MARPOL Annex VI

Operation in SOx Emission Control Areas, how to comply

Operation in SOx Emission Control Areas (SECAs) introduces new challenges to ship operators, both with respect to bunker management and voyage planning. The scope of this guidance note is to assist ship operators to comply with regulation 14 of Marpol Annex VI.

SOx Emission Control Areas (SECA)

Annex VI to MARPOL 73/78 limits the sulphur content of marine fuel oil to 1.5% per mass and will apply in designated SECAs. The first SECA is the Baltic Sea which enters into force on the 19 May 2006. The North Sea Area and the English Channel SECA will enter into force 22 November 2007. The geographical boundaries for these two SECAs (Fig. 1) are defined in MARPOL 73/78. (Note that EU directive 2005/33/EC, requires ships to burn fuel oil with less than 1.5% sulphur in the North Sea SECA from 11 August 2007.) New SECAs are expected to be adopted in the future based on certain criteria and procedures for designation of SECAs as given in Appendix III to Annex VI.

Guidelines for part-operation in SECAs

Almost all ships will continue to operate on high sulphur fuel oil (HSFO) outside the SECAs, mainly due to the high price and low availability of low sulphur bunkers in many ports. These ships will therefore need to switch to low sulphur fuel oil (LSFO) before entering a SECA. Regulation 14 (6) requires ships to allow sufficient time for the fuel oil service system to be fully flushed of all fuels exceeding 1.5% sulphur prior to entering a SECA. The time it takes to flush the fuel oil system of fuel oil exceeding 1.5% is a function of:

- Sulphur content in high and low sulphur fuel oil,
- Amount of high sulphur fuel between first point of blending and engine inlet, i.e. blending volume, and
- Fuel oil consumption rate.

A plot of this function (Fig. 2) shows the sulphur dilution time in percent of the fuel oil hours contained in the blending volume. It should be emphasised that this plot is a theoretical approximation with a built in safety factor, but without necessarily taking all operational procedures on board into consideration no guaranty can be given. Owners could contact DNV Petroleum Services (DNVPS) for a more accurate calculation on a ship to ship basis to reduce the time needed for the changeover process. For each SECA voyage, ship operators will need to have knowledge of the required changeover time and incorporate this is in the voyage planning for the ship.

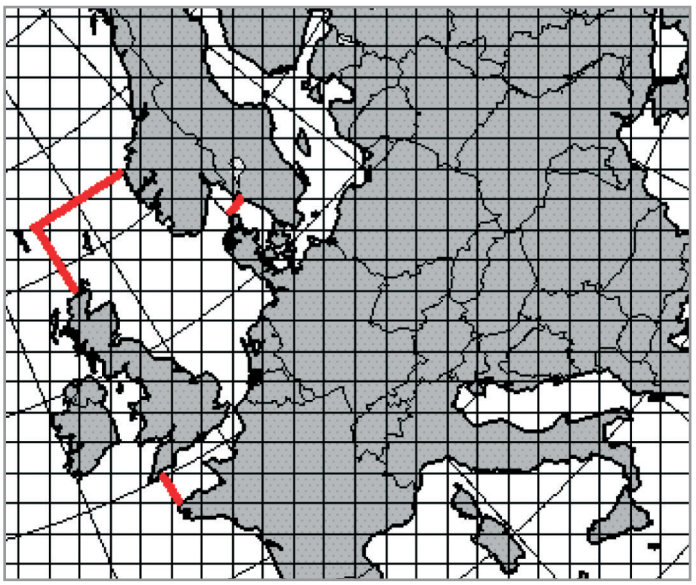

Fig. 1: Geographical boundaries for the Baltic Sea SECA and the North Sea Area and the English Channel SECA.

The optimal fuel oil (FO) system for switching to LSFO is to have double service and double settling tanks, which allows LSFO to be completely segregated from HSFO from the storage to the service tank. Blending will only takes place in the piping between the service tanks and the inlet to the engine.

If the FO system contains two service tanks and two settling tanks, and the blending volume contains fuel oil for 15 minutes of operation, the dilution time according to the graph below is 240%*15 minutes = 36 minutes when switching from HSFO with 2.8% S (world average) to LSFO with 1.3% S.

If the FO system contains two service tanks and one settling tank, the dilution time will be the same as for the previous example if one of the service tanks is already filled with LSFO. The settling tank should be emptied (either by pumping the HSFO back to storage or by consumption), and refilled with LSFO prior to entering a SECA.

If the FO system contains one service tank and one settling tank, the changeover time will be substantially longer. The first

