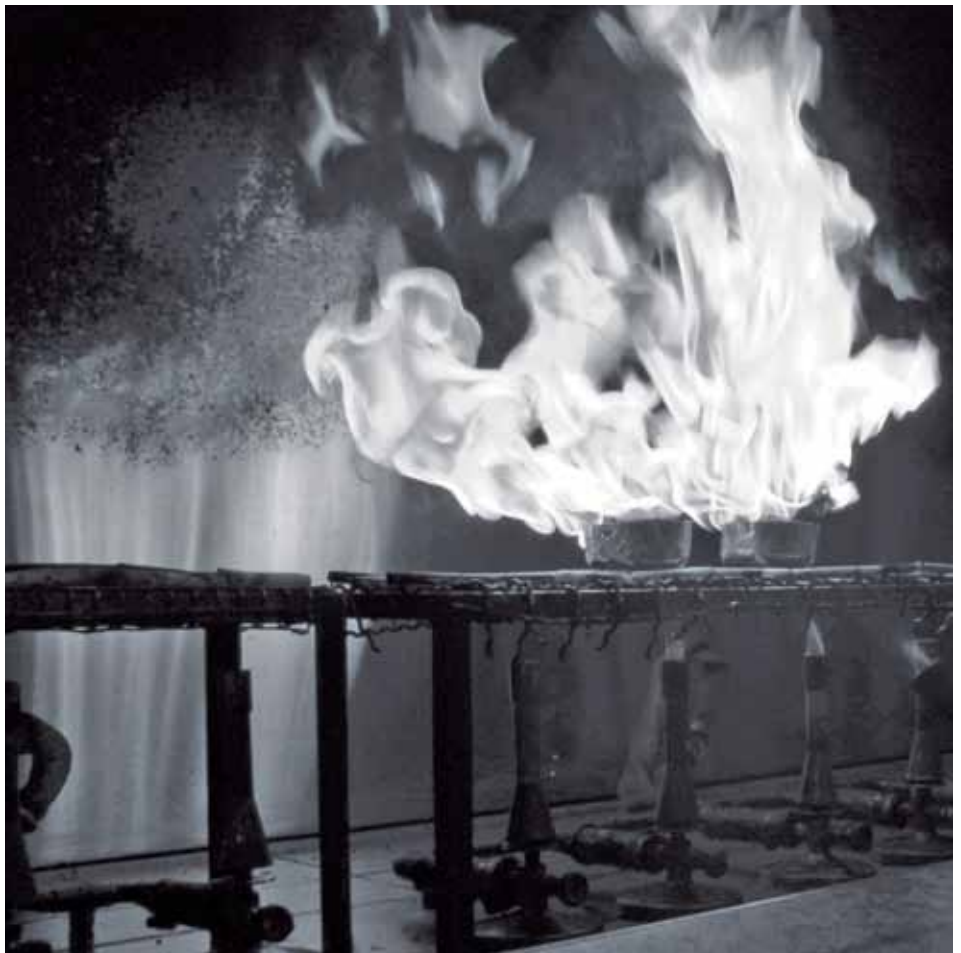
Onboard incineration outside an incinerator is prohibited except that sewage sludge and sludge oil from oil separators may be incinerated in the main or auxiliary power plants and boilers when the ship is not in ports, harbours and estuaries.

Incineration of PVC's (polyvinyl chlorides) is prohibited except in shipboard incinerators type approved according to resolutions MEPC 59(33) or MEPC 76(40).

Monitoring of combustion flue gas outlet temperature shall be required at all times and waste shall not be fed into a continuous-feed shipboard incinerator when the temperature is below the minimum allowed temperature of 850°C. For batch-loaded shipboard incinerators, the unit shall be designed so that the temperature in the combustion chamber shall reach 600°C within 5 minutes after start-up and will thereafter stabilize at a temperature not less than 850 °C. It must be ensured that the incinerators' flue gas outlet temperature monitoring system is operational.

All incinerators installed on a ship constructed on or after 1 January 2000 or incinerator that is installed on board a ship on or after 1 January 2000 shall be type approved in accordance with Resolution

MEPC 76(40) giving the IMO standard specification for shipboard incinerators. For such incinerators a manufacturer's operating manual is required.



