LOW SULPHUR FUEL OIL:
A GUIDE TO UPCOMING MARPOL ANNEX VI REGULATIONS

Air pollution caused by maritime transport is an important topic on the global environmental agenda. The change-over to cleaner fuels is a global trend and part of the IMO's long term objective to reduce the environmental impact of shipping.

Air pollution is regulated by the IMO through its International Convention for the Prevention of Pollution from Ships (MARPOL) and particularly Annex VI of the Convention. MARPOL Annex VI limits the some of the main air pollutants originating from ships' exhaust gases, including SOx and NOx. It also prohibits deliberate emission of ozone depleting substances.

The purpose of Skuld's LSFO Guide is to provide masters, ship's officers, shore personnel, managers and charterers with a general overview of the changing international and national laws and regulations which are to be considered prior to and beyond January 2015. Further, it is the intention to address possible technical solutions which will assist Ship-owners to achieve the necessary compliance standards. Skuld also aims to raise awareness about precautions that can be implemented while planning voyages and making contractual arrangements with Charterers and Bunker Suppliers after January 2015.

1. INTRODUCTION

Air pollution caused by maritime transport is an important topic on the global environmental agenda. The change-over to cleaner fuels is a global trend and part of the IMO's long term objective to reduce the environmental impact of shipping.

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The revised MARPOL measures were adopted by the IMO in relation to sulphur oxides (SOx) and nitrogen oxides (NOx) emissions from marine engines on 10.10.2008, when the Marine Environmental Protection Committee (MEPC) of the IMO adopted the revised ANNEX VI to MARPOL 73/78 which then came in to force on the 1st of July 2010.

The highest sulphur content which will be allowed in ship fuel is aimed to be no more than 0,50% globally (by 2020) and in Sulphur Emission Control Areas 0,10% (by 2015) . It is hoped that these changes in the regulation will facilitate a significant beneficial impact on the atmospheric environment and on human health, particularly for those people who are living in port cities and coastal communities.

ANNEX VI applies to all ships above 400 GT engaged in international trade between countries that have ratified the MARPOL Convention or ships which fly the flag of such countries. Compliance with MARPOL ANNEX VI requirements is an ultimate responsibility of the shipowner. Non-compliance might cause financial and legal consequences for the owners. It can also prejudice Member's P & I cover.

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The upcoming environmental requirements of 1st January 2015 will create a number of operational, technical, financial and legal challenges. We recommend that all companies involved with consumption and supply of bunker fuel obtain a full copy of "Revised Marpol Annex VI, Regulations for the prevention of air pollution from ships" and plan to be ready well in advance of the key date of: 01.01.2015.

2.1. The Revised MARPOL Annex VI:

The Regulations for the Prevention of Air Pollution from Ships (Annex VI) seek to minimize airborne emissions from ships (SO_x, NO_x, ODS, VOC) and their contribution to local and global air pollution and environmental problems. The revised Annex VI entered into force on 01.07.2010 is introducing significantly tightened emission limits (**Table 1**).

It should be noted that limitations in sulphur content apply to all fuel oils (heavy, MDO and gas oil), regardless of their use on board (combustion engines, boilers, gas turbines):

→ Practical: Alternative measures such as the use of scrubbers (Exhaust Gas Cleaning Systems) are also permitted in order to reduce sulphur emissions (in the SOx ECAs and globally) . Ships can fit an exhaust gas cleaning system or use any other technological method to limit SOx emissions. The 2015 standard of 0,10% in North America and Northern Europe is intended to be followed by the 0,50% global standard in 2020.

SOX Global Cap	4,50% m/m 3,50 % m/m 0,50% m/m	Prior 01.07.2012 After 01.07.2012 After 01.01.2020
SOX ECA	1,50% m/m 1,0% m/m 0,10% m/m	Prior 01.07.2010 After 01.07.2010 After 01.01.2015
NOX	Tier I DE installed on ships constructed from 01.01.2000 to 01.01.2011. Tier II DE installed on ships constructed on or after 01.01.2011. Tier III DE installed on ships constructed on or after 01.01.2016.	1) Allowable emissions NOx -17,0 g/kWh , n < 130rpm. 2) Allowable emissions NOX - 14,4 g/kWh, n <130 rpm. 3)NOx ECAs: 3,4 g / kWh when n < 130 rpm n 9,0 × n(-0,2) g/kWh when n =/>130 rpm but < 2000 rpm 2,0 g/kWh when n=/> 2000 rpm.

→ Important: Members are reminded that, from 1 January 2015, any ships calling at ECA zones (Baltic Sea, North Sea, 200 nautical miles around the US and Canada shoreline, including Hawaii, St. Lawrence Waterway and the Great Lakes and the US Caribbean zone) will have to use fuels with a maximum sulphur content of 0.10% by mass.

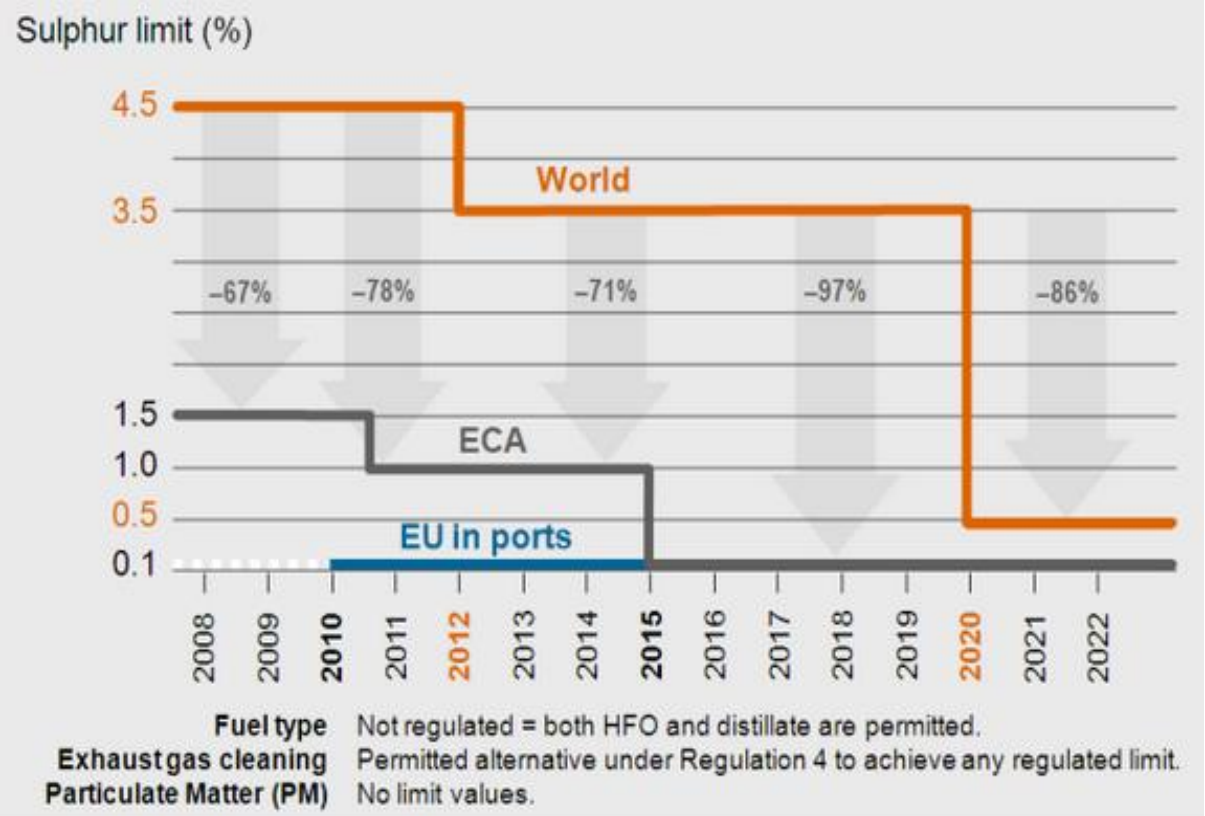


Figure 2. IMO sulphur limits for years 2008-2020 (% mass).

→ An updated list of countries that have ratified MARPOL (Annex VI) can be found here: http://www.imo.org/About/Conventions/StatusOfConventions/Pages/Default.aspx

→ To date 76 countries representing 95% of the world tonnage have ratified.

Emission Control Areas:

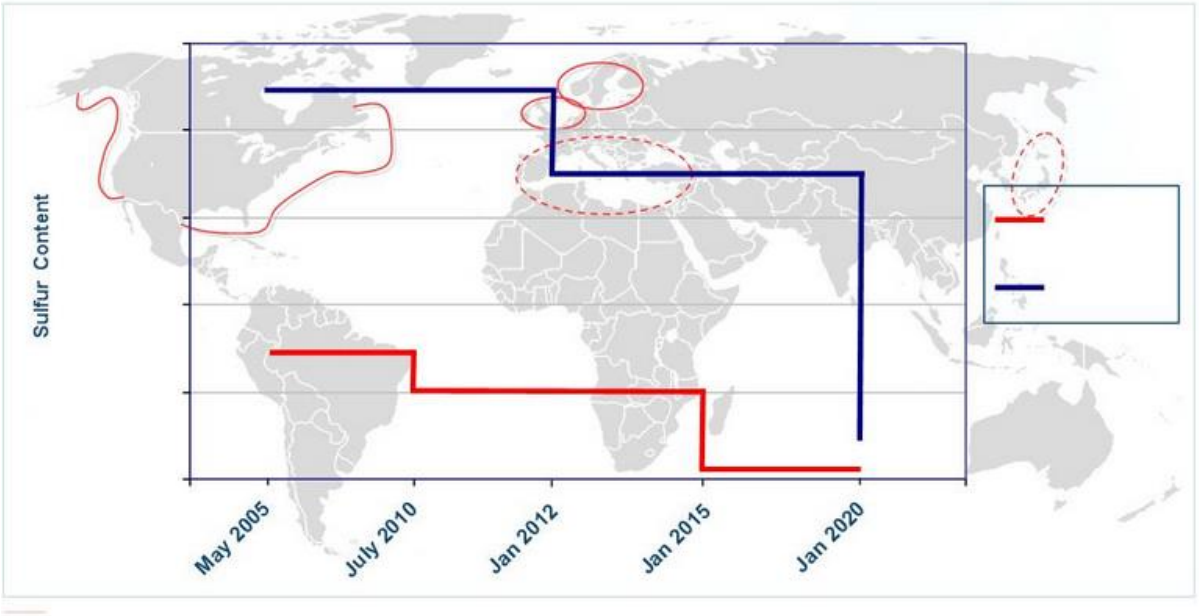
The revised Annex VI introduces the concept of an ECA – Emission Control Areas. It allows for an Emission Control Area to be designated for SOx and particulate matter (PM), or NOx, or all three types of emissions from ships. As defined in Annex VI (revised) ECA means an area where the adoption of special mandatory measure for emissions from ships is required to prevent, reduce and control air pollution from Nox or Sox and PM or all three types of emissions.