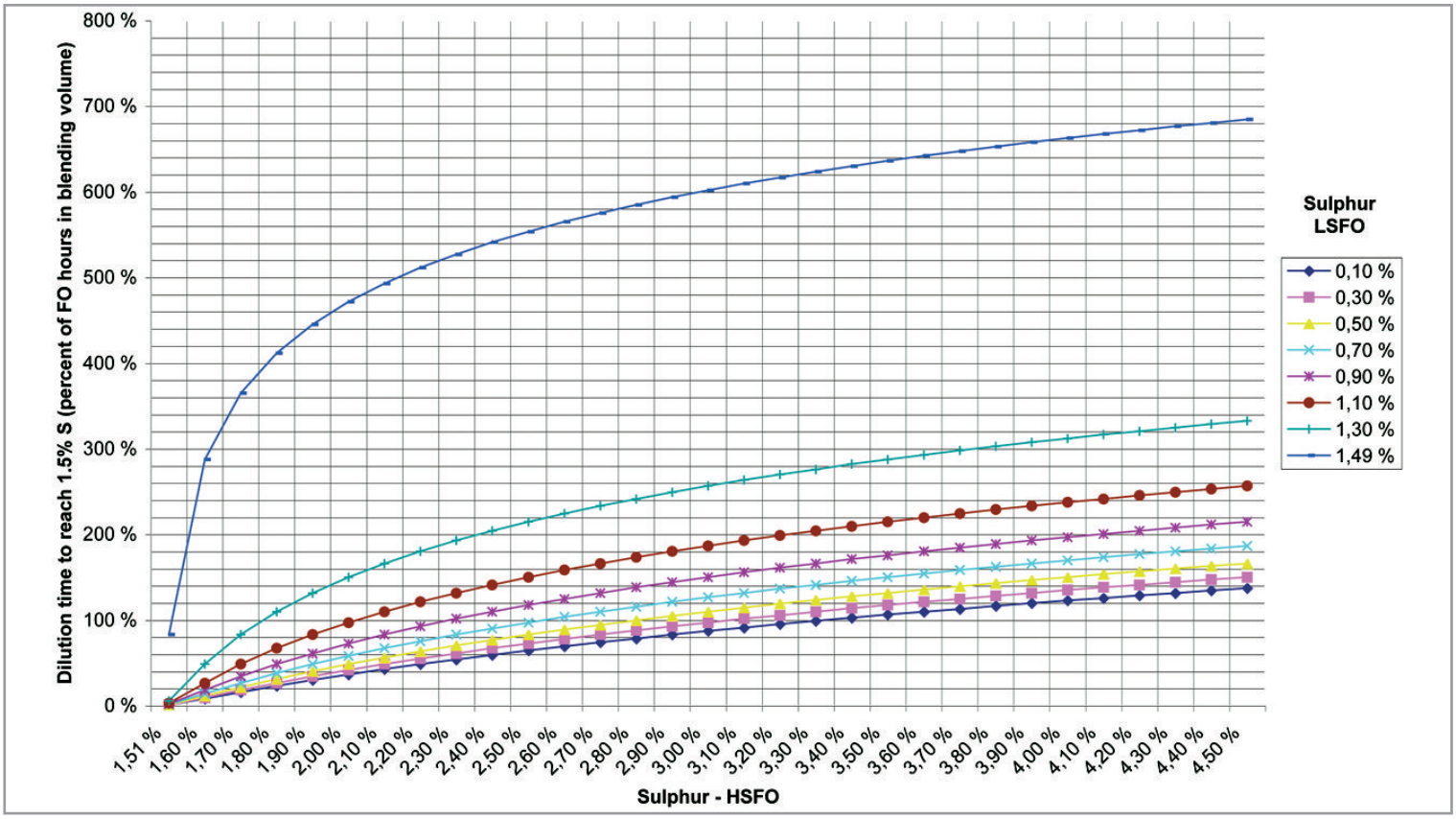

Fig. 2: Dilution time to reach 1.5% S in percent of the fuel oil hours contained in the blending volume.

point of blending is the settling tank and the blending volume will comprise of the settling tank, service tank and connected piping. If the settling tank and service tank each contain FO for 12 hours of operation, and we assume one hour of FO in the piping, the dilution time is 240%*25h=60h.

The dilution time can be reduced by minimising the service and settling tank contents prior to changeover to LSFO, however DNV recommends that the service tank contains enough fuel oil for continuous rating of the propulsion plant and normal operating load at sea of the generator plant for a safe period of time, e.g. eight hours. Another possible solution is to install new settling and service tanks, or to divide existing tanks if this does not impair the required capacity of HSFO used outside the SECA. Such modifications need to be approved by DNV.

Demonstrating compliance

Details of fuel oil changeover procedures from HSFO to LSFO, and vice versa, need to be recorded as required by Regulation 14(6) of Annex VI. The volume of LSFO in each tank, as well as the date, time, and the position of the ship when any fuel changeover operation is completed, is to be recorded in log books, i.e. the engine room log book. It should be noted that non compliance with regulation 14 while operating inside the SECA is a detainable deficiency and it is the shipowner's responsibility to document that the fuel oil burned within the SECA has a net sulphur content below 1.5%.

Alternatives

MARPOL Annex VI, Regulation 14 (4b) gives the option of using an exhaust gas cleaning system (EGCS) which reduces the total SOx emissions to 6.0 g/kWh. The development of stack-scrubbers for ships is still at an early stage and local authorities may prohibit discharging waste streams from scrubbers in ports and estuaries.

Risk of incompatibility and cylinder wear

Ship operators should assure that the LSFO oil is compatible with the HSFO by sending a representative sample of each fuel oil quality to a fuel oil testing company such as DNVPS. Blending high density fuel oil with low density fuel gives the highest risk of incompatibility, while blending two low density fuel oils represents the lowest risk. The blending ratio should in any case be as small as possible.

High base number (BN) lube oil in combination with low-sulphur fuel increases the risk of scuffing on the cylinder liner. The deposits are more solid when less oil BN additives are neutralised by sulphuric acid. DNV recommends carefully monitoring the cylinder liner condition when operating on low sulphur fuel oil, and if necessary change to low BN cylinder oil or reduce the feed rate in accordance with the engine makers recommendations. New cylinder oil tanks may need to be installed onboard and approved by DNV.

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