# 8. Regulation 18 – Fuel Oil Availability and Quality

## 8.1 GENERAL

Previously fuel oil quality was primarily a matter between owners/managers (and charterers) and suppliers. With the entry into force of Annex VI of MARPOL 73/78, 19 May 2005, Fuel Oil Quality became a statutory matter.

The revised MARPOL Annex VI adopted on 10 October 2008 also contains a additional provision on Fuel Oil Availability.

In addition to requirements controlling the Sulphur Oxide (SO<sub>x</sub>) and Particulate Matter emissions from ships by limiting the sulphur content of oil fuel, Annex VI contains requirements preventing the incorporation of potentially harmful substances, and in particular waste streams (e.g. chemical waste), into fuel oils.

Regulation 18 specifically requires that fuel oil supplied to ships is to be free from inorganic acids or chemical wastes that could jeopardise the safety of the ship, be harmful to ships' personnel, or which would contribute overall to additional air pollution. The addition of small amounts of additives intended to improve performance is however permitted.

IMO has asked ISO to review the current edition of ISO 8217 marine fuel oil specification and give recommendations to IMO on the specific parameters related to air quality, ship safety engine performance and crew health as well as specific values as appropriate. The ISO working group was re-established in the spring of 2008 and will consider the list of parameters and appropriate limits and report back to IMO. The work in ISO will be fast-tracked by issuing a "Public Available Standard" (PAS) that will be published in time for the entering into force 1 July 2010. It is expected that limits related to Ignition quality (HFO), Acid Number, Sodium, Lubricity (MGO/MDO) and Hydrogen Sulphide will be included in these recommendations to IMO.

The requirements to fuel oil quality in Regulation 18 are similar to the general

requirements of ISO 8217, although no references have been given by IMO to the same. Accordingly one question raised has been whether a fuel found off-spec compared to ISO 8217 table 2 test parameters, other than those limits specifically given by MARPOL Annex VI is in violation of Regulation 18. Consultations with certain port states indicate that this will likely not be the regular case. However it has been indicated that the general requirements of Regulation 18 may be enforced in case a ship is involved in accidents or near-accidents where fuel quality is a suspected contributor.

## 8.2 OPERATIONAL ISSUES

It is important to note that elaboration and clarifications relating to Regulation 18 are found in the revised "Guidelines for the sampling of fuel for determination of compliance with Annex VI of MARPOL 73/78" (MEPC59 resolution). Although this is a guideline, it is expected that the guideline will be used as requirements by port state inspectors. It should be noted that Intertanko has issued a thorough and useful guideline related to Annex VI which elaborates on the issues at hand. Further certain authorities such as Singapore developed their own Code of Practice which should be followed in order to comply with the Annex VI of MARPOL requirements when bunkering in Singapore.

### 8.2.1 BUNKER DELIVERY NOTES

It is a requirement of Regulation 18 that any fuel oil for combustion purposes delivered to and used onboard shall be recorded by means of a Bunker Delivery Note (BDN). This implies that a bunker delivery note shall be presented for every barge delivery and every grade.

Bunker Delivery Notes are required to contain all specific information as follows:

- Name and IMO number of receiving ship
- Port
- Date of commencement of delivery

- Name, address, and telephone number of marine fuel oil supplier
- Product name (s)
- Quantity in metric tons
- Density at 15° C, kg/m<sup>3</sup> \*
- Sulphur content (% m/m) \*\*

A declaration signed and certified by the fuel oil supplier's representative that the fuel oil supplied is in conformity with the applicable subparagraph of regulation 14.1 or 14.4 and regulation 18.3 of this Annex. (I.e. that the fuel supplied has a sulphur level below:

4.50% m/m prior to 1 January 2012  
 3.50% m/m on and after 1 January 2012  
 0.50% m/m on and after 1 January 2020  
 and that the fuel is free from inorganic acid, does not include any added substance or chemical waste which either jeopardises the safety of ships, adversely affects the performance of the machinery, is harmful to personnel, or contributes overall to additional air pollution\*\*\*).

Further, the revised MEPC Resolution recommends that the seal number of the associated MARPOL 73/78 Annex VI fuel sample is included in the BDN's for cross-reference purposes.