→ Emission Control Areas shall include those listed in or designated under regulations 13 and 14 of the Annex VI - Table 2:

Annex VI: Prevention of air pollution by ships (Emission Control Areas)			
Baltic Sea (SOx)	1,15% prior 01.07.2010	1,0% after 01.07.2010	0,10% after 01.01.2015
North Sea (SOx)	1,15% prior 01.07.2010	1,0% after 01.07.2010	0,10% after 01.01.2015
North American (SOx, and NOx and PM) up to 200 NM from coast		SOx - 1,0% after 01.08.2012	SOx - 0,10% after 01.01.2015 NOx – ME construed after 01.01.2011 – Tier II, after 01.01.2016 – Tier III
United States: Caribbean Sea ECA (SOx, NOx and PM)- waters of Puerto Rico and Virgin Islands		SOx -0,10% after 01.01.2014	NOx – ME construed after 01.01.2011 – Tier II, after 01.01.2016 – Tier III
California- **Airborne Toxic Control Measure (CCR)** - 17 CCR, Section 93118.2, Title 17, 24 NM off the California Baseline.	MGO/MDO for ME and AE, SOx – 0,1% after 01.01.2014; SOx – 0,10% after 01.01.2015.		**MARPOL**: NOx– ME construed after 01.01.2011 – Tier II, after 01.01.2016 – Tier III.

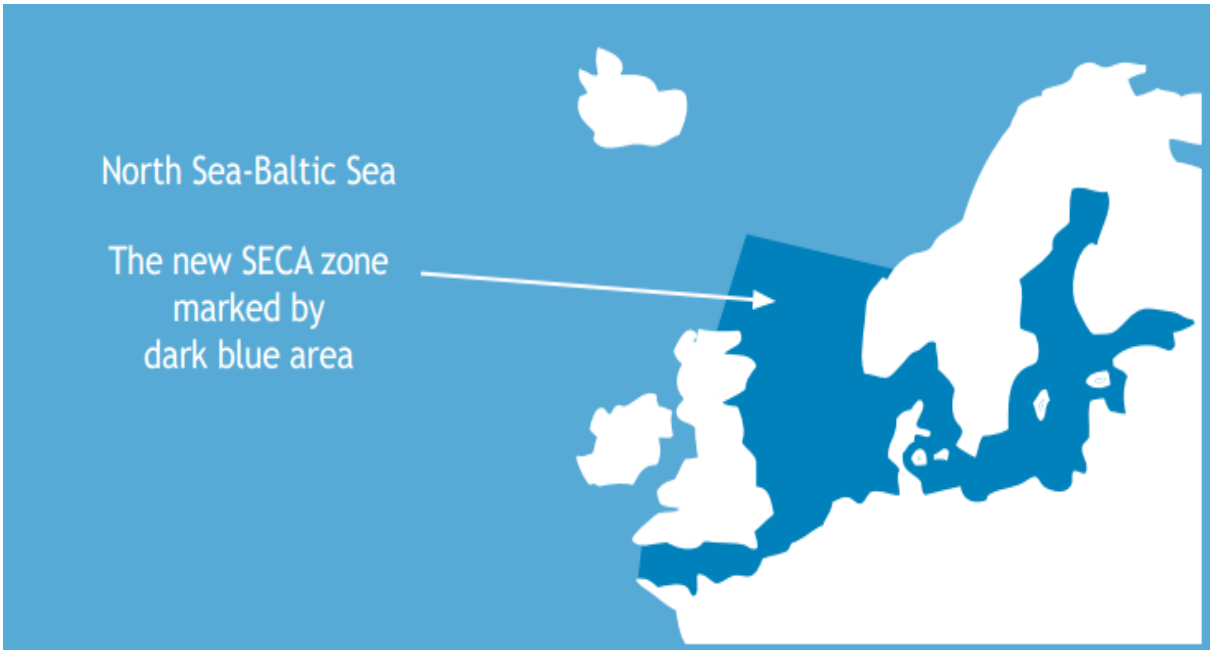
Table 2

Global Goals and present ECAs, possible future ECAs outlined :

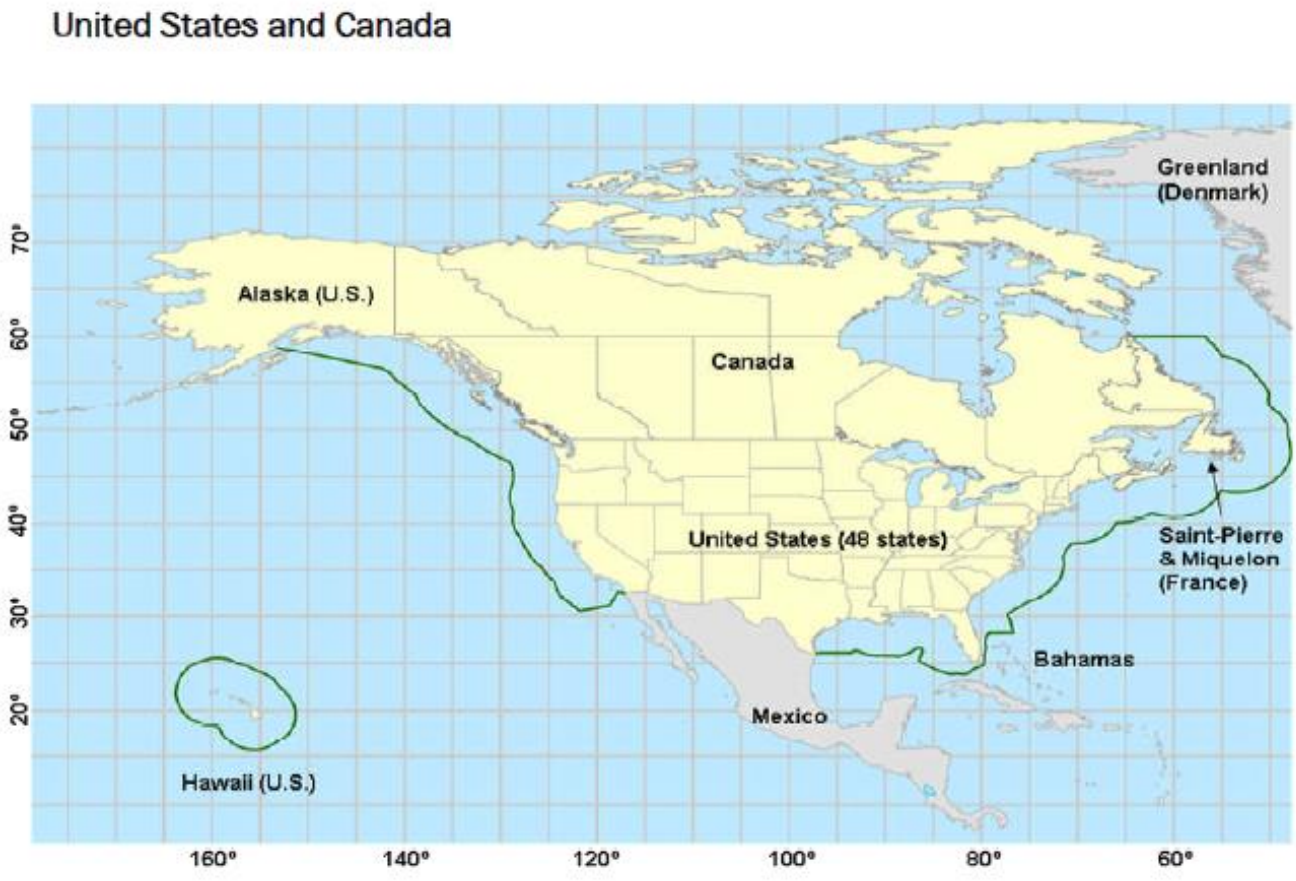


REGIONAL ECA Maps:

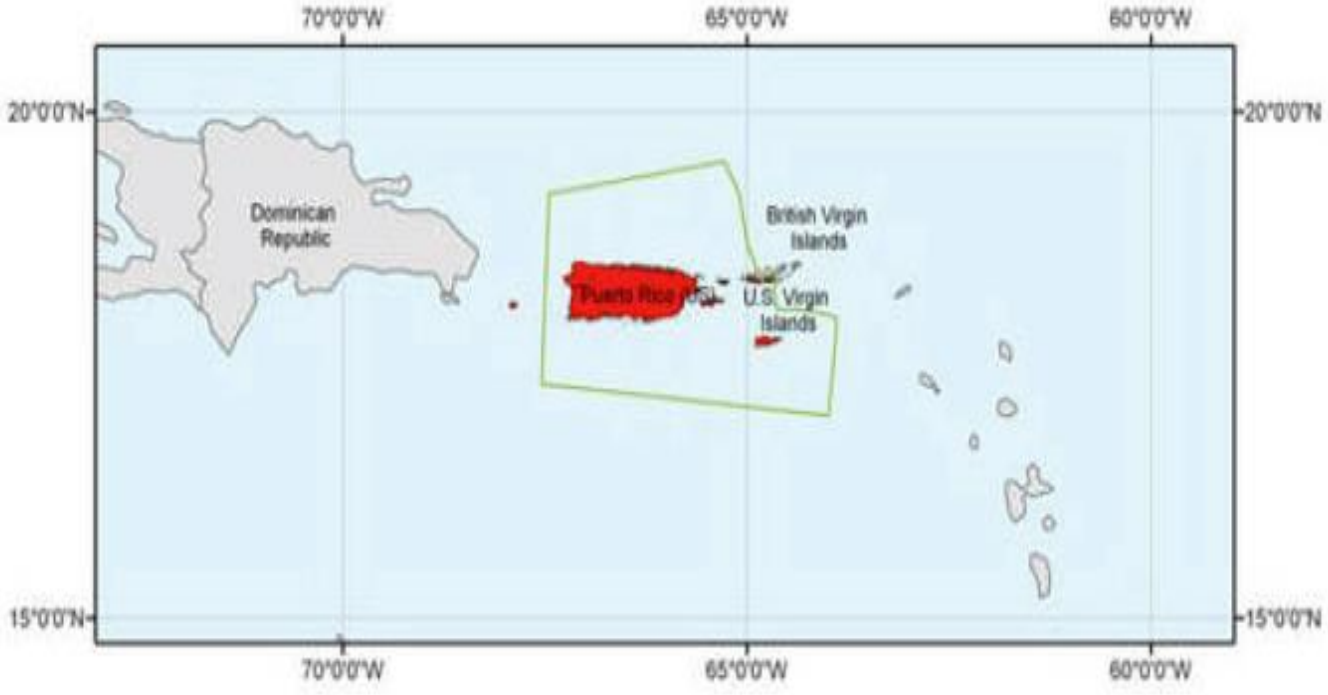
The EU ECA – including the addition of the North Sea ECA:



North American area (entered into effect 1 August 2012)–defined in Appendix VII of Annex VI of MARPOL (SOx, NOx, PM):



United States Caribbean Sea area (entered into effect 1 January 2014) – as defined in Appendix VII of Annex VI of MARPOL (SOx, NOx and PM):



2.2 MARPOL ANNEX VI - REGULATION 4 : SCRUBBERS

Regulation 4 : allows flag administrations to approve alternative means of compliance that are at least as effective in terms of emissions reduction as the prescribed sulphur limits (Scrubbers or Exhaust Gas Cleaning Systems are one, if not the main, alternative means) .

If scrubbers are to be installed then such installation must be verified as compliant in accordance with the IMO Exhaust Gas Cleaning Systems Guidelines (MEPC 184(59) – 2009 Guidelines for Exhaust Gas Cleaning Systems).

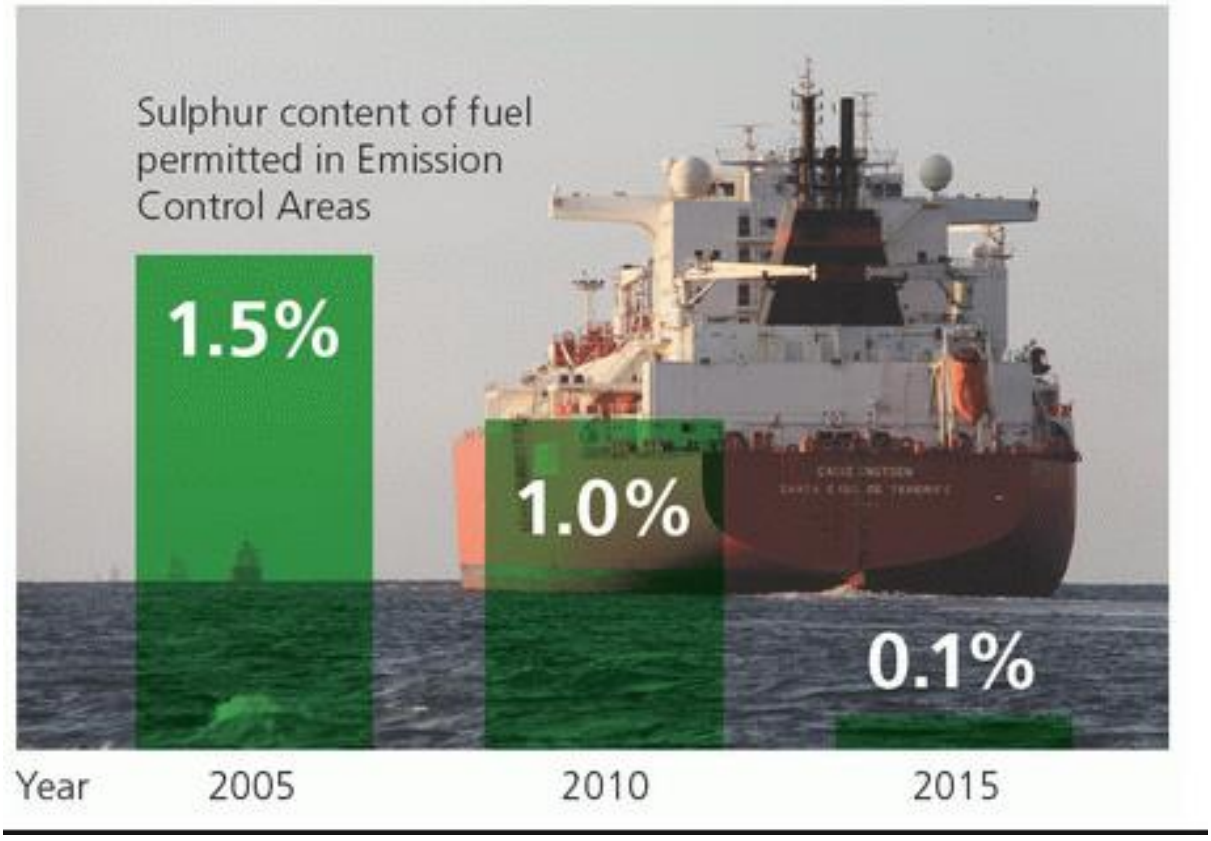
The Guidelines specify two methods of testing, survey, certification and verification schemes :

1) using parameter and emission checks or

2) through continuous monitoring of SOx

Compliance should be demonstrated on the basis of the SO2 (ppm) /CO2 (% v/v) ratio values. More details can be obtained here:

2009 Guidelines For Exhaust Gas Cleaning Systems



2.3 MARPOL Annex VI Regulation - 14 : limits on Sulphur Content

Regulation 14 places limits on the sulphur content of fuel to restrict SOx and particulate matter emissions, and is applicable to all ships in service and subject to the Convention.

It specifies different limits for operating inside and outside an Emission Control Area for SOX (ECA-SOX).

Fuel Oil Sulphur Content (% m/m)	Ratio Emission SO2(ppm)/CO2(% v/v)
4,50	195,00
3,50	151,70
1,50	65,00
1,00	43,00
0,50	21,70
0,10	4,30

Table 3 - Fuel oil sulphur limits recorded in regulations 14.1 and 14.4 and corresponding emissions values.

The sulphur content of fuel oil referred to in paragraph 1 and paragraph 4 of Regulation 14 shall be documented by its supplier. This does place a significant onus on having Suppliers provide fuel that is both physically and legally up to specification, merely documenting it as such is not sufficient.

An Engine room, with inspection of a possibly defective part underway

2.4 MARPOL Annex VI - Regulation 18 : Fuel Quality and Availability

Regulation 18 deals with the quality and availability of LSFO Fuels. In general this regulation is directed at fuel oil suppliers and their supervision by the appropriate authorities together with other regulatory aspects. The requirements of this regulation should be seen as supportive of Regulation 14 in respect of those aspects which are outside the control of the ship owner, primarily: the quality of the fuel.

The other aspect of regulation 18 which is important to – but beyond the control - of ship-owners is the availability of "compliant" fuel. In order to address situations of local non-availability, Regulation 18.2 sets out the rules for such eventuality.

As a starting point the ship owner must have made his best efforts to attempt to obtain the required fuel oil and that these efforts should be taken into account by Regulatory Authorities when considering what action to take, or not to take, in the case of a ship using non-compliant fuel oil.

Based on existing experience with present ECA compliance regimes, ships have encountered problems with non- availability of the requisite ECA complaint fuel or that the allegedly ECA compliant fuel was supplied with a sulphur content above the limit. This has been shown following fuel sample testing and despite the fact that the value in the BDN (Bunker Delivery Note) purports "compliance".

For information which is required to be submitted in a BDN please see Annex 1.

In cases of non-availability of compliant fuel or supply of non-compliant fuel ships should issue Notes of Protest to their Flag Administrations with copies to the port authority where the fuel was supplied and a copy to the PSC to the next port of call, as appropriate.

Members should check with their Flag Administrations as well as their regular fuel testing laboratories for standard formats for Notes of Protests, although at times ad hoc or bespoke forms would be appropriate. Examples of the types of information that may need to be included, particularly for the U.S. (where FONAR – Fuel Non-Availability Reports – have to be filed) can be found in Annex 2.

Fuel Samples taken as part of an investigation in to a quality dispute attended to by the Association.

Fuel verification procedure

Under MARPOL Annex VI there is a procedure for Samples under Regulation 18.8.2. In accordance with the MARPOL Annex VI legislation, the official sample is the MARPOL sample, which is taken by the Supplier and provided to the vessel at the time of bunkering. This sample can only be taken and analysed under the direction of the Port State Control Authority where an inspection or investigation is being undertaken, and this is to be done in accordance with the MARPOL verification procedure.

It should be further mentioned that a Vessel will be subjected to specific conditions and requirements if she calls a port without compliant fuel. Owners need to record all attempts to acquire compliant FO.

Whether an Owner would need to deviate from a planned voyage in order to find compliant fuel is not clear, but a shifting within a Port or wider Port area is unlikely to qualify as a deviation and is likely to be within the criteria for an Owner taking objectively reasonable steps to find compliant fuel.

→ **Hot Tip: ensure that both Charterparty and Bills of Lading incorporate appropriate liberties to bunker, so that a vessel could legitimately shift, deviate or make an intermediate stop on route in order obtain compliant fuel.**

A Vessel must seek to inform both next Port and its Flag State well in advance if no compliant fuel is available at the present Port. Port Authorities should inform the IMO about the situation.

If convincing and compelling evidence is submitted by the Vessel's Owners and Operators in a full and frank manner it may mitigate against possibly harder PSC action against the vessel. Indeed in the U.S. it would likely be a pre-requisite to avoiding severe penalties, that the Owner is very open and forthcoming with both the U.S. Coast Guard as well as the EPA (Environmental Protection Agency) about the situation.

It is hoped that Authorities in ECA zones will appreciate that there will be bunkering ports located in countries which are not Parties to Annex VI and therefore, apart from commercial considerations, there would be no direct requirement for them to comply with the various requirements of Regulation 18.

