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A GUIDE TO

ECA COMPLIANCE FOR SHIPS

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“A Guide to Emission Control Areas (ECA) Compliance For Ships”

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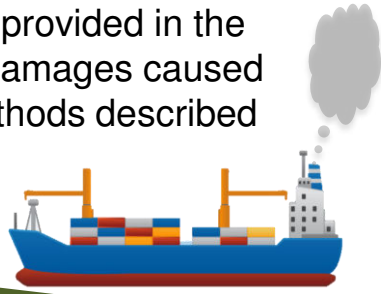

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Introduction

From 1st January 2015, all ships in the Emission Controlled Areas (ECAs) will have to reduce their sulphur content in fuel to 0.1% (From the present limit of 1%). All shipping lines plying in these areas will have to adhere to these mandatory regulations, resulting in considerable increase of their bunker costs as low sulphur fuel with 0.1% maximum sulphur content is far more expensive than the normal bunker currently used.

Presently there are three main solutions to achieve the 0.1% sulphur emission limit -

1. Burning distillate fuel

2. Using alternate fuels such as LNG

3. Installing Scrubbers to remove sulphur from the exhaust

Introduction

Now as the ship-owners struggle to choose one from the above mentioned equally expensive options, it is to note that every method would come with its pros and cons.

Getting down to 0.1% sulphur will be an extremely challenging task for most of the shipowners as there is no one cure-all solution. Distillate fuels are highly expensive, installing a scrubber system is not so “financially-friendly” and LNG also doesn't seem to be any cheaper (and the concept itself is quite new).

In this guide we will take a look at the latest shipping emission regulations, what steps ships will have to take to comply with them, and what are the solutions available for the same.

Chapter 1

MARPOL Annex VI and Emission Control Areas

What is MARPOL Annex VI and How It's Different From Other Annexes?

Each annex in MARPOL regulations i.e. Annexes I - V deals with a single subject of marine pollution prevention. However, Annex VI is different as it covers a variety of topics related to prevention of air pollution from ships. The areas covered under MARPOL Annex VI for prevention of air pollution are:

-Engine Exhaust Emissions: NOx and SOx

-Ozone Depleting Substances

-Volatile Organic Compounds

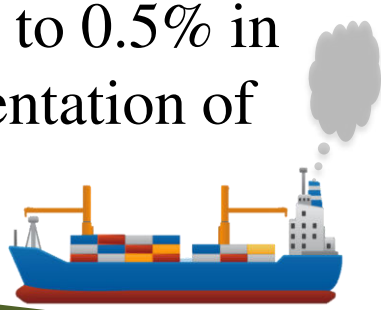
-Incineration

What are ECAs?

The revised MARPOL Annex VI, which entered into force in July 2010, changed the name and definition of special areas (where mandatory measures are required to control NOx , SOx and particulate matter), from Sulphur Emission Control Area (SECA) to Emission Control Area (ECA).

The revised version also introduced a phased reduction of SOx emissions in Emission Control Area (ECA). In July 2010, the allowable amount of sulphur in marine fuel was reduced from 1.5% to 1.0%. From January 1st 2015, this limit will be further reduced from 1.0% to 0.10%.

The global limit of sulphur-in-fuel outside the ECAs was reduced to 3.5% from 4.5% in January 2012. It's further expected to be reduced to 0.5% in 2020 or 2025, depending on the availability of fuel for implementation of this amendment.



Different ECAs in the World:

In March 2010, IMO's Marine Environmental Protection Committee adopted ECAs for USA and Canada, extending 200 nautical miles form both east and west coasts and around the islands of Hawaii.

These ECAs not also prohibit SOx emissions but also NOx and particulate matter. In September 2010, additional ECA around Puerto Rico and US Virgin Islands was discussed and eventually implemented. Future ECAs are likely to be proposed for:

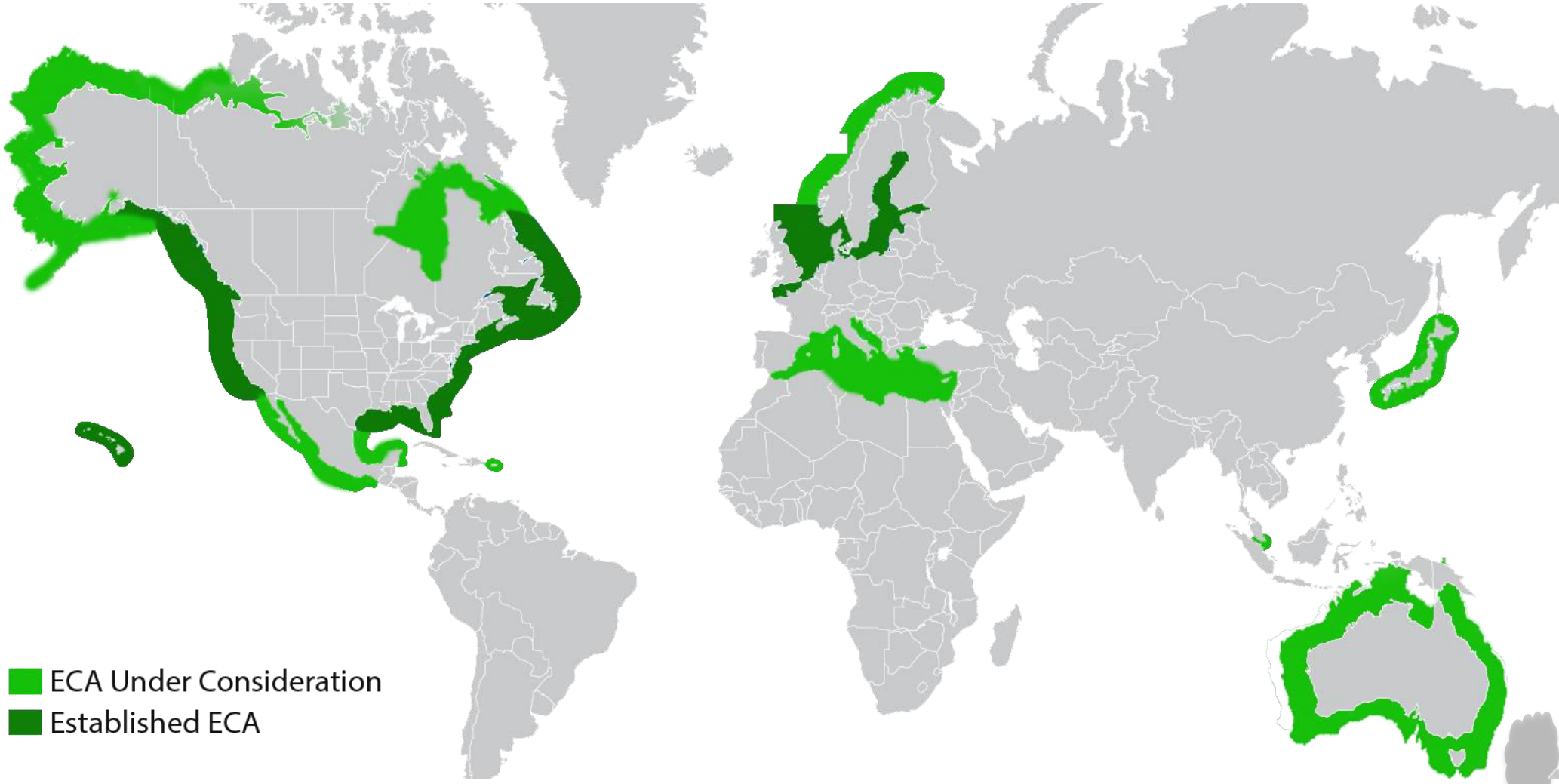
-Norway

-Japan

-Mediterranean

MARPOL Annex VI and Emission Control Areas

ECA MAP



MARPOL Regulations for SOx and NOx in ECA

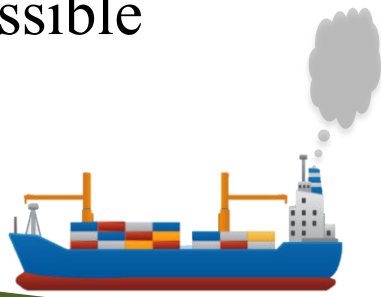
SOx Emission Regulation:

Regulation 14 of MARPOL Annex VI provides information on controlling SOx and particulate matters from emissions through limits on the maximum sulphur content of the fuel oils used.

Outside ECAs: Outside ECAs the sulphur maximum limits in the fuel are (According to Regulation 14.1):

- 3.50% on and after 1st January 2012

- 0.50% on and after 1st January 2020 (subject to review for possible postponement to 2025.)



Inside ECAs: Inside ECAs the sulphur maximum limits in the fuel are (According to Regulation 14.4):

- 1.00% on and after 1st July 2010
- 0.10% on and after 1st January 2015

OR

Alternative of above rules is to use a exhaust gas cleaning system or other technological methods onboard ships to reduce total sulphur emission from auxiliary and main propulsion engines to less than or equal to:

6.0g SOx/kwh.

NOx Emission Regulation:

MARPOL Annex VI also includes progressive reductions in NOx emissions from marine diesel engines on ships. For engines installed on or after 1st January 2011, "Tier II" emission limit is proposed whereas for ships with engines installed on or after 1st January 2016 and operating in ECAs, a more stringent emission limit of "Tier III" is proposed.

All engines fitted on or after 1st January 1990 but prior to 1st January 2000 are required to comply with "Tier 1" emission limits, if the engine is certified with an approved method.

NOx Tier III emission standards are 80% less than those of NOx Tier I. The emission value for a diesel engine is to be determined in accordance with the NOx Technical Code 2008 in case of Tier II and Tier III limits.

As per Marpol Annex –VI Tier III NOx limits are:

•For Engine Speed less than 130 rpm – 3.4 gNOx/kwh

•For Engine speed 130 rpm and above but less than 2000 rpm – 9*n-0.2 gNOx/kwh

•For Engine speed above 2000 rpm – 2 gNOx/kwh

Where:

n- Rated engine speed

g/kwh- Gram per kilo watt hour

rpm - Revolution per minute

NOx Tier III emission standards are applicable only in NECA (NOx Emission control Areas). Outside NECA, Tier II standards are applicable. Current NECA areas are the North American area and the U.S. Caribbean area. Tier III standards will also be applicable to ships built on or after 1st Jan 2016.

European Union Regulations

Just like IMO adopted Marpol 73/78 Annex VI on 10th October 2008, the European Union also implemented sulphur caps under the directive 2005/33/EC. Under these regulations, following limitations are in force today:

•1.50% sulphur limit for fuels used by passenger vessels on regular service between EU ports

MARPOL Annex VI and Emission Control Areas

- 0.10% sulphur limit on all gas oils placed on the market in EU Member States' territory and a 0.10% sulphur limit on all fuels 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.

Chapter 2

How Ships Produce NOx and SOx Emissions?

How Ships Produce NOx and SOx Emission?

The two main pollutants from ship's emissions are Nitrogen oxides (NOx) and Sulphur oxides (SOx). These gases have adverse effects on the ozone layer in the troposphere area of the earth's atmosphere and result in green house effect and global warming, apart from other adverse effects.