The BDN's are to be kept on board and readily available for inspection at all times. It shall be retained for a period of three years after the fuel oil has been delivered on board.

\* Fuel oil shall be tested in accordance with ISO 3675:1998 or ISO 12185:1996.

\*\* Fuel oil shall be tested in accordance with ISO 8754:2003.

\*\*\* IMO has asked ISO review to the ISO 8217 marine fuel quality specification to be completed by 1 July 2010. This may result in specific parameters and limits

### 8.2.2 MARPOL 73/78 ANNEX VI FUEL OIL SAMPLES (RETAINED SAMPLE)

Regulation 18 requires that every BDN is to be accompanied by a representative sample of the fuel oil delivered, taking into account the revised “Guidelines for the sampling of fuel for determination of compliance with Annex VI of MARPOL 73/78” referred to as retained sample.

The sample is to be sealed and signed by the supplier’s representative and the master or officer in charge of the bunkering operation on completion of bunkering operations, and retained under the ship’s control until the fuel oil is substantially consumed, but in any case for a period of not less than 12 months from the time of delivery. Although the resolution specifies that the

volume of the sample bottle should be no less than 400 ml, due to potential need for repetitive testing, DNV Petroleum Services recommends that the sample volume is not to be less than 750 ml.

It should be noted that the practical purpose of the retained sample is to enable port states to verify the sulphur content of the fuel, as well as to verify that the fuel oil quality is in accordance with Regulation 18. As Annex VI specifies that the Annex VI sample is not to be used for commercial purposes, DNV Petroleum Services recommends that for ship’s already participating in a fuel oil quality testing scheme, the Annex VI sample should be the fourth sample. In case the supplier is not in a position to comply with the procedural or documentary requirements stated in Annex VI of

MARPOL 73/78, the following actions should be taken by the ship’s crew:

- A Note of Protest highlighting non-compliance with MARPOL Annex VI requirements should be issued. The Note of Protest is to be forwarded to the relevant Port State.
- Reference to the Note of Protest is to be made in the BDN (if supplied).
- If the supplier does not provide a MARPOL Annex VI sample, the ship’s crew should propose their own representative MARPOL Annex VI sample to be taken the official MARPOL Annex VI sample. The crew should request counter-signing and sealing by the supplier. If this is accepted by the supplier, a Note of Protest should not be deemed necessary.



### 8.2.3 SAMPLING PROCEDURES

Note that the revised MEPC Resolution specifies in detail that the fuel sample is to be obtained at the receiving ship's inlet bunker manifold and is to be drawn continuously throughout the bunker delivery period. The term continuously drawn is specified to mean a continuous collection of drip sample throughout the delivery of bunker fuel. Sampling methods are further clarified as either; manual valve-setting continuous-drip sampler (equivalent to DNV Petroleum Services' Line sampler), time-proportional automatic sampler, or

flow-proportional automatic sampler.

Further the guidelines specify that sample bottle labels are to contain the following information:

- Location at which, and the method by which, the sample was drawn.
- Date of commencement of delivery.
- Name of bunker tanker/bunker installation.
- Name and IMO number of the receiving ship.
- Signatures and names of the supplier's representative and the ship's representative.
- Details of seal identification.
- Bunker grade.

### 8.2.4 SAMPLE INVENTORY

The revised MEPC resolution also contains recommendations on sample storage location. Specifically the samples are to be kept in a safe storage location, outside the ship's accommodation and where personnel would not be exposed to vapours which may be released from the sample. Further, the retained sample should be stored in a sheltered location where it will not be subject to elevated temperatures, preferably at a cool/ambient temperature, and where it will not be exposed to direct sunlight. On tankers, the cargo sample locker would be considered an adequate storage space. Alternatively, a suitable locker (with opening ensuring adequate air flow) in an adequately ventilated area of the engine room located at a safe distance from ignition sources and hot surfaces may be considered.

The above guideline also recommends that the ship's master should develop and maintain a system (e.g. log book) to keep track of the retained samples.

### 8.2.5 SUPPLIER'S RESPONSIBILITY

While most IMO conventions place full responsibility on the ships and shipowners, Regulation 18 also places responsibilities on the fuel suppliers (fuel oil quality declaration, BDN and the Annex VI fuel oil sample by continuous drip and at the receiving ships manifold).