This is not guaranteed, though.

Hence it should be usual for Ship Owners and Operators, when ordering bunkers, to at least ensure they specify in their ordering instructions that the fuel oil supply process is to be in accordance with the requirements of Annex VI and with specified maximum sulphur content appropriate to the particular intended future area of operation.

The USA, Canada, and EU have domestic regulations and directives related to the non-availability of LSFO which are meant to be parallel to Regulation 18, to which more see below.

USA – FOND and FONAR

The US Environmental Protection Agency (EPA) has posted FOND Instructions in respect to procedures if no compliant fuel is available:

FOND Instructions

Given the great length and detail of U.S. regulations, the Association has and will continue to publish separate Loss Prevention Material and Guidance specifically for trade to and from U.S. territories.

The caution here must be that Members must take U.S. regulatory compliance very seriously, because U.S. authorities take these matters very seriously.

Any Member unfamiliar with the peculiarities and specific challenges and issues of U.S. trading is well advised to contact the Association in advance of considering such business and certainly before fixing it.

European Union Regulations – Fuel Quality

EU legislation has been aligned with the IMO requirements by Directive 2012/33/EU which has amended Council Directive 1999/32/EC as regards the sulphur content of marine fuels.

The Directive establishes limits on the maximum sulphur content of gas oils, heavy fuel oil in land-based applications as well as marine fuels, and thus it serves as the EU legal instrument to give effect to the sulphur provisions of MARPOL Annex VI. This implies especially the introduction of, inter alia, stricter sulphur limits for marine fuel in SECAs (1,00 % until 31 December 2014 and 0,10 % as of 1 January 2015) as well as in sea areas outside SECAs (3,50 % as of 18 June 2014 and, in principle, 0,50 % as of 1 January 2020).

The Directive also contains some additional fuel-specific requirements for ships calling at EU ports, obligations related to the use of fuels covered by the Directive, and the placing on the market of certain fuels (e.g. marine gas oils):

- → Applies in all EU member states irrespective of vessel's flag;
- → From 1st January 2010, ships at berth for longer than 2 hours within ports in the European Union are required to switch to low sulphur content marine fuel oil under Article 4b of Directive 2005/33/EC. This being fuel with a maximum sulphur content of 0.10%.
- → Vessels operating in the EU Economic Exclusion Zones (EEZ) must use fuel with a sulphur content below 0.50% mass as from 2020 irrespective of when the 0.50% global cap, specified in Annex VI, is given effect.
- → Sale of gas oil with Sulphur contents of above 0,10% is banned in the EU.

The Directive does not contain provisions to regulate ship emissions of NOx or PM.

Samples sealed for future testing.

European Union Regulations – Fuel Availability

If a ship is found by a Member State not to be in compliance - the competent authority of the Member State is entitled to require the ship to:

- (a) present a record of the actions taken to attempt to achieve compliance; and
- (b) provide evidence that it attempted to purchase compliant marine fuel in accordance with its voyage plan and,
- (c) if compliant fuel was not made available where planned, to demonstrate attempts to locate alternative sources .

While it is understood that the ship may not be required to deviate from its intended voyage or to delay unduly the voyage in order to achieve compliance, the Association would still counsel caution and recommend Owners / Operators do seek to have the right fuel on board.

Furthermore, Member State shall take into account all relevant circumstances and the evidence presented to determine the appropriate action to take, including the decision not taking control measures (by which it is meant fines and detentions). A ship shall notify its flag State, and the competent authority of the relevant port of destination, when it cannot purchase compliant marine fuel. A port State shall notify the Commission when a ship has presented evidence of the non-availability of marine fuels which would comply with this Directive.

Californian regulations: - ARB'S California OGV fuel requirement

California is interesting to Ship-Owners for a number of reasons, and for present purposes it is the fact that under State Law both marine gas oil (DMA) and marine diesel oil (DMB) are to contain < 0,10% sulphur as of 1st January 1 2014.

Vessels visiting Californian Ports and / or traversing its waters must comply with both OGV Fuel Regulation and the ECA.

The California OGV Fuel Regulation contains a Noncompliance fee Provision designed to accommodate vessel operators unable to find compliant fuel. Using this provision vessel operators can pay a fee in lieu of direct compliance with the fuel standards.

Good faith efforts in acquiring compliant fuel need to be demonstrated on the inbound voyage and purchase of the compliant fuel is required for the remainder of the voyage in Californian waters.

For more information and details please consult the following Advisory page here:

California Advisory

2.5. Compliance options

Annex VI MARPOL allows compliance through several methods:

- → use of a LSFO, this could be Gas Oils, Distillates, Blends, etc.
- → Exhaust Gas Cleaning Systems (i.e: Scrubbers)
- → the use of LNG as an alternative fuel

Ultra Low Sulphur Fuels

The various options and issues that may be encountered with respect to this option will be discussed further in Section 3 of this Guide below.

What the Association would like to impress upon Members here is that for the purposes of the new Sulphur content regulations, any fuel that is in fact below 0.1% in Sulphur content will be compliant, but only for this specific purpose.

That does not mean it is a fuel that is suitable for the specific vessel's engines or that it meets any other standards or regulations. This means when ordering bunker fuel, a big picture view needs to be had of all the issues, not just Sulphur content.

The Association is aware of various Suppliers planning or already marketing new fuel types as "Marpol Annex VI" compliant. Members are well advised that such new fuels, be they distillates or blends or indeed anything else for that matter, actually are suitable for the vessel and meet all other necessary standards.

Scrubbers

The use of such technology is not new, having existed since the 1950s, and what we are seeing today are more modern and advanced options becoming available.

As always, when Members consider making a significant capital investment in to vessel's equipment, they should satisfy themselves that they are working with reliable business partners, using proven technology and providing suitable warranties.

LNG – the future fuel of Shipping ?

As with respect to LNG, Natural gas is an alternative fuel offering the shipping market great potential. LNG could also provide ongoing compliance for a range of potential future legislation, as - compared to HSFO - it emits 99% less harmful particulates, 80% of NOX and provides a 20% reduction in CO2.

However, the infrastructure for LNG bunkering is still very much under development, subsequently those keen to use LNG as a fuel may at present not be able to consider world-wide trading as the supply infrastructure needs to expand.

As of 1st January 2015 and beyond - when the industry starts to face the increased costs in complying with Marpol Annex VI- there may be an accelerated demand and then supply of such fuel. Major marine hubs such as Antwerp, Singapore, Zeebrugge, Portsmouth, as well as some Baltic Sea and North Sea ports are aiming to provide LNG bunkering facilities.

It may take, however, a general development for LNG to come in to full force as a marine fuel, given the large number of conventionally fuelled vessels on the water and under construction. Retro-fitting such tonnage would at present not be economical.

→ Words of Caution :

The Association strongly recommend Owners carefully consider their options.

The primary onus of compliance is 100% on Owners. Liability for non-compliance is channelled towards owners at all times. The Ship/Owner is subject to Regulations, not the Charterer. Owners are to ensure technically, operationally and legally that vessel can and will comply.

Charterers may not be liable for loss, delay, fines, costs or expenses arising or resulting from the Vessel's failure to comply with Regulations once compliant fuel is supplied.

2.6 Charterparty Advice and Recommendations

ADVICE AND RECOMMENDATIONS :
1. Owners need to review Bunker Clauses in their charters. It is recommended to put a clear description of the vessel's tank capacity in to the charter. NB: C/P chain needs to be on a BTB to limit exposure for Disponent Owners / Time Charter Operators.
2. Bunkers need to be not only suitable for the engine of the particular vessel but also regulatory compliant.
3. Detailed specification and standard of the fuel to be purchased have to be contractually agreed with Charterer before concluding the fixture. The Bunker Supply Chain needs to be reviewed to ensure compliance and discover potential quality problems.
4. Secure proper indemnity regime in case Charterers fail to comply in providing contractual fuel and vessel becomes subject to penalties / detention by PSC.
5. Bunker broker may not be a party to the sale contract under English Law– hence, he may have no liability in case non-compliant fuel is provided.
6. NB: choice of law, jurisdiction and time bar in bunker purchase contracts need to be checked. Ask and check: What are the legal consequences imposed by particular jurisdictions and choice of law clauses? Where does the Vessel bunker ? Is the supplier located in a country which is party to the latest Marpol Annex VI or not?
7. Known Risks related to LSFO use include: • Non availability of LSFO; • Mistimed or improperly executed change-over of fuels (thermal shock). • Incompatibility of distillate fuel with residual HSFO • Low flash point • Alternative 0.10% sulphur fuels may have high pour point
8. EGCS (Scrubber) functionality, reliability and durability may not be included within any of the statutory approvals, class unit approval or class approval of ship specific installation. Risk of non-compliance due to lack of system's reliability needs to be considered and addressed.
9. How flag and port states will respond in the event that a ship cannot comply is not yet apparent – it could be required for the ship to sail to the nearest port until either the EGCS has been fixed or an alternative method of compliance is available. The commercial consequence of delays will depend on the ship's trading pattern.

C/P obligations through prism of BIMCO's Sulphur Content Clause:

Owners	Charterers
1. Warrant that the Vessel shall comply with Regulations 14 and 18 of MARPOL Annex VI and with the requirements of any emission control zone.	1. Charterers shall : Supply compliant fuels of such specifications and grades to permit the Vessel, at all times, to comply with the maximum sulphur content requirements of any emission control zone when the Vessel is ordered to trade within that zone.
2. Warrant that the Vessel shall be able to consume fuels of the required sulphur content when ordered by the Charterers to trade within any such zone.	2. Warrant that any bunker suppliers, bunker craft operators and bunker surveyors used by the Charterers to supply such fuels shall comply with Regulations 14 and 18 of MARPOL Annex VI, including the Guidelines in respect of sampling and the provision of bunker delivery notes.
	3. Shall indemnify, defend and hold harmless the Owners in respect of any loss, liability, delay, fines, costs or expenses arising or resulting from the Charterers' failure to comply.

Further chartering and fixture points to consider are :

1. does the vessel have enough free & clean tanks to take the ECA compliant fuel?

2. what happens if the vessel, on a long period charter, switches to a trading pattern with ECA Port calls?

3. who would be liable for the time and cost of ensuring sufficient tank space is cleaned up to "safely" take the ECA compliant fuel without the risk of cross contamination?

