

Date: 04.12.09

### Low-Sulphur Fuels

all engine types

Effective January 1, 2010, the EU Directive 2005/33/EC ("Directive") provides for new standards regarding the allowable sulphur content of marine fuels in certain operational areas. Against this background we would like to give you some information on how you may adjust the operation of your MaK engines to the use of low-sulphur fuels.

The term "low-sulphur" used in the Directive has different meanings, depending on the fuel grades:

- a) If the term "low sulphur" is used with reference to heavy fuel, the sulphur limit ranges between 1 to 1.5 %
- b) For distillate fuel the sulphur content is 0.1 % corresponding to 1000 ppm and lower

For further information on the different limits that will be applicable depending on the operational area of the vessel effective January 1, 2010 and further requirements regarding the sulphur content of marine fuels, please refer to the Directive.

### Operating modes with different fuel grades

Please ensure that, depending on the fuel grade, a suitable lubricating oil is used for the engine. The Total Base Number ("TBN") of the lubricating oil should match the sulphur content of the fuel. If the TBN of the lubricating oil is too high, this may lead to deposits on piston crown and top land of the piston. If the TBN is too low, corrosion symptoms have to be expected.

#### 1. Heavy fuel operation with HFO and a sulphur content of 1 to 4.5 %:

This fuel is to be treated like conventional heavy fuel. The lubricating oil should be an oil with TBN 30 or 40, as hitherto.

#### 2. Operation with low sulphur distillate fuel and a sulphur content of $\leq 0,1\%$ :

We recommend to use lubricating oil with TBN 15.

#### 3. Mixed operation, changeover of fuel grade:

Engines operated with heavy fuel in sea service should use lubricating oil with TBN 30 or 40 even if they are changed over to distillate fuel with less than 0.1 % sulphur for a limited period of time. We recommend lubricating oil with TBN 15 only in case of longer operation with low sulphur distillate fuel exceeding a continuous period of more than 750 operating hours.

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### **Notes regarding mixed operation**

Sometimes, bunker suppliers produce low sulphur heavy fuel by adding low sulphur distillate fuel to conventional heavy fuel. Mixing of these fuel grades by bunker suppliers or when switching between conventional heavy fuel and distillate fuel during operation, may lead to mutual incompatibilities. This may result in the precipitation of asphaltenes. Under such circumstances the following irregularities may occur:

- Increased formation of sludge in the bunker tanks
- Reduced heating performance of the preheaters due to formation of deposits and damage to the preheaters due to heat accumulation resulting from these deposits
- Reduced service life of separators
- Reduced service life of filters or very frequent backflushing of automatic filters
- Formation of deposits in pump elements with decreased clearance that may even lead to sticking of the pump plungers

If any of the above symptoms are observed, we recommend to contact your responsible CAT dealer.

The experience gained with low-sulfur fuels so far has shown that MaK engines can process these fuels without any particular changes. The more widespread use of low-sulfur fuels will allow us to gain more information in this regard, particularly on long-term operation. In case this will produce findings relevant to owners and operators, we will inform you accordingly.