Annex VI of MARPOL 73/78 also contains instruments to encourage port states to ensure that suppliers fulfil their obligations. Port states are therefore required to:

- Maintain a register of local suppliers of fuel oil.
- Require local suppliers to provide the BDN and sample, certified by the fuel oil supplier that the fuel oil meets the requirements of regulations 14 and 18.
- Require local suppliers to retain a copy of the bunker delivery note for at least three years for inspection and verification by the Port State as necessary.
- Take action as appropriate against fuel oil suppliers that have been found to deliver fuel oil that does not comply with that stated on the Bunker Delivery Note.
- Inform the Flag Administration of any ship receiving fuel oil found to be noncompliant with the requirements of regulations 14 or 18 of this Annex.
- Inform IMO for transmission to Parties to the Protocol of 1997 of all cases where fuel oil suppliers have failed to meet the requirements specified in regulations 14 or 18.



However, despite the suppliers' responsibilities and the instruments available, previous experience from Port State Controls indicates that it is advisable for owners/managers themselves to ensure compliance. In order to assist ships in ensuring that the operational requirements are met, it should be considered to include clauses related to MARPOL 73/78 Annex VI compliance in bunker contracts and agreements with suppliers, as well as charter parties. For vessels taking part in a fuel testing scheme it could be advantageous to include a clause referring to the 4th sample taken at the receiving vessel manifold as the retained sample in case the supplier is not in a position to comply with the procedural requirements stated in Annex VI of MARPOL 73/78

### 8.2.6 FUEL OIL AVAILABILITY

There is a new provision on Fuel Oil Availability in the revised Annex VI of MARPOL as follows:

- 1 Each Party shall take all reasonable steps to promote the availability of fuel oils which comply with this Annex and inform the Organization of the availability of compliant fuel oils in its ports and terminals.

2.1 If a ship is found by a Party not to be in compliance with the standards for compliant fuel oils set forth in this Annex, the competent authority of the Party is entitled to require the ship to:

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

### 8.2.7 THIRD PARTY INSPECTIONS

The limited experience after implementation has shown that, class surveyors, port state inspectors and possibly also vetting inspectors have scrutinised onboard documentation and records (e.g. sampling procedures, change-over procedures, ER log books, BDN's, sample inventory log books etc.), as well as the fuel oil sample inventory. It should be noted that the United States Coastguard has recently issued policy letter "Guidelines for ensuring compliance with Annex VI of MARPOL 73/78" as Annex

VI became effective for the United States on 8 January 2009 for foreign flagged ships operating in U.S. waters as well as U.S. flag ships. It is further expected that a North American Emission Control Area (U.S. and Canada) could be a reality in 2012/2013.

Consultations with port states indicate that analysis of the onboard Annex VI samples will be carried out upon suspicion, e.g. in case of an accident or near accident. However, the EU has proposed a more frequent testing of both onboard retained samples and also tank samples to verify compliance. It should also be noted that Dutch authorities carry out such testing today to verify compliance with existing low sulphur requirements to marine distillates as well as SECA compliance. Testing of the representative sample should be done in accordance with the "Fuel Verification Procedure for Marpol Annex VI Fuel Oil Samples" (Appendix VI of the revised MARPOL Annex VI).

Based on experiences with port state inspectors scrutinising of oil record books related to sludge and oily bilge water inventory and balance, owners and managers could expect that similar practice could be applied with respect to high-



sulphur and low-sulphur fuel movements and consumption when operating in SECA's or the EU (bunker quantity is required specified in BDN's). Accordingly, it is advisable that crews are instructed and trained to thoroughly verify that the supplied quantity is in accordance with that specified in the BDN's, or alternatively that independent bunker quantity surveyors are hired for this purpose.

It need be emphasised that currently, the Annex VI sample is only required to be retained under ships' control and not tested. However, fuel oil quality testing represents a pro-active approach, both in terms of verifying compliance prior to any port state control, and more importantly as a safeguard against the adverse effects of poor fuel oil quality in combustion machinery. Third parties may also consider test reports from a reputable and accredited independent testing laboratory as equivalent to additional testing of onboard samples.

