

Low sulphur fuel changeover

Background

To reduce emission from ships, various international regulations and Emission Control Areas (ECA)¹ have been in force since 2005. Recently, new and stricter fuel sulphur content regulations promulgated by California² and the EU³ have been developed and implemented. The Californian Air Resource Board (CARB) has since 1 July 2009 enforced the use of diesel oils (MDO) or gas oils (MGO) in Californian waters.⁴ In addition, when in berth in EU ports, vessels must as of 1 January 2010 use marine fuels with a sulphur content not exceeding 0.1% by mass.

Since the implementation of the regulation on 1 July 2009, the USCG 11th District has documented a major increase in propulsion failures related to fuel changeover.⁵ The San Francisco Bar Pilots have reported anecdotally a marked increase in engine failures, engines not starting and problems with changes in speed, which affect manoeuvrability. The purpose of this circular is to set out the various fuel limits and their date of implementation, to provide information about the possible risks involved when switching to low sulphur fuels, and to give recommendations to owners and vessels.

Marine fuel limits in EU and date of implementation

The following table lists marine fuel limits in the EU, and their dates of implementation:

Vessel location	Sulphur limits all types of marine fuels used onboard from			
	1 January 2010	1 July 2010	1 January 2012	1 January 2015
Ships at berth in EU community ports and ports in non-EU countries that have adopted directive 2005/33/EC	0.1%	0.1%	0.1%	0.1%
Inside ECA but not at Berth	1.50%	1.00%	1.00%	0.10%
Outside ECA, but not at Berth	4.50%	4.50%	3.50%	3.50%

The risks and possible consequences involved

Change from HFO to MGO or MDO on engines and boilers has occurred since HFO was initially used on board ships. However, one difference is the very low viscosity and low sulphur MGO or MDO now coming on the market as a result of the new requirements. When changing to low sulphur fuel, several engine problems can occur, one of which is thermal shock in the fuel system due to the rapid change in temperature and poorer lubrication qualities of low sulphur fuel. This can result in sticking/scuffing of the fuel valves, fuel suction valves and fuel pump plungers, which

¹ Under MARPOL Annex VI, Regulations for the Prevention of Air Pollution from Ships, countries can apply to set up Emission Control Areas (ECA). More information about ECA areas is available at: http://i.pmcndn.net/p/ss/library/docs/subscriber/ECA_s_2009.pdf.

² CARB, "Marine Notice 2009-2, Regulations on Fuel Sulphur and other Operational Requirements for Ocean-Going Vessels within California Waters and 24 NM of the California Baseline", 7 May 2009.

³ EU Directive 2005/33/EC, "Amendment of the EU Low Sulphur Directive".

⁴ The following regulations are in force when operating within the 24 nautical mile regulatory zone off the California Coastline: From 1 July 2009, Marine gas oil (MGO) at or below 1.5% sulphur content, or Marine diesel oil (MDO) at or below 0.5% sulphur content. From 1 January 2012, Marine gas oil (MGO) or Marine diesel oil (MDO) at or below 0.1% sulphur content.

⁵ HSC of the San Francisco Bay Region, "CARB: Ocean-Going Vessel Clean Fuel Regulation", 14 Oct 2009.

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again lead to shut down of the main engine followed by manoeuvring problems. Waters where fuel switching is required are often environmentally sensitive and contain a number of hazards to navigation together with strong tides and currents. The increased risk of furnace explosion in the event of flame failure during operation of the boiler on low sulphur fuel is another safety issue.⁶

Recommendations to Ship owners and Managers

Owners and Managers are required, by the ISM Code 1.2.2.2, to assess the variety of risks that may be involved when changing to low sulphur fuel, by systematically identifying and analysing potential hazards to their vessels, personnel and to the environment. Based on these, the appropriate maintenance (ISM 10) and operational procedures (ISM 7) should be developed.

The manufacturers of the engines and boilers must be contacted and their recommendations on how to change over and run the equipment on low viscosity fuel must be part of the ISM procedures on board. If the manufacturer's recommendation includes certain requirements for modification to the equipment or systems, these must be implemented with Class approval. As not all required modifications will be completed by 1 January 2010, there may be a need for owners to document that the necessary modifications are in progress.

Operational recommendations

Vessels that trade between areas with different sulphur limitations should test the MGO and MDO received on board as the Bunker Receipt may only give the max/min values of the viscosity. If viscosity below 2.5 - 3 cst is received, problems could be expected as the viscosity will easily fall below 2 cst when passing through the fuel system on board.⁷ The first problems will be the fuel pumps, injection valves and boiler burners suffering internal leaks with malfunction and reduced capacity.

If such low viscosity fuels are to be used, changeover on main engine, auxiliary engines and for boilers producing steam for propulsion from HFO to MDO/MGO should take place sufficient time before arrival at Californian ports to ensure that both the propulsion and manoeuvring are maintained.⁸ If difficulties are encountered, the engines must be changed back to their original HFO.⁹ Such procedures must be implemented by the Assured with reference to the ISM code and emergency procedures.

Before starting the changeover, watch out for a reduction or increase in temperature, observe the viscosity and reduce the engine load. To protect the injection equipment against rapid temperature changes, the changeover process must be carried out slowly and in accordance with the manufacturer's instructions. The same also applies when changing from MGO to HFO.

⁶ Other significant operational implications by using low sulphur fuels might be reduced lubrication, low viscosity, flashpoint, acidity, catalytic fines or ignition and combustion quality.

⁷ During the changing process from HFO to MGO, it is recommended that temperature change of the fuel inlet to the fuel pumps do not exceed 2°C/minute.

⁸ It is not considered necessary to test the auxiliary boilers before arrival at port.

⁹ If the Master of the vessel determines that compliance with the regulations would endanger the safety of the vessel, its crew, cargo, or passengers, the Master should immediately take the necessary steps to remedy the situation (CARB, "Marine Notice 2005-5, Safety Exemption Information and Claim Form", Sept 2009).

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