Global Sulfur Cap - 2020

GLOBAL SULFUR CAP - 2020

INTRODUCTION

As agreed at the IMO's Marine Environment Protection Committee (MEPC 70) meeting, held in October 2016, a 0.50 percent global sulfur cap on marine fuel oil will be implemented beginning January 2020. This will require all vessels operating outside Emission Control Areas (ECAs) to use fuel oil with a maximum sulfur content of 0.5%, while vessels operating within ECAs will be restricted to a maximum sulfur content of 0.10%. Alternative approaches to satisfy the requirement include the use of fuels such as LNG, LPG, CNG, bio fuel, solar power or fuel cells. Given the many compliance option available, the identification of the optimal fuel strategy for a ship/fleet is complex. Factors to be considered include the ship's trading area, ship's age, the availability of different fuels (i.e. LNG, LPG, CNG etc.) in the area of operation, capital costs and operating costs. This document provides information on various compliance options and identifies how ABS can assist owners and operators during the decision making process.

COMPLIANCE OPTIONS AND CONSIDERATIONS

1. Low sulfur distillate fuels – These fuels are widely used and have few limitations. However, there are several issues related to the distillation and desulfurization process that must be taken into consideration when burning marine gas oil (MGO) in engines originally designed for use with heavy residual oils. One particular concern is the reduction in the lubricity of the fuel which affects pumps and components in the fuel system. The refining process also reduces the aromatic content and density of the fuel, resulting in a decrease in energy content by one percent on a volumetric basis.

   For existing vessels originally designed to use heavy residual fuel oils (HFO), the engine and boiler manufacturers should be consulted to identify any modifications required prior to using MGO. HFO pumps may need to be replaced due to reduced fuel oil viscosity and lubricity. Additionally, a cooler or chiller may be needed in the fuel system to control temperature and maintain viscosity of the fuel.

2. Low sulfur heavy fuel oil – Various marine fuel suppliers have developed low sulfur fuel oils which are specially designed to help marine operators comply with 0.10% sulfur limits. These new fuel oils contain low sulfur, like MGO, but have a higher flash point and higher viscosity similar to HFO and require preheating.

   Low sulfur, heavy fuels have not yet been categorized according to ISO 8217. Before use on board, a ship operator should consult the engine manufacturer to ensure use of these fuels will not affect the engine warranty. A vessel owner should request certification or confirmation from the engine manufacturer or fuel supplier that these types of fuels can be used. Some fuel developers are claiming that their product is unique and are meeting all of the tests included in the ISO 8217:2012 specification. Availability of these fuels is restricted at present, but may improve as 2020 approaches.

3. Exhaust Gas Cleaning Systems (EGCS) - EGCS, commonly known as scrubbers, can be installed to treat the exhaust gas prior to discharge to the atmosphere. Treatment approaches include the use of sea water, chemically treated fresh water or dry substances.

   EGCS offer the potential for lower operating costs by permitting the use of less expensive high sulfur residual fuels. The capital, installation and operational costs associated with the installation of a SOx scrubber must be considered on a vessel-specific basis.

4. Liquefied Natural Gas (LNG) - The use of LNG as bunker fuel is increasing and expected to cover a portion of the global 0.50% sulfur cap demand in 2020. While LNG-fueled ships are a relatively new concept, LNG cargo ships have used cargo boil-off as fuel for their propulsion boilers for more than four decades. As a result, the industry has acquired significant experience in designing, constructing, operating and inspecting these vessels.

   The capital costs, limited infrastructure, relatively low oil prices and a regulatory framework which remains under development has limited the growth of LNG as a fuel. Also, since LNG has a lower energy density compared to conventional fuel oils, the onboard volume required for the bunker tanks can be as high as four times that required for HFO.

5. Alternate fuels - Alternatives to the above fuels, include liquefied petroleum gas (LPG), ethane, methanol, compressed natural gas (CNG), bio-fuel, solar power and fuel cells. Currently, none of these fuels are widely used in the marine industry; however, it is expected that some of these emerging technologies may become more common in the future.