Hot Tip : address these issues before you conclude your next period fixture !

The preceding sections of this publication set out the current and future regulations concerning the supply and consumption of marine fuels with respect to allowable sulphur content.

From 1st January 2015 ships will be required to consume fuel with a sulphur content of maximum 0.10% mass sulphur when in EU ports and in ECAs. Outside these restricted areas the maximum sulphur content for marine fuel will be 3.50% mass and this will continue until 2020 when there will be a further reduction to 0.50% mass (subject to review).

In this section you will find some practical information for Ship Owners/ Managers and Ships' Staff to consider and evaluate in order to ensure compliance and reduce the risks associated with the supply and consumption of low sulphur fuel oil (LSFO).

Readers must keep in mind that because there are many different types of ships and engines the information provided in this section can only be generic. Ship Owners and Managers must obtain specific guidelines from Engine Makers and Lubricant Suppliers regarding fuel switching and selection of appropriate lubricants. They should also ensure that the crew are provided with operating procedures that are applicable to their particular ship and engines.

Ship's crew then need to carefully follow the procedures and document their application.

Bunker Fuel and Marpol Lines on a Tanker Vessel.

Carefully managing fuel supplies will be important in the future, especially for residual and 0.10% sulphur fuel supplies as cross contamination is a serious risk.

3.1 Types of fuel and specifications

From 1st January 2015 the selection and supply of marine fuels may, to a degree, become more simple because the need to store and consume three different fuels (high sulphur residual fuel oil (HSFO) fuel 3.50% max., low sulphur residual (LSFO) fuel 1.00% max. and distillate fuel 0.10% max. sulphur) will disappear and it will only be necessary to order and consume two grades, HSFO max 3.50% sulphur and a LSFO with maximum sulphur of 0.10% mass.

HSFO with a maximum sulphur content of 3.50% mass is widely available. As with any residual fuel the quality can vary from region to region, port to port and between different suppliers in the same port. It is best practice to order to a grade in the ISO 8217 fuel specification and in particular to try and purchase on the basis of ISO 8217:2010 (Fourth Edition 2010-06-15) or 5th edition 2012. The quality characteristics in the tables of this specification do not provide a maximum for sulphur so in addition to ordering to your preferred grade (e.g. RMG 380) a maximum sulphur content of 3.50% mass should be included.

→ Hot Tip: Always pay very careful attention to ensure you are ordering the right fuel, not just in terms of ISO standards, but also sulphur content as well as suitability for the specific engine on board the vessel at hand. Ops and Chartering Teams should liaise closely on these issues.

LSFO (max. 0.1% mass sulphur) is generally thought to be gas oil but it appears that some suppliers are seeking to offer the market a type of distillate fuel meeting this low sulphur requirement at a lower price than gas oil.

It is possible that such fuels could be used without cause for concern but care should be taken to ensure that such fuels not only meet the sulphur upper limit but also all the other quality characteristics set out in ISO 8217.

Some of these alternative fuels have characteristics similar to ISO DMB or ISO RMA. If they are held in ship's bunker tanks that are designed for storage of gas oil then careful consideration should be given to their pour point which could be up to 30C.

Gas oil bunker tanks do not normally have heating coils and if the fuel is not maintained at a temperature of 10C above the pour point then it could solidify. These fuels are likely to have very good ignition and combustion qualities but because they are paraffinic they should be segregated from residual fuel to avoid incompatibility problems.

This could also be a problem when switching the engines from residual fuel over to low sulphur fuel. Gas oil is also paraffinic therefore this problem is not only connected with use of these high pour point alternative low sulphur fuels.

The above alternative LS fuels may only be available in a few ports and if they are taken on board the user shall need to check with the supplier that if they need to be mixed on board with gas oils that this will not lead to operational problems.

ISO 8217:2010 provides three grades of distillate fuel DMX, DMA, DMZ and DMB. DMX is only suitable for storage and use outside the main machinery space as it has a low flash point. It may be used for lifeboat engines and emergency generators and is rarely ordered. More detailed information is available in Section 4 of this Guide.

DMA and DMZ are gas oil specifications and the only difference between the two is that DMZ has a higher minimum viscosity than DMA. DMZ may be preferred to avoid the need for chilling the fuel before injection into the engines. Owners should check with their engine makers for minimum viscosity requirements as very low viscosity can affect fuel pump operation.

DMB is rarely supplied to ships as it is not a clear and bright distillate fuel and may contain a small residual fuel fraction.

Please note that ISO 8217:2010 does give maximum sulphur levels for the above distillate grades but these are far higher than the 0.1% regulation limit. The buyer must state that the maximum sulphur content is to be 0.10% mass in addition to meeting the other quality limits in the specification e.g. DMZ maximum sulphur 0.10% mass.

Charterparty clauses that refer to the quality of fuel to be supplied by Time Charterers must be checked to ensure they meet the requirements of Owners for each ship.

Samples, readied and sealed following an on board attendance.

3.2 Compliance with the sulphur upper limit - test precision

There have been reports of fuels being ordered to a maximum sulphur content of 0.10% mass, for use in EU ports, where the receiver tested sulphur content result exceeded the upper limit.

Suppliers may argue that when using ISO test methods the precision of the test needs to be taken into account and that a fuel that exhibited a sulphur content of 0.13%, based upon a single test result, would not necessarily contravene the upper limit of 0.10% . Suppliers should take care to ensure that they deliver compliant fuel, keeping in mind the precision of the test method.

In case of a dispute with Port State Control, the parties may have to apply the Marpol test procedure that is less tolerant to test precision. In any event such disputes between suppliers and receivers result in a huge amount of correspondence, additional testing and loss of goodwill.

Suppliers therefore need to take care to ensure the product meets the sulphur upper limit. Buyers should stipulate that the fuel when tested must not have a sulphur content above 0.10% mass or for residual fuel 3.50% mass.

The precise details of the technical issues concerned with "test precision" are beyond the scope of this guide, but Owners and Technical Managers should familiarise themselves with this issue as it is likely that where there is marginal difference specification dispute then it will become very relevant. . (A very useful document on this may be found on the CIMAC website "The Interpretation of Marine Fuel Oil Analysis Test Results with Particular Reference to Sulphur Content".

It is also an Industry concern whether any given Authority in any given Port is familiar with this issue and knows how to approach it.

Bunkering at Singapore

Excessive Sludge

3.3. Potential quality issues

Experience has shown that although distillate fuels in general have fewer quality problems than residual fuels, there is still need for care in the supply chain, in relation to production, storage and distribution, to ensure that the specification is fully met at the time of delivery.

If the fuel to be supplied is the DMA or DMZ (gas oil) grade with a maximum sulphur content of 0.10%, then it has to be clear and bright in appearance. Any low level contamination during storage and distribution with product containing a residual fraction will affect its colour.

Great care is also needed to avoid contamination with water as these fuels should not exhibit visible evidence of this. If the fuel is dyed for customs purposes then the supplier should carry out a water test by ISO 12937 (Karl Fischer titration method) and the result should not exceed 200mg/kg.

A number of problems with low flash point of gas oils have been recorded. Not only do fuels with a flash point below 60°C fail the ISO specification but they also contravene International Safety Regulations (SOLAS) and as such are not permitted for use on board in the machinery spaces.

The current (5th, 2012) edition of ISO 8217 does not permit the inclusion of bio-derived materials (other than

“de minimis” levels of fatty acids (FAMES) in marine fuels.

As biodiesel type fuels are becoming more widespread in use on land, great care is needed to avoid contaminating marine fuel with these products. Bio fuels are undesirable in a marine environment as they have an affinity to water, are prone to storage stability issues and are liable to microbial problems.

This an emerging issue and in the future Owners may have to accommodate fuels containing bio-derived constituents, such as fatty-acid methyl esters (FAMES); and the next version of ISO 8217, probably in 2017, is expected to permit the inclusion of FAMES up to a possible limit of 5%, in certain specified grades.

Owners should continue sampling all fuels by continuous drip method at the time of delivery and use reputable testing houses to verify quality and confirm compliance with specifications.

3.4 Delivery documentation and sampling for compliance

Marpol Annex VI has now been in force for many years and Ship Owners should have developed and implemented procedures for management of Marpol samples and documentation relating to fuel deliveries, fuel switching and consumption. It may be a good time to review those procedures and make sure crews are aware of their obligations and that they are following Marpol requirements.

All fuel oil deliveries should be recorded in the oil record book. The engine log should record which bunker tanks were used for consumption each day. The Marpol Annex VI record book and ideally the engine log must state when fuel switching (from HSFO to LSFO) was carried out along with the position of the ship.

The crew must retain bunker delivery receipts and Marpol fuel samples issued by the Supplier. Additional delivery samples may be taken by the ship's crew but for Marpol purposes the official Marpol sample is that issued to the ship by the Supplier and the seal number should be recorded on the bunker delivery receipt.

Fuel samples need to be stored in a safe, clean environment and preferably in a cool location. The regulation requires that Marpol samples are retained on board for at least 12 months and bunker delivery receipts should be retained for three years.

It should be kept in mind that Port State Control Officers may not only demand to see and test the Marpol sample but they may also take samples from the bunker tanks or fuel supply line to the engines to check compliant fuels have been used.

That means PSC may decide to sample and test fuel not just “as supplied”, but “as in use” on the vessel. This is a significant difference that Owners and Technical Managers must appreciate.

3.5 Storage and segregation

HSFO can be stored in bunker tanks that have previously contained low sulphur residual fuel. Storing only one grade of residual fuel after 1st January, 2015, should make segregation much easier. It is always best practice to segregate new bunkers from pre-existing supplies to avoid compatibility problems and eliminate the risk of contaminating good fuel with a poor quality new supply.

0.1% gas oil must be stored in clean tanks or tanks that have only carried low sulphur gas oil in the past. Otherwise previous residues of HSFO or high sulphur diesel fuel will contaminate the new supplies of gas oil. If the tank capacity for normal storage of gas oil is too small then it may be necessary to clean one of the main residual bunker tanks and keep it for only for the storage of gas oil. However, if this becomes necessary then, depending on existing pipelines and transfer pump configurations, it may be necessary to fit a new designated transfer pipeline and pump to transfer fuel from this tank to the normal gas oil storage tank or service tank.