Sulphur Oxides or SOx Emissions:

The sulphur oxides emission is due to the presence of sulphur compounds in marine fuels used for ship's engines. Better the grade of the fuel, lower will be the sulphur content as it is removed by refining of the fuel.

The smoke containing sulphur oxides emitted by the combustion of marine fuel will further oxidize and in presence of catalyst like NO2, form sulphuric acid - a major cause of acid rain.

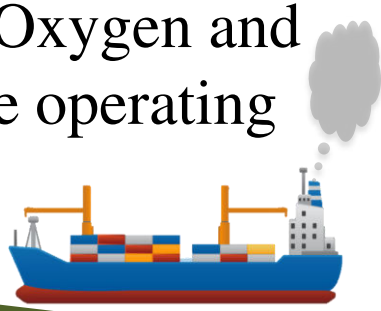
It has also been recognized that the emission of SOx contributes towards

formation of secondary inorganic aerosol gases, fine particles that are harmful to humans.

Shipping industry mainly consumes low grade of fuel oil i.e. heavy oil and diesel oil with higher sulphur content as compared to those used by any other transportation medium. However, due to MARPOL Annex VI stringent norms, ships are now using better grades of marine fuels.

Nitrogen Oxides or NOx Pollution:

Fuel is burnt inside the combustion chamber of the marine engine with correct mixture of fuel and air in the presence of heat or ignition source. The ignition source in the engine is the compression stroke of the piston, after which, the combustion begins. As the air mixture is 21 % Oxygen and 78% Nitrogen, nitrogen reacts with oxygen under certain engine operating conditions to form nitrogen oxides or NOx.



What Causes NOx in Marine Engines?

- High cylinder Temperature and Pressure during combustion process
- Heavy load on the engine or engine unit
- Improper air and fuel ratio for combustion
- High temperature of intake or scavenge air inside the cylinder
- Over-heated cylinder jacket due to poor heat transfer by jacket cooler
- Higher jacket water temperature
- Bad quality of fuel used for engine

Chapter 3

Precautions To Be Taken When switching to LSFO and MGO

Marine Engines Problems and Precautions

Propulsion engines are widely affected as a result of fuel changeover when ships enter ECS zones. Following precautions are to be taken during fuel changeover procedure:

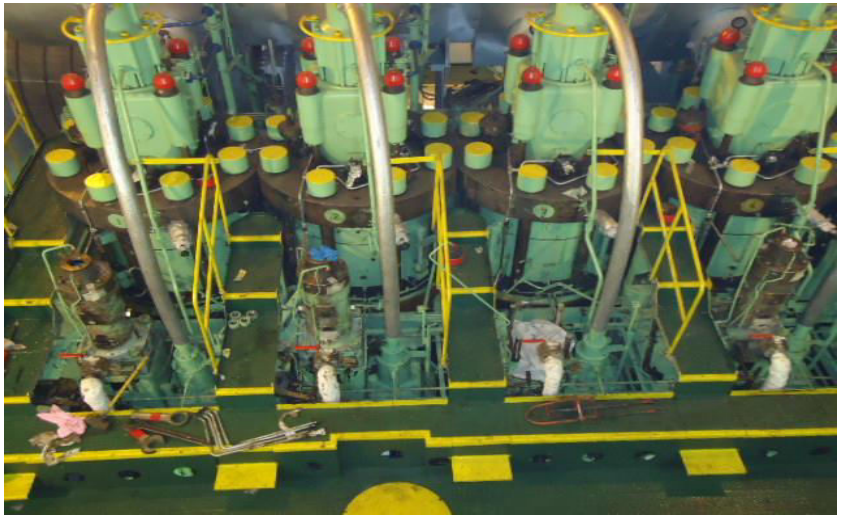
1. Compatibility of cylinder oil with fuel oil:

The interrelation of fuel and cylinder oils plays a critical role in the operation of various parts of the combustion chamber.

While using the normal high sulphur oil, the cylinder oil used is of high alkalinity (high TBN) but as we shift the fuel to LSFO in ECA, proper care should be taken for selecting the cylinder oil, as the normal cylinder will damage the internal parts of the combustion chamber. Low alkalinity based oil are to be used only after consulting with the engine maker.

2. Low viscosity and low lubricity:

Gas oil is prominently used in ECAs when the ship is docked at port. After changing over from fuel oil to gas oil, the major problem experienced by fuel injection and transfer equipment is of leakage and lack of lubricity due to reduction in the viscosity of the oil i.e. gas oil.



This will lead to abnormal wear in the surface of plunger and barrel of fuel pump or wear in the internal part of the injector along with oil leakage. Since engine parts (specially fuel pump and injectors) are not designed to accommodate such drastic viscosity changes in the fuel oil, engineers need to consult with engine maker to install fuel oil cooler or to add special additives in the fuel to improve the lubricity.

3. Ignition delay and poor combustion:

The composition of low sulphur fuel oil has low residual carbon with low viscosity. Normally, clarified oil with high aromatic is used as cutter stock during manufacturing of such oils.

Fuel oil with high aromatics tends to show defective and poor combustion, leading to abnormal wear in cylinder/ liner.

Precautions when wear is noted in the engine parts after changing to LSFO:

- Reduce the overall engine output

- If required, advance the fuel injection timing

- Check the quantity of cylinder oil. Increase if required

Precautions When switching to LSFO and MGO

- Raise scavenge air temperature

- Reduce cylinder cooling water temperature

- Enhance the fuel purification and cleaning process

- Add combustion accelerating agent

The above steps can be taken only after consulting with the engine maker to get the best results.