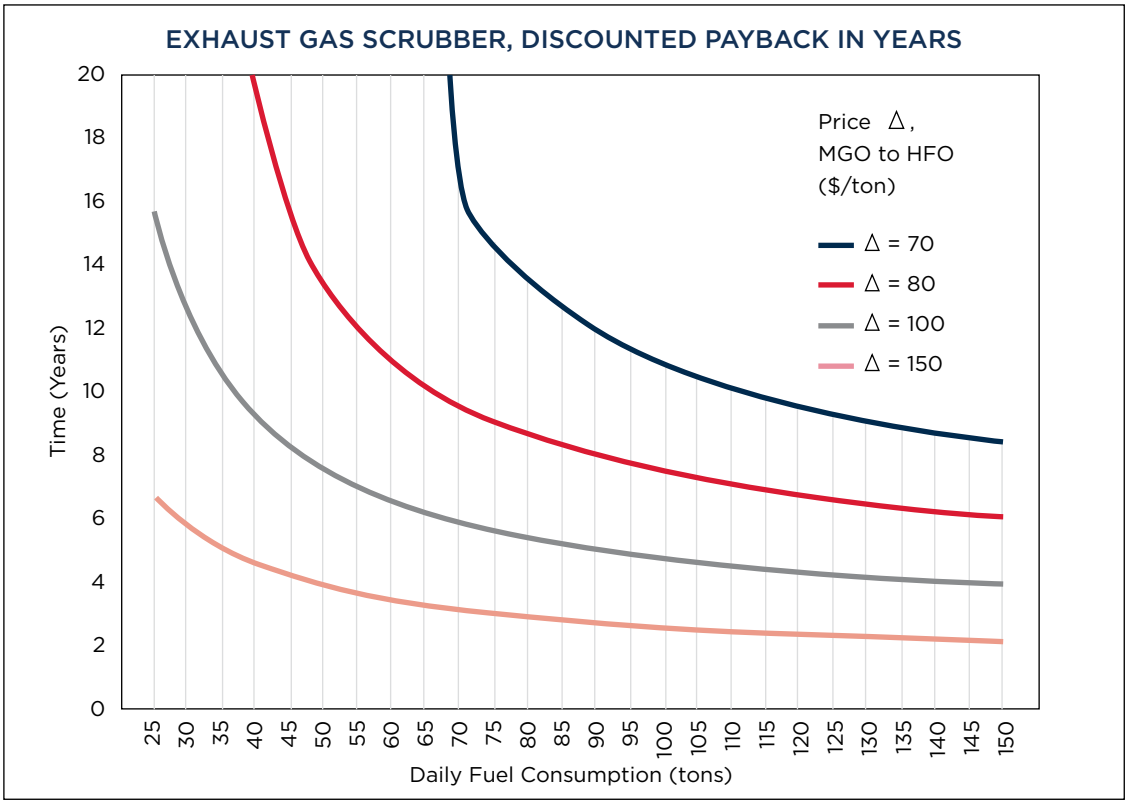
DEVELOPMENT OF AN EFFECTIVE FUEL STRATEGY

1. Vessel operating profile – It is important to develop an effective fuel strategy by assessing the right fuel for a vessel or fleet. An owner or operator should choose the fuel which will serve as the best fit for a particular vessel or fleet based on the trading patterns, particular configuration of the vessel(s) and available compliance options. Low sulfur distillate fuels, low sulfur heavy fuel oil, exhaust gas cleaning systems (EGCS), liquefied natural gas (LNG) and other alternative fuels are currently being considered. The evaluation should take into account the projected fuel availability and price along with capital and operational costs of the available solutions.

2. Projected fuel costs – There are several sources that provide projections for the cost of marine fuels. In developing a fuel strategy, one important parameter is the calorific fuel cost differential between the fuels under consideration. The next obvious factor is the amount of fuel consumed per day. In the example below, the expected discounted payback period for vessels retrofitting a scrubber using the NIST lifecycle cost analysis methodology is calculated. The graph shows that for an expected annualized fuel consumption (shown as the daily transit consumption in tons per day), the payback period decreases with the amount of fuel consumed and the discount realized by utilizing heavy fuel oil versus MGO.

   Assumptions considered in this example are shown in the following table. Front end cost (CAPEX) includes equipment, engineering and installation. For simplicity, the total CAPEX is assumed to vary linearly based on daily fuel consumption.

CAPEX		
	Minimum	Maximum
Fuel consumption (ton/day)	25	150
Total CAPEX ($)	5M	11M
Equipment	40% of the CAPEX	
OPEX		
Maintenance and repair	3% of equipment cost	
Additional fuel consumption due to installation of scrubber	0.5%	
Fuel cost	Fuel price x Consumption x Utilization factor	



The impact on the payback period is accelerated by higher price differences between the base fuel cost, MGO and that of HFO. Given the assumptions in this example, price differentials exceeding $150/ton, result in scrubbers becoming a financially viable option, particularly for vessels with a daily fuel consumption exceeding 100 tons per day. Larger fuel price differentials will result in shorter payback periods.

3. Similar studies can be carried out to compare the impact of LNG in lieu of MGO. Consideration of LNG as a fuel is significantly more attractive when considered as a new build option and will always be dependent on fuel availability.

ABS ASSISTANCE

ABS is available to support vessel owners and operators as they consider fuel options by:

- Providing guidance on the current sulfur cap requirements and alternative fuel options
- Completing techno-economic modeling, taking into consideration the vessel design, age, operating profile and compliance options
- Evaluating the technology of exhaust gas cleaning systems including suitability for a vessel or fleet

Please contact your local ABS office with request for assistance or send your request to EnvironmentalPerformance@eagle.org.

CONCLUSION

The 0.50% global sulfur cap on marine fuels will come into effect on 1 January 2020. This is a significant reduction from the current 3.50% sulfur limit and will have a considerable impact on the shipping industry, including owners and operators, bunker suppliers and refineries. All these sectors need to work together to meet these challenges, taking appropriate actions to address the likely increased demand.