→ Hot Tip : before fixing their vessels out in the future, especially if trading limits include ECAs or are on a world-wide basis, Owners need to think :

- → how much tank capacity does my vessel have
- → what is the fuel history of these tanks
- → will I be able to successfully trade my vessel in / out of ECAs zones
- → who will be responsible for possible tank cleaning costs and time

3.6. Documentation on consumption and fuel switching

As mentioned in the above it is not only necessary to comply with the regulations by taking on board fuel with the correct sulphur content, but vital to avoiding penalties that Owners can demonstrate that the appropriate fuel was consumed at all times when the ship was in the restricted areas.

Many Owners have adopted the use of Marpol log books that can be used to record deliveries of LSFO and the contents of bunker tanks before and after deliveries.

These logs are also used to record dates, times and ship positions (latitude and longitude) when the consumption of fuel was switched from HSFO to LSFO and back again.

These logs are useful as they can be shown to any inspection authority rather than collecting together deck logs, engine logs and the oil record book where this information may also be stored. In any event keeping correct data is a requirement and Inspectors will appreciate clear, accurate and concise documentation and this will speed up the inspection process.

Daily noon records of fuels remaining on board and consumptions should be made in the engine log as Inspectors may want to check these against the records of fuel switching.

3.7 Fuel treatment

All residual fuels need effective treatment before injection into the engines. This includes preheating and settling in the settling tank with regular checks of the drain to remove accumulated water, centrifuging and filtration.

Optimum performance from separators can be achieved by always running two units in parallel with both set up as purifiers or in series with a purifier followed by a clarifier. Throughput should be just above the minimum needed for consumption with excess fuel overflowing from the service tank to the settling tank. The fuel oil temperature at entry to the centrifuges should be 98C.

If the delivery sample test results indicate high aluminium and silicon or water then during separation take "before" and "after" purifier samples for testing to check the purifier efficiency.

Fuel filters must be maintained in good condition and be frequently inspected and cleaned. Heating for injection should typically be set to maintain injection viscosity between 10cSt and 15 cSt.

Gas Oil does not usually require heating and centrifuging and should be free of particulate matter. However as poor quality gas oil can be supplied it is best to sample and test all deliveries and if quality problems are detected, such as high water or particulate matter, then settling and purification to remove water would be required. The normal filtration system in the fuel supply to the engine will also help to reduce particulate matter.

Owners should contact their engine makers to seek advice on the potential need for fitting coolers to the fuel injection system when gas oil is used.

Gas oils have a very low viscosity and this can result in leakage and loss of pressure within the fuel pumps and fuel valves. Cooling the gas oil will raise its viscosity and may resolve this potential problem.

It is also very important to maintain fuel pumps and fuel injection valves in good order. Worn components may not be a problem when heavy residual fuel is in use but could cause loss of power when consumption is switched to low viscosity gas oil.

Distillate fuel that has become contaminated with water can, over time become infested with bacteria and this can cause severe sludge build up in the tanks, filters and piping systems. If this happens then it would be necessary to apply a Biocide and clean the tanks.

Gas oils that contain a small amount of FAME (for example, Biodiesel) can be prone to sludge formation as they have a tendency to retain water.

Choked Filters

3.8 Fuel changing procedures

Prior to the ship entering an emission control area it will be necessary to switch engine consumption from HSFO to LSFO (gas oil) and on leaving the special area consumption will be switched back to HSFO.

This switching process needs very special care and attention to avoid machinery damage and loss of propulsion and electrical power. It has been reported that a significant number of ships have lost power when fuel switching. Clearly this could result in a serious situation that could put the safety of the crew and ship in jeopardy.

It is of note there have been over 70 instances of loss of power off the Californian coast resulting from fuel changeover.

All Owners and Managers must obtain detailed recommended changeover procedures from the engine makers for all ship's engines, main and auxiliary.

The main problem associated with fuel switching is the large difference between the temperature and associated viscosity of the two fuels. HFO, depending on its viscosity at 50C will be heated for injection up to around 150C. Low sulphur gas oil, complying with ISO grade DMZ will have a viscosity at 40C of between 3cSt and 6cSt.

During the changeover there are a number of factors that need to be taken into account:

a) Changes in fuel temperature must be gradual to avoid thermal shock and damage to the fuel injection components. This could cause loss of power.

b) Gas oil must not be heated to a high temperature that would result in gassing up of the fuel in the delivery system resulting in loss of power. In addition if the gas oil is heated this will reduce its viscosity and the fuel pumps may not be able to hold the pressure needed for injection, this would also result in a loss of power.

c) The residual fuel needs to be heated sufficiently to provide a suitable injection viscosity. Too low viscosity could result in poor ignition and combustion and engine fouling.

d) Gas oil may not be compatible with residual fuel and when the two are mixed during the change-over this could result in excessive sludge production leading to filter blocking and potential loss of power. Ship's crew should be warned of this potential problem and they must be vigilant during the change over.

Some engine makers offer an automated change-over system and if a ship is frequently changing fuels this could be the best solution. If automatic systems are not fitted then the crew must follow the manual procedures provided by the engine makers.

3.9. Selection and use of Cylinder Oils

To prevent acid corrosion resulting from a combination of water and sulphur compounds cylinder oils have been developed to neutralize the acid formed during combustion.

These cylinder oils contain alkaline compounds, typically calcium salts. The base number of these lubricants (BN or TBN) is a measure of the lubricant's ability to neutralize acid. The higher the base number the more acid can be neutralized.

When 2 stroke engines are continuously operated on high sulphur fuel it is normal practice to feed the cylinders with a high TBN cylinder oil, typically a TBN of 70. The cylinders are fitted with variable delivery lubricators that allow the engineers to adjust the feed rate up or down to suit engine load conditions and variations in the sulphur content of the fuel.

Under optimum conditions the cylinder liners undergo a small amount of corrosion that creates an open grain structure of the cylinder liner wall. This is desirable as it provides the tribology needed for development of a good oil film on the liner wall and this prevents excessive liner wear.

If the TBN of the cylinder oil is too high or the feed rate too high then this controlled desirable corrosion stops and the liner becomes polished resulting in a loss of the oil film and rapid liner wear.

In addition to this the excess additives in the lubricant will create ash and this can cause piston ring fouling and wear of the rings. Continued operation with worn liners and ineffective piston rings can result in blow-by and scavenge fires.

Striking the optimum balance between cylinder oil TBN, lubricant feed rate, fuel sulphur content and engine power can be difficult and Owners/Managers and Engineer must obtain and work with the engine maker's guidelines. The Cylinder Oil manufacturers should also be able to provide useful information on the application of their products.

Depending on the periods the ship is expected to spend in low sulphur control areas Owners should consider the need for storing and using two types of cylinder oil, high and low TBN. Some Lubricant suppliers offer cylinder lubricants that they claim are suitable for use with high and low sulphur fuels but the suitability of these for operation both on gas oil and high sulphur fuel should be discussed with the engine makers.

Seized Fuel Pump

3.10. Monitoring engine lubrication to identify unusual wear of piston rings and liners and system oil contamination

Suppliers of marine lubricants generally offer a routine testing service for their lubricants when in service. This cost of this service is usually included in the price of the lubricant.

Under these arrangements ship's engineers take samples of lubricants in use from a number of machines and systems including main and auxiliary system oils, hydraulic systems and the stern tube. Samples are typically taken four times a year. The lubricant supplier tests the samples and provides analysis results along with comments on the condition of the oil and its suitability for further use.

For 4 stroke main and auxiliary engine system oils this is a very useful service. It not only provides information on contamination of the lubricants with fuel and combustion deposits but also an increase in wear metals will indicate wear of engine components and corrective action can then be taken.

The above tests on 2 stroke engines system oil will not provide such useful information with respect to wear of cylinder liners and piston rings. However sampling and testing of "drain oil" or "scrape down oil" from the waste cylinder oil on a regular basis can provide valuable information on the concentration of wear metals.

Trend analysis will show any significant increase in wear metals such as iron, indicating undue wear piston rings and liners. The ship's engineers can use this information to make changes to cylinder oil fed rates and obtain a better understanding of when pistons and liners should opened for inspection and calibration.

Although piston rings and liners can be examined via the scavenge space it is not easy to evaluate ring and liner wear. Scrape down oil analysis is therefore recommended, perhaps six to ten times a year, depending on engine running hours.

The lubricant suppliers do not normally offer this for free but many of the bunker fuel testing companies offer this service at a modest cost

3.11 Alternatives to LSFO for Marpol compliance - Scrubbers (EGCS)

The Marpol regulations offer the option to consume fuels with higher sulphur content which are less costly while operating a scrubber that reduces the sulphur dioxide content of the exhaust to the same or a lower level than using the mandated fuel.

Two schemes are applicable to demonstrating the performance of a scrubber.

Scheme A where the scrubber is certificated on installation and then at regular intervals, usually annually thereafter.

Scheme B where the performance is checked on a daily basis and the results maintained on board for verification by the enforcement agency, typically Port State Control.

Instrumentation is required to monitor the SO_2(ppm) /CO_2(%v/v) ratio as well as the vessel's location to demonstrate compliance. Scheme B is favoured by port state authorities and coast guards.

Open and hybrid, and to a lesser extent, closed exhaust cleaning systems generate wash water that must meet the specifications set out by the IMO. The condition of the water on entering the sea is to be monitored and recorded.

Scrubber wash water is cleaned within the system with filters and centrifuges and the residual or sludge removed must be delivered ashore to specific reception facilities.

This residue is not considered to be more toxic than other oily waste that accumulates on a ship and can usually be discharged to the same type of facility.

Scrubbers using wash water generate some 0.25kg/kWh of residue. For example a 55,000 ton tanker consuming 35 tons of fuel oil per day would generate 50 kg of residue per day.

Types of Scrubbers

Systems to date are either "wet" where the exhaust gases come in to contact with water with or without chemicals additives and "dry" where granules of calcium hydroxide are used to absorb the SOx with the granule being replaced on a regular basis. Within the wet category the various designs all rely on the abstraction of the pollutants from the exhaust stream into the wash water.