Boilers Problems and Precautions

Low flash point:

As LSFO is a low flash point fuel, the risk of flashback from the burner increases in the boiler as the fuel has high volatile content. It is recommended to frequently purge the boiler and if oil leak is detected, same to be rectified and furnace to be cleaned before operation.

Duplication of flame eye (to detect flame failure) and duplication of fuel stop valve to the burner will increase the safety of boiler burner against flashback.

Air Fuel Ratio:

Since the calorific value of the LSFO and HFO are different, the air

supplied to burn the fuel needs to be re-adjusted else black smoke will appear from boiler exhaust due to excess air setting for LSFO.

Turn Down Ratio: The boiler burner is set to operate for HFO. When LSFO is introduced, the turn down ratio increases, resulting in increase in the minimum boiler load. This will lead to poor ignition of fuel hence change of atomizer is recommended to suit the LSFO.

Pumps Problems and Precautions

The pumps installed in the fuel supply system for marine engine, boiler etc. are designed for operating heavy fuel oil. When the changeover takes place, the flow rate and pressure of the pump reduces due to low viscosity of the new fuel.

It will also lead to leakage from the pump seal and wear of internal parts

due to low lubricity property. Care must be taken to track leakage of fuel and if required to change the pump seal to avoid leakage. It is always recommended to install an additional pump in the system, which is compatible with LSFO.

Other Important Precautions:

•Avoid excess mixing of fuels (LSFO and HFO) while changing over procedure is carried out as this will lead to formation of large amount of sludge, clogging of strainers etc.

•LSFO fuel has low flash point when compared to HFO fuel

•Check the bunker note to ensure the flash point of the supplied LSFO is more than 60 Degree C

Chapter 4

Procedure to Switch from HFO to LSFO

Fuel Oil Changing Over Procedure for Main Engine

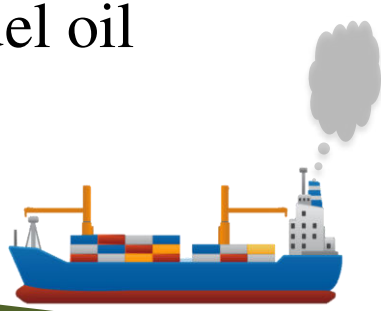
Considering that most of the ships today run on high sulphur fuel oil, changing over of fuel at the right time is very important. Moreover, it's also imperative to change over the fuel from high to low sulphur at correct time as an early change over will lead to loss of low sulphur oil, which is quite expensive, whereas a delay in the changeover procedure will lead to violation of MARPOL annex VI.

This process is to be done along with using other technologies to reduce SOx and NOx from ships. Also, most of the ships today are equipped with one service tank and one (or two) settling tanks, which can result in mixing of two different grades of oils while performing changing over of fuel. Needless to say changing over of fuel includes several important factors to be considered including those mentioned herein.

Procedure to Switch from HFO to LSFO

Every ship is provided with changeover Low Sulphur Fuel (LSF) calculator that tells the correct changeover time at which the system should be running on LSF before entering an Emission Control Area (ECA). This system requires some important factors to be considered:

- The sulphur content of high sulphur fuel currently in the system
- The sulphur content of low sulphur fuel
- The fuel capacities of the main engine systems including settling tank, service tank, main engine piping and transfer piping from service tank to main engine
- Capacity of transfer equipment – Fuel oil transfer pump and fuel oil separators



Procedure to Switch from HFO to LSFO

Once the change-over time is calculated which also accounts the time of intermixing of two different sulphur grades oil (let's suppose 48 hours), following actions are to be taken 48 hours prior:

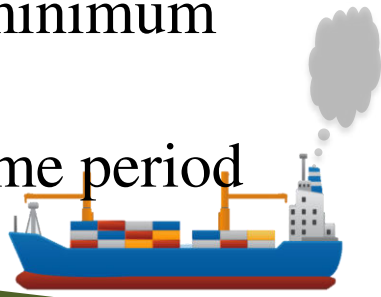
- Ensure that no transfer of high sulphur fuel is carried out any further to settling tank

- Ensure that the low sulphur bunker tank steam is open for transfer and purification of fuel should not have any problem

- If two separate settling tanks are present, one can be dedicated to low sulphur oil which will reduce the changeover period

- Keep running the separator till the settling tank level reaches minimum

- If filling of service tank with HSFO increases the calculated time period



Procedure to Switch from HFO to LSFO

of changeover, stop the separator and drain the settling tank

•Settling tank can be first drained in to fuel oil overflow tank, and then the oil drained can be transferred to bunker tanks containing same grade of oil

•Once the settling tank is drained from heavy sulphur oil, fill the settling tank with low sulphur oil via transfer pump

•As the separator is stopped, service tank oil will be consumed by main engine system

•Remember not to lower the level of service tank below which the fuel pumps cannot take suction

•Start separators from settling to service tank which will be now filling

Procedure to Switch from HFO to LSFO

low sulphur oil

•Fill the LSFO oil in to settling and service tanks as per the quantity required to cross the ECA calculated by the chief engineer according to the voyage plan

Note: Once the changeover procedure is completed, remember to change the HMI setting of Cylinder oil lubricator system (Alpha lubrication) or changeover the cylinder oil daily tank suitable for low sulphur operation.

Fuel Oil Change Over for Auxiliary Engine and Boilers

Some ports have regulations which states using gas oil for generators and boilers while the ship is at port (for e.g. European ports). For this, change over generators and boiler to diesel oil with sulphur content less than 0.1 %.