Recognizing that a 0.50% global sulfur cap will come into effect, shipowners should make sure that their ships will be ready to run with compliant fuel or use alternative technology to meet the upcoming global sulfur requirements as well as relevant ECA requirements in advance of the 2020 date.

SUPPLEMENTAL INFORMATION

REGULATIONS

1. IMO Regulation 14 of MARPOL Annex VI – The SOx emission requirements covered by Regulation 14 of MARPOL Annex VI have provisions for nations to apply designated special areas to further reduce harmful emissions from ships operating in their coastal waters. The first two Emission Control Areas (ECA) approved by the IMO, known as Sulfur Emission Control Areas (SECAs), were the Baltic Sea and the North Sea (including the English Channel). Two additional ECAs, known as the North American and US Caribbean Sea have been added. The table below shows the phases of sulfur limits that will be enforced globally.

IMO GLOBAL		SECA/ECA	
Date	**Sulfur %**	**Date**	**Sulfur %**
Initial limits	4.50%	Initial limits	1.50%
1 Jan 2012	3.50%	1 Jul 2010	1.0%
1 Jan 2020	0.50%	1 Jan 2015	0.10%

2. European Union – The EU Sulfur Directive 1999/32/EC, as amended by Directives 2005/33/EC and 2009/30/EC, mandated all ships to use fuel with a maximum sulfur content of 0.10%m/m when 'at berth' (including at anchor) in EU ports. This requirement became effective 1 January 2010. The Sulfur Directive was further amended by Directive 2012/33/EU to reduce the fuel sulfur limit to 0.50 percent for operation in EU waters (i.e. outside SECAs) beginning 1 January 2020.

3. State of California, United States – The California "Fuel Sulfur and Other Operation Requirements for Ocean-Going Vessels within California Waters and 24 Nautical Miles of the California Baseline" (or, the Ocean Going Vessel (OGV) Fuel Regulation) has been enforced since July 2009 and was designed to provide significant air quality benefits by requiring ships to use cleaner, low sulfur marine distillate fuel in ship main engines, auxiliary engines and auxiliary boilers. The OGV Fuel Regulation does not apply to propulsion boilers. The table below shows the phases of sulfur limits enforced into the regulated California water.

Fuel Requirement	Effective Date	ARB's California OGV Fuel Requirement Percent Sulfur Content Limit
Phase I	1 January 2000	Marine gas oil (DMA) at or below 1.50% sulfur; or Marine diesel oil (DMB) at or below 0.50% sulfur
	August 1, 2012	Marine gas oil (DMA) at or below 1.0% sulfur; or Marine diesel oil (DMB) at or below 0.50% sulfur
Phase II	January 1, 2014	Marine gas oil (DMA) at or below 0.10% sulfur; or Marine diesel oil (DMB) at or below 0.10% sulfur

The California Air Resource Board, CARB, regulations do not specifically allow the use of anything other than low sulfur distillate fuel for compliance. However, CARB has permitted the use of ECA compliant non-distillate low sulfur fuel or equivalent alternative emission control technologies under a 'Research Exemption' criteria which is applicable during the sunset review period. This is the period during which CARB staff will evaluate the emission reductions achieved by the ECA regulations and compare them to the emissions reductions achieved by the California OGV fuel regulation. In all cases, the vessel owners and operators must notify the CARB authority to agree to this 'Research Exemption'. The notification is to be sent prior to initial entry into regulated California Waters.

4. The People's Republic of China (PRC) – China has developed local air emissions regulations applicable to the Pearl River Delta, Yangtze River Delta and Bohai Rim Area under "The People's Republic of China Air Pollution Prevention Law". The regulations apply to ships navigating, at berth and operating within the emission control areas which extend out to 12 nautical miles from the coastline.

   The regulations implement a phased date approach and are focused on the application of international requirements and controlling emissions from ships at berth for more than two hours. Beginning 1 January 2017, ships at berth must use fuel with a maximum sulfur content of 0.50% and starting 1 January 2019 this fuel limit is also applicable within the PRC Marine Emission Control Areas. However, some of the local authorities among these three regions implemented the regulations earlier than the original declared date by separate instructions. The use of alternatives such as shore power connections or exhaust gas cleaning systems (scrubbers) is permitted.

   Hong Kong Special Administrative Region of the PRC – The regulation for air pollution control for ocean going vessels (OGV) at berth was first enforced on 1 July 2015. Vessels are to use fuel oil, not exceeding 0.50% sulfur, while at berth excluding the first and last hour of the berthing period. The regulation applies to a vessel of 500 gross tonnage and above. Hong Kong recently decided to align with the newly adopted China ECA regulations, noted above.

5. Australia – The Australian Government announced on 1 December 2016 that all cruise ships berthing at Sydney Harbor may burn fuel with a maximum sulfur content of 0.10% or utilize an alternative method to deliver the same outcome.

WORLD HEADQUARTERS
16855 Northchase Drive
Houston, TX 77060 USA
P 1-281-877-5800
F 1-281-877-5803
ABS-WorldHQ@eagle.org
www.eagle.org

ABS

© bob63/Shutterstock

01/17 16385