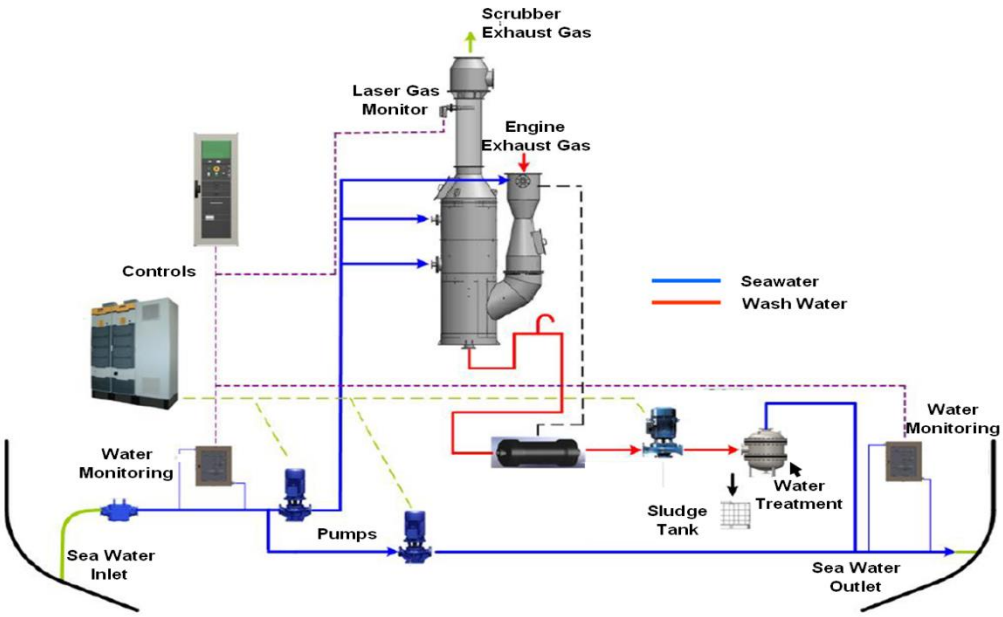
Wet Open Scrubbers

These systems pump sea water from outside the ship's hull below the water line into the scrubber device located in the funnel space above the engine where the exhaust gasses and sea water interact through a number of different devices. The sea water absorbs the SOx and other pollutants and is then referred to as "wash water" which is cleaned of any particulate matter; include any sand that may have been in the sea water, with cyclonic separators and in some designs with filters.

The cleaned wash water is then diluted with a secondary stream of sea water that has not been through the scrubber and returned to the sea ensuring it meets the pH and other wash water criteria.

These systems are referred to as open as they rely solely on the alkalinity of the seawater with all the sea water being returned to the sea.

Open Loop Scrubber (Hamworthy Krystallon)



Wet Closed Scrubbers

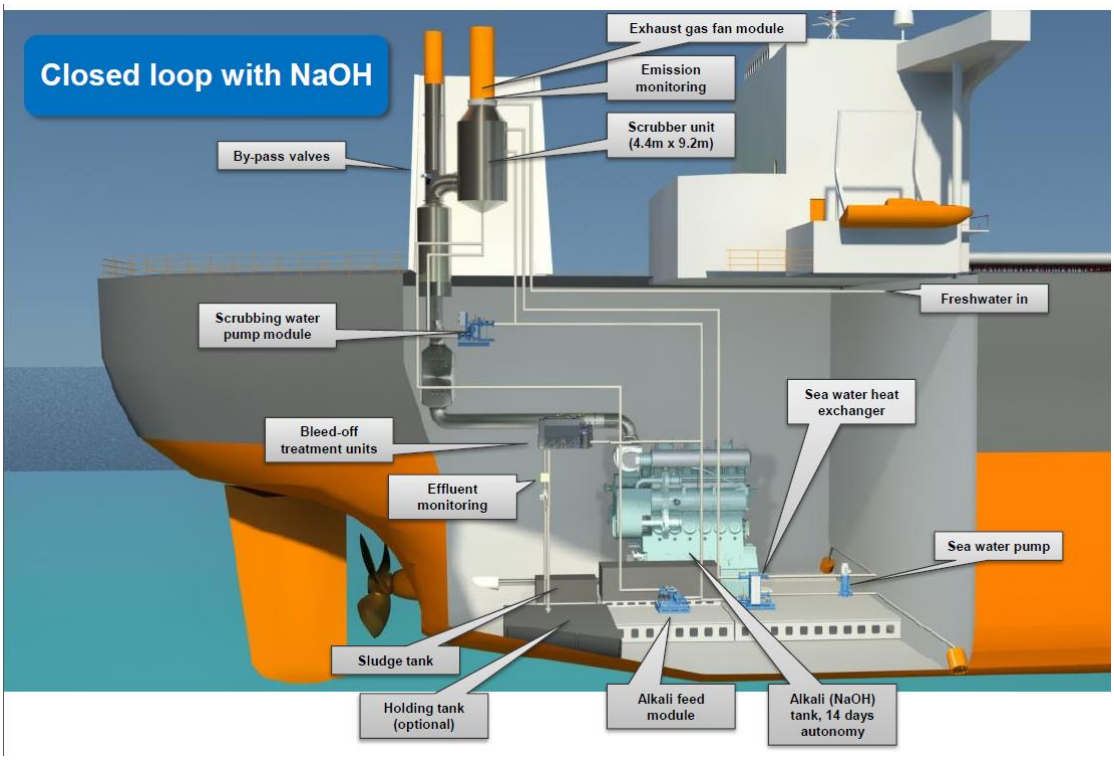
The system is considered a closed loop as it uses fresh water generated by the vessel with an alkaline additive in the form of Sodium Hydroxide /caustic soda (NaOH) solution to facilitate neutralization of the acidity.

The wash water is dosed automatically in response to the sulphur content of the exhaust stream. A dosing unit injects NaOH at the rate necessary to maintain a constant pH at the scrubber outlet.

The system operates in a similar fashion as the open loop scrubber interfacing the exhaust with the wash water but the wash water after a heat exchanger is re-circulated. A small portion of wash water is bled off, to be replaced by fresh water, and processed through a separator/ centrifugal to remove particulates and discharges as clean water.

These discharges are relatively small and can be held in a holding tank so that it can be discharged in less critical areas, generally in deep water. This functionality is optional, but there have been concerns that some port authorities could ban the discharge of wash water within their areas of authority.

Closed Loop Scrubber (Wartsila)



Hybrid Scrubbers

Combine the open and closed loop systems providing the option to use the closed option, for example in or near ports to eliminate any wash water discharges but switching to open loop operations at sea eliminating the need to use chemical additives.

The hybrid scrubber has all the same components as the closed loop system but requires a second wash water treatment system to process all the wash water in open mode operations. The seawater pump supplying the heat exchanger in the closed loop switches to provide seawater for the open system, bypassing the heat exchanger and the pump circulating the fresh water in the closed operations provides seawater in open mode.

Dry Scrubbers

There is currently only one manufacture of this type of exhaust gas cleaning system. It is referred to as dry because it uses granules of calcium hydroxide through which the exhaust is passed. The calcium hydroxide reacts with the SOx to become gypsum and water. The concept is based on technology developed for furnaces such as those used in the manufacture of ceramics.

The granules are contained in a rectangular structure forward of the superstructure. An automated system introduces fresh granules at the top which are eventually removed from the bottom as they are converted to gypsum. The exhaust enters the structure near the bottom and is redirected to the original funnel after passing through the system. The back pressure on the engine is reduced through the use of an air blower.

The calcium hydroxide granules are periodically loaded onto the ship and stored in bulk. The spent granules are also stored onboard and off loaded into the same land side infrastructure to be disposed of for use in the manufacturing of plaster board as well as in the steel industry.

Engine Room Inspection

Members will be aware of the quite dizzying array of ISO standards that apply to various aspects of a Ship, and fuel is no exception. The modern ISO 8217 standard for fuel oil has now undergone several revisions since its inception in 1987, and one may find the following standards :

- ISO 8217; 1987 – 1st Edition.
- ISO 8217; 1996 – 2nd Edition and industrial standard.
- ISO 8217; 2005 – 3rd Edition and most widely used specification. It is a commercial standard and not mandatory standard, preferred by suppliers and Charterers for various reasons.
- ISO 8217; 2010 - 4th Edition which replaced 2005 version , comparatively many changes were introduced and Suppliers may seek a premium for supplying fuel to this standard
- ISO 8217; 2012 - 5th Edition which replaced the 2010 version . However, the only change is a hydrogen sulphide H2O test method.

Changes in the standards recognize regulatory developments and hopefully provide a better protection against the supply of poor quality fuels. ISO 8217: 2010 Standard specifies requirements for petroleum fuels for use in marine diesel engines and boilers. It specifies 6 categories of residual fuel and 4 categories of distillate fuel:

= Same as ISO 8217:2005
= Change in figures
= New limits
= New parameters

Distillate fuels Standard ISO 8217-2010

Table 1 – Distillate marine fuels

ISO/FDIS 8217:2010 (E)

Characteristics		Unit	Limit	Category ISO -F- DMX	DMA	DMZ	DMB	Test method reference
Kinematic Viscosity at 40 °C (a)		mm2/S	max	5.500	6.000	6.000	11.00	ISO 3104
			min	1.400	2.000	3.000	2.000	
Density at 15 °C		kg/m3	max	-	890.0	890.0	900.0	ISO 3675 or ISO 12185 See also 7.1
Cetane Index		-	min	45	40	40	35	ISO 4264
Sulfur (b)		mass %	max	1.00	1.50	1.50	2.00	ISO 8754 or ISO 14596 (See also 7.2)
Flash point		°C	min	43	60	60	60	ISO 2719 (See also 7.3)
Hydrogen Sulfide (c)		mg/kg	max	2.00	2.00	2.00	2.00	IP 570
Acid number		mg KOH/g	max	0.5	0.5	0.5	0.5	ASTM D664
Total Sediments by hot filtration		mass %	max	-	-	-	0.10 (e)	ISO 10307-1 (See also 7.4)
Oxidation Stability		g/m3	max	25	25	25	25 (f)	ISO 12205
Carbon residue – micro method on the 10% vacuum distillation residue		mass %	max	0.30	0.30	0.30	-	ISO 10370
Carbon residue: micro method		mass %	max	-	-	-	0.30	ISO 10370
Cloud point		°C	max	-16	-	-	-	ISO 3015
Pour point (upper) d	Winter Quality	°C	max	-6	-6	-6	0	ISO 3016
	Summer quality	°C	max	0	0	0	6	ISO 3016
Appearance		-	-	Clear and bright (j)			-	See 7.6
Water		volume %	max	-	-	-	0.30 (e)	ISO 3733
Ash		mass %	max	0.010	0.010	0.010	0.010	ISO 6245
Lubricity, corrected wear scar diameter (wsd 1.4) at 60 °C (h)		µm	max	520	520	520	520 (g)	ISO 12156-1

a 1 mm2/s = cSt
b Notwithstanding the limits given, the purchaser shall define the maximum sulfur content in accordance with the relevant statutory limitations, see Annex C.
c Due to reasons stated in Annex D, the implementation date for compliance with the limit shall be 1 July 2012. Until such time, the specified value is given for guidance. For distillate fuels the precision data are currently being developed.
d Purchasers should ensure that this pour point is suitable for the equipment on board, especially if the ship operates in cold climates.
e If the sample is not clear and bright, the total sediment by hot filtration and water tests shall be required, see 7.4 and 7.6
f If the sample is not clear and bright, the test can not be undertaken and hence the oxidation stability limit shall not apply
g If the sample is not clear and bright, the test can not be undertaken and hence the lubricity limit shall not apply
h This requirement is applicable to fuels with a sulfur content below 500 mg/kg (0.050 mass %)
j If the sample is dyed and not transparent, then the water limit and test method as given in 7.6 shall apply.