Boiler:

- Shut the steam to the fuel oil heaters of boiler
- When the temperature drops below 90 degree, open the diesel oil service tank valve going to the boiler system
- Shut the heavy oil valve for boiler system slowly and observe the pressure of the supply pump

Procedure to Switch from HFO to LSFO

- Check flame and combustion of the boiler
- Let the heavy oil outlet be kept open and diesel oil outlet not open for sometime
- This is to ensure no heavy oil goes to diesel oil system
- When the line is flushed with diesel oil, open the diesel outlet valve and shut heavy oil outlet valve

Generators/ Auxiliary Engine

Generators must be changed over from one grade to another while at load as this will help in better flushing of the system.

If only one generator is being changed over, keep running another generator

Procedure to Switch from HFO to LSFO

for emergency purpose in case something goes wrong

Follow the procedure:

- Shut the steam to the fuel oil heaters of generators
- When the temperature drops below 90 degree, open the diesel oil service tank valve going to generator system
- Open the local diesel inlet valve and shut the heavy oil inlet valve simultaneously and slowly, by keeping an eye on the fuel pressure and changing only one generator into diesel with the help of separate diesel pump
- Let the heavy oil outlet be kept open and the diesel oil outlet kept shut till the system is flushed thoroughly

Procedure to Switch from HFO to LSFO

- After some time open the diesel oil outlet and shut heavy oil outlet
- If the complete system is to be changed into diesel oil, open the diesel oil inlet valve to generator supply pump simultaneously closing the heavy oil inlet valve
- If the return line is provided to diesel service tank, open it after some time, simultaneously closing the heavy oil return only after the system is flushed properly
- The changeover procedure must include recording of every action and onboard oil quantity as a proof of doing the job correctly

Chapter 5

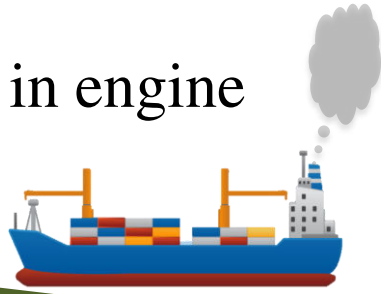
Important Logs, Record Book and Technical File

Logs and Records:

Engine department

Change over procedure from high sulphur to low sulphur fuel or vice versa is actually the job of engine department. When changing over the fuel, following things are to be noted:

- Record all the fuel tank levels, including HFO and LSFO, when changeover starts (48 hour prior)
- Quantity of low sulphur oil in settling and service tank at the time LSFO is supplied to the propulsion system
- Date, time and position of changeover started to be recorded in engine log book

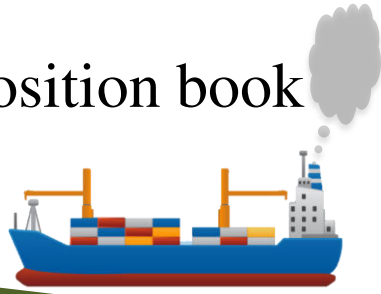


Important Logs, Record book and Technical File

- Date, time and position of changeover completed to be recorded in Oil Record Book (ORB)
- Record the TBN of new cylinder oil to be used with LSFO
- Similar data to be recorded in engine room log book

Deck Department:

- Position of ship prior 48 hrs. of ECA area and notification given to the engine room to be recorded in bridge log book
- Position of ship when initial changeover done
- Entry position in lat- log for ECA to be recorded in ship's position book and bridge log book

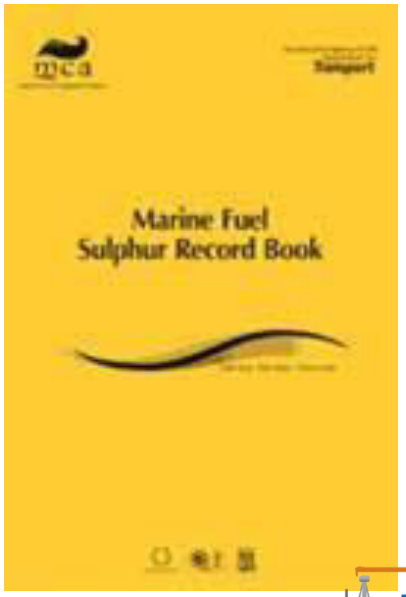


- R.O.B of HSFO and LSFO during changeover
- Changeover time from HSFO to LSFO (or vice-versa)

Marine Fuel Sulphur Record Book:

A sulphur record book is a logbook in which ship's LSFO and HSFO fuel details are recorded including the location of tanks, changeover procedure etc.

This document is a reference to ensure the ship is complying with the ECA requirement by segregating different grade (sulphur content) of fuel and correct changeover procedure is applied while entering or exiting the ECA areas.



Content of Record Book:

- Ships outline diagram-containing locations of all the fuel oil tanks with capacity of individual tanks
- Name and call sign of the vessel
- IMO number of the vessel
- Notifications of non-compliance
- LSFO changeover procedure
- LSFO changeover procedure in template form
- Record for fuel oil used at EU berth

Important Logs, Record book and Technical File

- Bunker delivery note storage location
- MARPOL sample storage location
- MARPOL sample custody transfer
- Location for fuel oil change over procedure displayed in engine room and other areas of ship

Each changeover operation must be signed by officer in-charge and each completed page of the record book to be signed by the Master.

Total 3 templates are provided with this e-book to keep important records :

Template 1: Bunker Delivery Note and MARPOL Sample Record Sheet

Template 2: Emission Control Area Fuel Oil Changeover Record Sheet

Template 3: Bunker Oil Sulphur Content Record Sheet

NOx Technical File:

What is NOx Technical File?

NOx Technical file (commonly known as Engine Technical File) is a set of documents provided by the engine manufacturer to ensure that the engine fitted on ship (on or after 1st Jan 2000) are complying with requirements and use of equipment which prevents NOx emission.

