Transport Canada Transports Canada

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SHIP SAFETY BULLETIN

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We issue Ship Safety Bulletins for the marine community. Visit our Website at www.tc.gc.ca/ssb-bsn to view existing bulletins and to sign up to receive e-mail notices of new ones

Subject: **Regulations for Vessel Air Emissions: Fuel Oil Change-Over Operations**

Purpose

This bulletin advises stakeholders of the potential consequences of:

- fuel change-over between residual fuel commonly known as Heavy Fuel Oil (HFO) and low sulphur fuel oil (LSFO); and
- the change-over requirements under MARPOL Annex VI and the *Vessel Pollution and Dangerous Chemicals Regulations* (the Regulations).

Background

During combustion, sulphur oxides form from the sulphur in the vessel's fuel. This is why we now control the sulphur content in fuel. For vessels using emission control technology, the controls use an equivalent sulphur dioxide to carbon dioxide ratio.

The Regulations set air emission standards, including sulphur content limits in marine fuel, within the North American Emission Control Area (NA-ECA). These Regulations can be accessed through the Laws of Canada website managed by the Department of Justice Canada. Transport Canada will enforce these Regulations as set out in the *Policy on Compliance and Enforcement of the Canada Shipping Act, 2001* - TP 13585.

Main engines, auxiliary engines and boilers switching over to low sulphur fuels will create many challenges to vessels operating in the NA-ECA. As of January 1st, 2015, **all vessels operating in the NA-ECA must use fuel that does not exceed 0.10% sulphur content.**

Keywords:

1. Air Emissions
2. Nitrogen oxides
3. Regulations
4. Pollution Prevention
5. Compliance

Questions concerning this Bulletin should be addressed to:

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Most marine diesel engines and boilers are designed to operate on HFO. If the operator does not make sure fuel switching is done carefully during the transition from HFO to LSFO (with a sulphur content of 0.1%), this can put a vessel's machinery at risk and jeopardize the safety of the vessel, passengers and crew. This is why MARPOL Annex VI, Regulation 14.6, requires vessels using separate fuel oils, to carry a written procedure for the fuel oil change-over.

Challenges

Since changing from high to low sulphur fuels during operations may lead to several challenges, the vessel operator must take into account the different operating temperatures of the two fuels. If they don't do this, the vessel risks propulsion failure, black out, and/or damage to the machinery.

HFO and LSFO have quite different operating temperatures. This means that a change-over operation not being done correctly may lead to a rapid fall or rise in temperature with increased chances of thermal shock to the equipment. Fuel systems also have to account for their difference in viscosity to avoid fuel pump failures, leaks, and clogged filters. The fact that HFO and LSFO are mixed in different ratios during the change-over procedure increases the risk of the fuels becoming incompatible; which may cause the engine to shut down.

MARPOL - Compliance

Vessel-owners and operators need to take a measured, well informed and well documented approach to fuel switching. They should post these required procedures in the engine control room and the wheel house for easy reference.

The procedure must outline the time required for the fuel oil service system to be fully flushed of all fuel oil exceeding the applicable sulphur content specified by MARPOL, or authorized by permit according to vessel documents, **before** entering the NA- ECA.

Information a ship operator must record in a ship's official log book as prescribed by the vessel's Administration includes:

- the volume of LSFO in each designated tank; and
- the date, time, and position of the vessel when any fuel oil change-over operation is:
    - **completed before** entry into the ECA; or
    - **begun after leaving** the ECA .

Assistance from Engine Manufacturer or Classification Society

Vessel owners may ask their engine manufacturer or classification society as appropriate to verify their change-over procedures and documents.

Hazardous Situations

Vessel owners/operators should do compliant fuel change-overs well in advance to avoid problems during the transiting passages, in proximity to shore or in narrow channels. Transport Canada has received reports of main engine shutdowns and blackouts, resulting in exposing the vessel to hazardous situations.

Owners/operators must also ensure vessels can access all available power of its engines it needs to maneuver in ice or in strong winds and currents. The engine manufacturer or classification society should be consulted as appropriate.

Other Considerations

Transport Canada further notes and agrees with the following recommendations for vessel owners and operators from the US Coast Guard Marine Safety Alert 2-15 on the subject:

- Ensure fuel oil switching is accomplished outside of busy traffic lanes and the ECA. Generally the ECA is 200 nm from the North American Coast.
- Utilize their technical resources to develop safe operations and maintain full compliance with emission requirements;
- Consult with engine and boiler manufacturers for fuel oil change-over guidance and to determine if system modifications or additional safeguards are necessary;
- Consult fuel suppliers for proper fuel selection;
- Ensure all sensors, controls and alarms – pressure, temperature, viscosity, differential pressure, flow indicators, etc., are operational and function as designed;
- Ensure system piping, seals, gaskets, flanges, fittings, brackets, etc., are maintained.
- Ensure detailed system schematics are available;
- Review and update fuel oil change-over procedures as needed;
- Establish a fuel oil system inspection and maintenance schedule;
- Review and update fuel change-over procedures based on lessons learned;
- Provide initial and periodic crew training for accomplishing safe, effective and leak-free fuel switching;
- Remember that the energy content of a given volume of LSFO may differ from residual fuel, such that existing throttle settings may not give the desired

propeller shaft RPM or generator loads and performance/speed trials on LSFO may need to be conducted and;

- Anticipate that there may be many technical challenges for operators when beginning to use LSFO as a matter of routine and compliance. These range from excessive leakages of fuel system components, increased wear and tear on these components, lack of lubricity of the fuels and the need for possible changes in maintenance schedules, operational methods, etc.

Inspection and Reporting

A vessel experiencing loss of power, or a significant reduction in power which may result in a dangerous occurrence when navigating in ice or in other difficult sea conditions are to report the occurrence to Transport Canada Marine Safety and Security, by way of the nearest Marine Communications and Traffic Services Centre (MCTS) via the ECAREG or RMIC on the East and West Coasts respectively. The owner/operator must also make arrangements with their flag Administration or the Recognized Organization acting on its behalf as appropriate, to inspect the vessel and report their findings to Transport Canada.