SOURCE: DNVPS

Summary:

In respect to distillate fuels the following amendments reflected in 2010 Standard are worth keeping in mind:

1) an additional grade , DMZ has been added with a minimum viscosity of 3,000,2/s at 40C.

2) Specifications for the following were added:

- → hydrogen sulphide (for safety reasons for reducing risk of exposure to the health of crew),
- → acid number (high acidic compounds may cause damage to the engine fuel injection system),
- → oxidation stability (minimize addition of bio-diesel (FAME) to reduce storage risk on board the vessel)
- → and lubricity (avoid fuel pump wear due to too low lubricity).

3) The minimum viscosity requirement of 2,000 m2/s has been added for DMB.

- → Hot Tip : know and understand what ISO standard of fuel is required under your Charterparty, Time Charterers in particular need to watch out to ensure they stay BTB on specific ISO standards, be it 2005, 2010 or indeed any other standard.

5. PROTECTION AND INDEMNITY COVER

Members are asked to always consult the Rules and Terms of the Association for the policy year in which their claim event occurs. The following is illustrative of the Rules of the Association under the 2014 Rule Book.

In case Members are faced with a claim event because non-compliant fuel is alleged to have been found on board, presumably following a PSC Inspection, then the matter needs to be considered in the light of the terms of Rule 19.

The standard insurance terms under Rule 19 cover Members' liability for pollution fines, customs law breaches in relation to the cargo, breach of immigration rules, as well as some limited scope for smuggling events. There is at present no basic cover for fines that may follow should the vessel fail to have the right fuel on board.

The Association may, however, in its absolute discretion (Rule 19.4), cover in whole or in part, a member's liability for fines other than those set out in Rule 19.1. This discretionary cover is subject to the express condition, however, that the member took all prudent steps to avoid the law / regulatory breach that gave rise to the fine.

After several years of operation with Low Sulphur fuels (1,0% fuel) ship owners and operators should be fully aware about the requirements of calling various ECA ports and zones. Owners should realize that there might be and will be differences in enforcement of MARPOL Annex VI by different countries.

For example, fuel change over requirements will inter alia apply when the ship is securely moored or anchored in the port. As limits of various ports and harbours are defined locally, it is strongly recommended that Owners seek advice of their local agents as to whether specific anchorages fall within port limits or not. Thorough preparation and planning is advisable prior to any ECA passage.

It is expected that all vessels are to have compliant fuel on board prior entering an ECA. Port Authorities will not accept any delays related to change over procedures caused by the Owner / Operator having to purchase and deliver compliant fuel to the Vessel. Any costs associated with such delays, detention by authorities and deviation in order to procure compliant fuel are likely not to be covered by Owner's standard P & I Insurance as these are primarily operational matters.

Disputes between Owners and Charterers, or Owners / Charterers against Suppliers may, however, be within the province of FD&D cover (if the same has been arranged). Always subject of course to Rule 27 and the terms of entry of the Member / Vessel in to the Association.

6. INDUSTRY CONCERNS

The new MARPOL VI amendments coming in to force on 01.01.2015 have already created numerous concerns in the shipping community.

These include:

i. The overall cost of compliance by having to buy more expensive fuel and / or invest in new technologies and vessel equipment.
ii. The impact on short sea traffic inside ECAs which may lead to some routes becoming uneconomical.
iii. competition issues between those Owners benefiting from State grants and those that have to fund things on their own, as well as between Owners who intend to be compliant and those that do not
iv. availability of fuel that not only meets the specific sulphur standards, but is also otherwise fit and safe for specific vessel engines
v. unproven technology or suppliers of such technology for alternative compliance options
vi. lack of clarity on likely enforcement standards
vii. probably inconsistent approach of standards and enforcements across ECAs and continents

Ship-owners that decide to take a wait & see approach and not invest in new technologies or alternative compliance options for the time being will instead have to seek to obtain compliant fuel, and have to face the challenge of price, quality and supply certainty issues.

Words of Caution: because of the lack of clarity with respect to enforcement standards across different ECAs (and inside them), there may be a temptation to work on the basis that enforcement will not be stringent. This is likely to prove an expensive assumption to make. There is already clear lobbying under way

in some countries to encourage the authorities to take a strict approach to enforcement and infringement issues. Not least as a result of the founding of the Trident Alliance.

The Trident Alliance was initially established by American Roll-on Roll-off Carrier (ARC), EUKOR Car Carriers Inc., Höegh Autoliners, J. Lauritzen, Maersk, Rickmers-Linie, Stena, Torvald Klaveness, UECC, Unifeeder, Wallenius Wilhelmsen Logistics. Since September 2014 The Trident Alliance has also welcomed Scorpio, Flinter, Solvang, Nordic Tankers, and Ardmore Shipping Corporation. All in all above mentioned companies represent approximately 7% of the World's Bunker consumption. This Grouping has already begun to promote the enforcement of MARPOL Annex VI Standards, especially in EU Member States.

The current aim of the Trident Alliance is to explore various solutions and strategies on how to facilitate technology development for measuring SOx and developing the consistent enforcement of regulations.

The European Community Shipowners' Association's has also been addressing the importance of some of the above mentioned issues in its Open letter to EU Member States and the European Commission. It urged the Commission to establish a legal certainty about proper and consistent compliance and enforcement of MARPOL Annex VI standards. The possible toleration or acquiescence to unintended operational non-compliance situations and the acceptance of the use of open-loop and/or closed-loop scrubber systems in EU waters and port areas were among Association's main concerns.

Generally speaking the introduction of the MARPOL Annex VI and stringent LSFO requirements marks an important period of change for the shipping industry whereby environmental regulations have become the major drivers.

Manifold on a Tanker

7. REFERENCES

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2. Resolution MEPC 59/24/Add1 – Annex 9 , Resolution MEPC. 184 (59) – Guidelines for Exhaust Gas Cleaning Systems.
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8. CREDITS

This Guide was prepared by:

Inna Van Spriel, Assistant Vice President, Lawyer, Skuld Oslo 2

Chris Fisher, Marine Engineer and Fuel Consultant - Brookes Bell.

For more detailed technical information on Bunkers and related Environmental matters please refer to "Bunkers - An Analysis of the Technical and Environmental Issues" Compiled by Chris Fisher and Robin Meech. Visit the web site of "Petrospot" for details.
Further contribution and editing by:

Christian Ott, Vice President Head of Claims, Skuld Singapore Branch, Loss Prevention and Recurring Claims Team Leader. For further enquiries Members are asked to contact the Association: lossprevention@skuld.com

Annex 1: BUNKER Delivery Note

Regulation 18 of Annex VI requires that all fuel oil taken by a ship must be accompanied by a bunker delivery note. The form of the bunker delivery note is described in Appendix V to annex VI.

IMO Marpol

Bunker delivery note checklist:

1. Name and IMO number of receiving ship.
2. Port.
3. Date of commencement of delivery.
4. Name, address and telephone number of the supplier.
5. Product names.
6. Quantity (t).
7. Density at 15°C (test method ISO 3675).
8. Sulphur content percentage (test method ISO 8754).
9. Declaration signed and certified by the fuel oil supplier's representative that the fuel oil supplied conforms with.

Annex VI regulations 14 (paragraphs 1 and 4) and 18 (paragraph 3):

The bunker delivery note should be kept on board the ship in such a place as to be readily available for inspection at all reasonable times. It should be retained for a period of three years after the fuel has been delivered on board.

Regulation 18 also requires that the bunker delivery note must be accompanied by a representative sample of fuel oil sealed and signed by the supplier. The bunker delivery note is signed by the bunker barge master and the chief engineer or master of the ship receiving fuel oil.

Annex 2:

North American ECA- Information required to protect Owner's position (GUIDELINES) if compliant fuel is not available:

- The vessel's name, flag, and IMO identification number;
- A copy (or description) of the ship's voyage plan at the time of entry into the NA ECA;
- Date when vessel received notice it would be conducting a voyage in the NA ECA, and the vessel's location when it first received such notice;
- The date and time the ship operator expects to enter and exit the North American ECA;
- Actions taken to achieve compliance prior to entering the NA ECA : description of all attempts made to locate alternative sources of compliant fuel oil, and a description of the reason why compliant fuel oil was not available;

- In cases of fuel oil supply disruption- the name of the port and the name of the fuel oil supplier that is now reporting the non-availability of compliant fuel oil;
- If applicable, identify and describe any operational constraints preventing using compliant fuel oil (e.g. viscosity or other fuel oil parameters).
- Specify steps taken, to resolve these operational constraints.
- The availability of compliant fuel oil at the first port-of-call in US , and steps to obtain that fuel oil; if non available – lowest Sulphur contents available.
- If the vessel operated in NA ECA in the prior 12 months -the names of all U.S. ports the dates of the port calls, and whether the vessel used compliant fuel oil;
- Other additional information might be required: contact details ship master, ship operator, legal agent in the United States, ship owner, and any related parent companies and/or designated corporate official to answer additional questions.