This is an important document which needs to be present onboard to ensure ship's engine is complying with MARPOL Annex VI regulation and the document is used as a reference to issue International Air Pollution Prevention Certificate (IAPP) to the ship. The Ship Owner/ Ship management is responsible to maintain the file and ensure it is available to class and port state during surveys and inspection. Two copies of the technical file to be maintained- One on ship and one at shore office.

What Data it Contains?

The NOx or Engine Technical file contains the record of operating parameters of the engine along with parts/ components and settings, which may influence the NOx emission and continued compliance. Following data is noted in the engine technical file:

- Identification of parts and components, which influence the NOx in exhaust emission namely:
  - Piston
  - Cylinder head
  - Fuel pump

Important Logs, Record book and Technical File

- Fuel injector nozzle element
- Turbocharger
- Exhaust manifold mountings
- Scavenge air cooler

➢ Engine test data: This is the test data, which was recorded in the test bed of the engine. It is used to compare with the current engine parameters to assess the performance of the engine

➢ Record of change in the emission related component: The file must be updated with all the records of any change or renewal of engine components, which affect the NOx emission. A sheet is provided in the file, which needs to be updated as per the actual job done on the engine

Important Logs, Record book and Technical File

- Operating values: The file also highlights the required operating parameters in which the engine should operate to comply with NOx emission limits of MARPOL Annex VI. Following are the parameters listed in the technical file:

  - Fuel delivery time
  - Cooling water temperature LT and HT
  - Charge air temperature
  - Piston distance (Bumping clearance)
  - Exhaust back pressure
  - Max air inlet restriction etc.

Chapter 6

Different Methods to Achieve ECA Compliance

Controlling Sox Emission:

SOx or sulphur oxides are formed during combustion process in the engine because of presence of sulphur content in the fuel.

Following are the methods and technologies used to reduce sulphur emission from marine engines.

Use of Low Sulphur Fuel Oil:
It is expensive but most commonly used method to comply with Annex VI of MARPOL while entering emission controlled area (ECA).

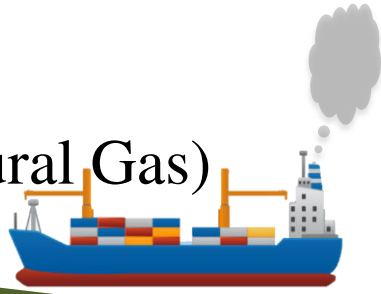
Exhaust Gas Scrubber Technology:
The exhaust gas from the engine is passed through the scrubber tower where a liquid is showered over it. Fresh water blended with caustic soda (NaOH) is used as a scrubbing liquid, which reduces the SOx to 95%.

The scrubbing water is then sent to a water treatment effluent emulsion breaking plant after which it can be discharged overboard.

Cylinder Lubrication:
Good quality cylinder lubrication along with efficient control systems such as Pulse or Alpha lubrication systems can neutralize the sulphur in the fuel and reduce SOx emissions from the engine.

LNG Fuel:
Natural gas is a potential winner in terms of being environment friendly, safe, reliable and cost effective. When compared to oil, natural gas has become an important commodity with a key global energy impact. Due to the influential properties possessed by natural gas, it is the only an alternative fuel which is believed to drive the future.

Studies have shown that usage of natural gas or (Liquified Natural Gas)



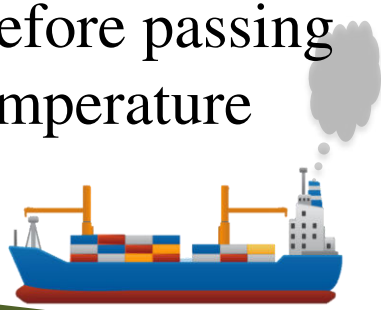
LNG as fuel has cut down the poisonous suphur emissions or SOx significantly with a substantial reduction in carbon dioxide (CO2) and Nitrox or NOx gases.

Controlling NOx Emission:

To comply with this Tier III requirements, ships shall have to be installed or retrofitted with equipment/systems, which can reduce NOx below Tier III standards.