It should also be noted that the procedures and documentation of DNV Petroleum Services fuel oil quality testing scheme will be in full compliance with Annex VI of MARPOL 73/78 and the associated revised MEPC Resolution. Further participation in such a scheme ensures that ships have access to compliant sampling equipment (sample bottles, seals, line samplers and cubitainers). It further gives ship operators access to DNV Petroleum Services bunker alerts and bulletins as well as comprehensive fuel oil quality statistics, all of which will provide ship operators with valuable assistance in their bunker management.

#### For further information, please contact

##### Annex VI in general:

DNV, Cargo Handling, Piping Systems, Marpol and Gas Carriers (MNBNA880@dnv.com and MNBNA843@dnv.com)

##### NOx and engine related inquiries:

DNV, Section for Machinery Systems (MGGNO894@dnv.com) DNV, Section for Machinery (MNBNA373@dnv.com)

##### SOx and fuel related inquiries:

DNV, Cargo Handling, Piping Systems, Marpol and Gas Carriers (MNBNA880@dnv.com)DNVPS, DNV Petroleum Services (DNVPS.OSLO@dnvps.com)

# Appendix 1

# Appendix 1

## Owners' Annex VI Checklist

The following table is a proposed checklist for Owners preparing for the implementation of Annex VI of MARPOL 73/78 and the initial survey to obtain the required International Air Pollution Prevention (IAPP) Certificate.

Item	Comment	Tasks
<b>Regulation 6</b> When do I need to carry out Initial Survey?	Prior to delivery from yard	DNV will perform initial IAPP survey on request from yard
<b>Regulation 12</b> Ozone Depleting Substances (ODS)	<ul style="list-style-type: none"> <li>■ Halons</li> <li>■ CFCs</li> <li>■ HCFCs</li> </ul>	<ol style="list-style-type: none"> <li>1. Prepare lists of ODSs for all ships</li> <li>2. Prepare instructions for handling ODSs</li> </ol>
<b>Regulation 13</b> NOx Certification	<ul style="list-style-type: none"> <li>■ Engines greater than 130kW on ships keel laid on or after:               <ul style="list-style-type: none"> <li>- 1 January 2000; or</li> <li>- 1 January 2011; or</li> <li>- 1 January 2016; or</li> </ul> </li> <li>■ Engines greater than 5000 kW and 90 litres cylinder displacement installed in ships keel laid between 1 January 1990 and 1 January 2000; or</li> <li>■ Engines greater than 130kW which undergoes a major conversion, including replacements by new engines, on or after 1 January 2000</li> </ul>	<ol style="list-style-type: none"> <li>1. Get an overview of engines requiring NOx Certification</li> <li>2. Check that these engines are certified and have the necessary documentation; EIAPP Certificate and Technical File</li> </ol> <p>(See also flow-sheet at page 5 of main document)</p>
<b>Regulation 14</b> Sulphur Oxides SOx	<p>Max. Sulphur 4.50 % m/m prior to 1 January 2012</p> <p>Max. Sulphur 3.50 % m/m on or after 1 January 2012</p> <p>Max. Sulphur 0.50 % m/m on or after 1 January 2020</p>	Prepare instructions

Item	Comment	Tasks
<b>Regulation 14</b> SECAs	Max. Sulphur 1.50 % m/m prior to 1 July 2010  Max. Sulphur 1.00 % m/m on or after 1 July 2010  Max. Sulphur 0.10 % on or after 1 January 2015	1. Can all engines and boilers operate on low sulphur fuel? 2. Plan bunker strategies 3. Calculate Fuel Changeover Time for all ships. Prepare operational and log instructions.
<b>Regulation 15</b> VOC	Tankers only, operating at VOC designated ports  VOC management Plan from 1 July 2010	Certified VOC return system?
<b>Regulation 16</b> Shipboard Incineration	Restrictions on Incineration	Prepare instructions
<b>Regulation 16</b> Type approved incinerator	Incinerators installed on or after 1 January 2000 to be type approved according to resolution MEPC.76(40)	1. Gets an overview of incinerators requiring type approval. 2. Check that Certificate and operation manual is available
<b>Regulation 18</b> Fuel Quality	Requirements for fuel quality, documentation and sample storage	1. Prepare routines for filing of Bunker Delivery Notes 2. Prepare instructions for taking samples 3. Prepare facilities for sample storage.





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