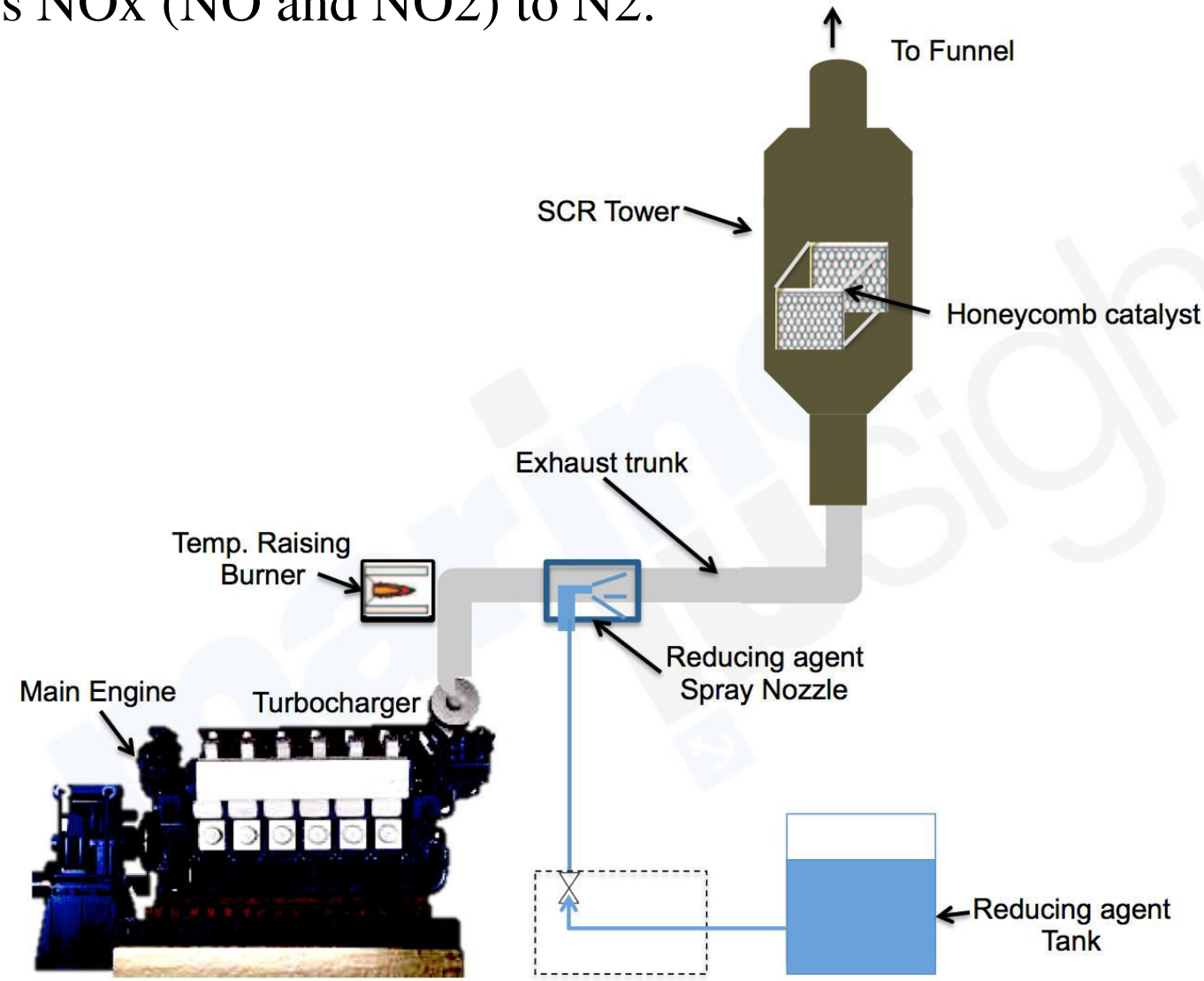
Mentioned below are seven technologies available to meet these criteria:

Selective Catalytic Reduction (SCR):
In this system, urea or ammonia is injected in the exhaust gas before passing it through a unit, which consists of special catalyst layer, at a temperature between 300 and 400 Deg. C.



Different Methods to Achieve ECA Compliance

Chemical reaction between Urea/ammonia and NOx in exhaust gases reduces NOx (NO and NO2) to N2.



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SCR unit is installed between the exhaust manifold/receiver and the turbocharger.

High efficiency turbocharger is required for this system as there is pressure drop across SCR reactor. Engine load should be 40% and above, as NOx is reduced to N2 within specific temperature window (300-400 Deg. C).

If temperature is above 400 Deg. C, ammonia will burn rather than reacting with NOx which will lead the system to be ineffective. If the temperature is below 270 Deg. C, the reaction rate will be low and the ammonium sulphates formed will destroy the catalyst.

- Some B&W engine uses DeNOx or SiNOx system using SCR technology

- Some Wartsila engines also has NOR (NOx Reduction) system that uses

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SCR technology

➢More than 90% reduction is achieved by using SCR technology to comply with Tier III emission standards.

Exhaust Gas Recirculation (EGR) :
In this technology, part of the exhaust gas after turbocharger is re-circulated to scavenge receiver, after passing it through the scrubber (exhaust gas washing) unit. Around 50-60% NOx reduction from tier-I is claimed by making use of EGR.

However, discharge of cleaning water requires treatment like purification and separating exhaust gas cleaning sludge. As some countries are against discharge of this water, re-using this water poses corrosion problem. NOx reduction takes place due to reduction in excess air (oxygen content) used

for combustion; addition of CO2 and water vapor reduces peak temperatures as both have higher specific heat than air.

EGR system along with combination of one of the technologies such as altered (delayed) injection method, new design fuel valve, common rail injection principle, electronic engines, scavenge air moisturizing, can be used to comply with Tier III standards.

Scavenge Air Moisturizing :

Air from the turbocharger, after passing through the compressor, has high temperature. Seawater is injected to this high temperature air for cooling and making it saturated. Distillation process makes it possible to use seawater instead of fresh water.

Humidification of air is controlled by maintaining scavenge air temperature between 60-70 Deg. C. Water in saturated air reduces the peak temperature

as water has higher heat carrying capacity than air.

Around 60% NOx reduction is achieved by this method. By using combination of other technologies such as EGR with Scavange Air Moisturizing, NOx Tier III standards can be achieved.

Miller Cycle :

By making use of Miller cycle in 4-Stroke engines along with high efficiency turbocharger, that is, early closing of inlet valves before BDC, causes expansion and cooling of intake air which reduces NOx production. This NOx reduction method will require two turbochargers (2- Stage Turbocharging).

This method along with Direct Water injection (DWI) principle and other methods such as fuel water emulsion can bring NOx well below Tier III standards.

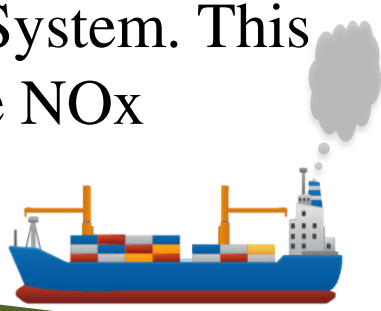
Use of Low Pressure Gas Engines :

New marine engines using low pressure LNG as marine fuel will have greater importance in meeting Tier III standards. Wartsila has developed 2-stroke DF which makes use of low pressure LNG as fuel. It is based on lean-burn principle (relatively high air/fuel ratio), in which, the pre-mixed air/fuel charge is ignited by pilot fuel.

One of the most important aspects of this engine is that the emissions are below NOx Tier limit, and this is achieved without use of exhaust gas treatment system.

CSNOx :

Ecospec have developed a system known as CSNOx which uses fresh water or seawater to pass through Ultra Low Frequency Electrolysis System. This treated water is further reacts with the exhaust gas to reduce the NOx content.



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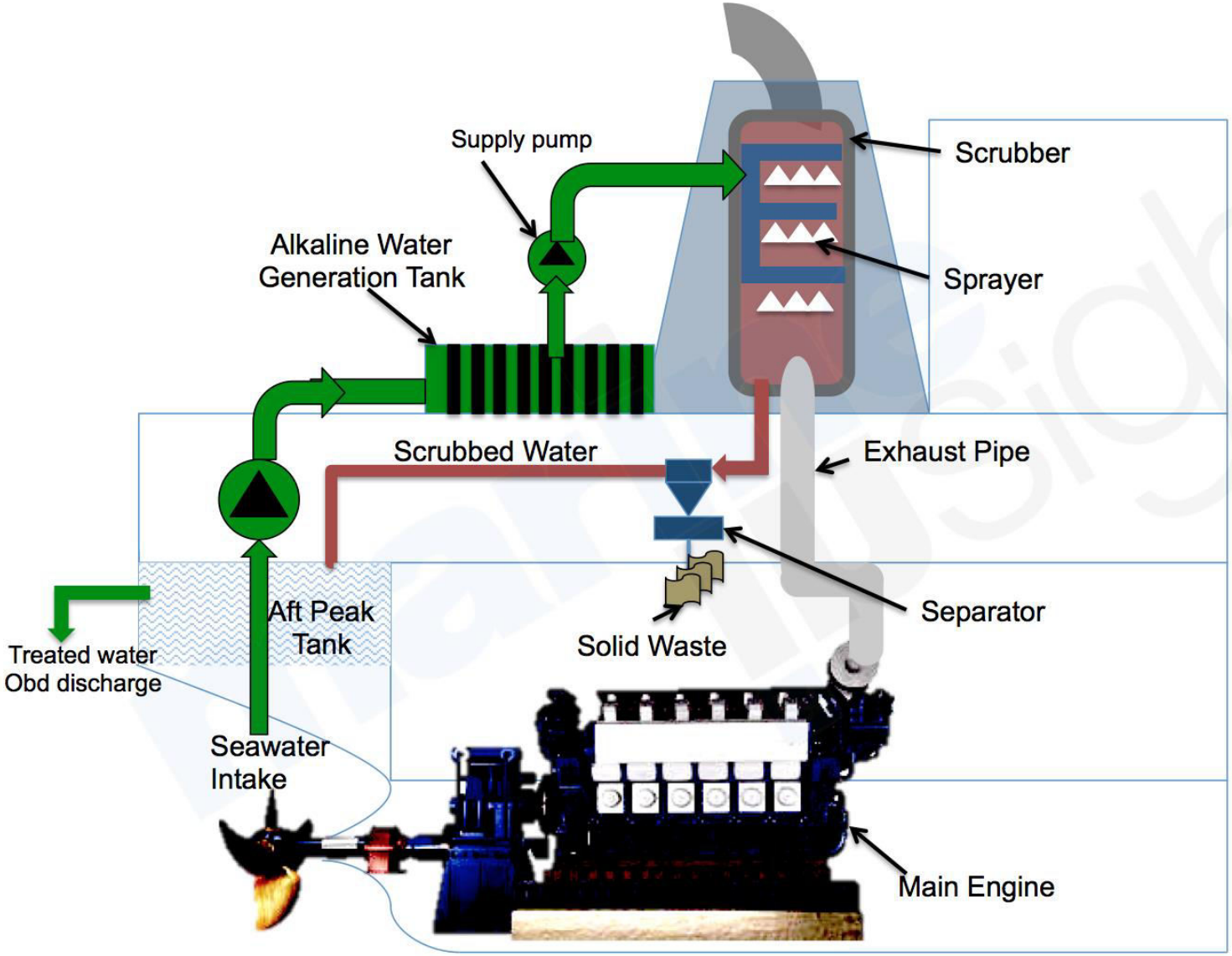
The system reduces CO2, SOx and NOx in one compact equipment.



Different Methods to Achieve ECA Compliance?

This technology along with other NOx reducing methods mentioned above can be used for compliance with Tier III standards. CSNOx has an advantage of achieving high efficiency with low maintenance and power consumption.

Combination:
Combination of Technologies having one or more combinations such as electronic engines with variable fuel timings, LNG as fuel or direct water injection or fuel in water emulsions etc. with other NOx reducing methods can be used to comply with Tier III emission standards.

These mentioned combinations may or may not require exhaust gas scrubber to comply with Tier III norms.

Conclusion

There is a lot of confusion and apprehension in the industry regarding the new ECA 0.1% sulphur regulations. Shipowners are facing the ultimate dilemma of finding ways to comply with the new law while preventing a significant increase in their operational overheads.

On one hand the rising costs of bunker fuel and transportation will pose some real struggle for shipowners as they try to maintain business-as-usual, whereas on the other hand the complexity and practicality of retrofitting vessels with new technology, along with the additional financial costs that come along with them, would lead to difficulty in maintaining profits and the much required competitive position.

As the whole shipping industry prepares for the new regulation, it would be interesting to see how shipowners, seafarers and other important players are adapting to the changing environment during this challenging, yet exciting time.

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