

MAN Diesel

MAN Diesel A/S • Denmark



Att.: Mr Keith Saddler

LSP/KEA/TGL/43992

13 December 2007

No Objection Letter

To. Maersk Fluid Technology

Att. Keith Saddler

Letter of No Objection Letter for operating A.P.M blending on-board concept.

With reference to Letter of 20 November 2007 we can inform you as follows:

MAN Diesel has made the following test of A.P.M blending on board concept MFT-I where system lube oil is mixed with an additive tailor made to compensate for the lack of cylinder lube oil abilities and the Lube oil is hereafter used as cylinder lube oil.

This technique is new to the market and the reason for deviating from the traditional use of System and Cylinder oil is primarily to secure a continued exchange of lube oil and thereby keeping high quality, cleanliness and lubricity of the System oil.

The test was performed in 4000 hours followed by MAN Diesel with the combination of additive RT2522-2 and MG300 system oil used as cylinder lube oil and the engine performance has been checked by MAN engineers at the test start, during and at test end. The test has shown acceptable operation performance of the MFT-I blending system and is hereby given a "No Objection Letter", for use in MAN B&W 2 stroke engines.

The test was performed with a chosen additive and system oil (RT2522-2 and MG300).

Additive and system lube different from the RT2522-2 and MG300 may give a different performance in the engine and, it is therefore mandatory for the safety and reliability of the engine operation that the different combination of additive/system oil is individually tested.

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Equipment description and test requirement is attached in encl.1)

However, as MAN Diesel does not warrant the performance by the MFT-I equipment or any feed stock or additive package materials, MAN cannot be held responsible for any damage caused by the improper use of SEA-MateT products or the use of system oil and additive package materials.

Encl 1) Equipment description and Test requirement

The Main Engine Cylinder Lubricant blended on-board concept consists of:

1. special purpose made blending equipment to blend a cylinder lubricant from System Oil and an Additive Package,
2. System Oil, either fresh or used,
3. suitable Additive technology Pack, and
4. appropriate analytical instrumentation required to determine the Base Number ("TBN") and elemental / metal contaminants level within the blended cylinder lubricant; in addition and in order to use a variable TBN Cylinder Lubricant, the analytical instrumentation must be able to carry our sulphur measurements of the fuel oil used.

Analysis of the blended cylinder lubes oil Further

As Guideline for further testing, following minimum requirements was specified to keep continuity and repeatability for evaluation of the system performance. Same requirements are to be followed when the concept is used in service after receiving NOL.

- stable TBN (± 2 mg KOH / g), ASTM D2896 (or other comparable test methods)
- TBN max. 80, min. 60, ASTM D2896 (or other comparable test methods)
- stable viscosity ($\pm 2\%$, SAE 50/40), ASTM D445 (or comparable test methods)
- lubricant stability (no precipitation after one month storage)
- no wear particles, e.g. metals, sand, etc, ICP or XRF Analyzer measurement
- water: max 0.2%, ASTM D1744 (or equivalent method)
- flash point: min. 190 °C, ASTM D93 (or equivalent method)
- TAN: 0 mg KOH / g, ASTM D664 (or equivalent method)

In the acknowledgement that the system oil is contaminated especially at the test start if "used" system oil is used it is important that TBN and wear particles is measured from each batch of blended Cylinder Lubricant.

The operator should take and analysis at least two (2) samples per blend, with at least one sample being retained for no less than six (6) months on-board/on-site.

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The System Oil TBN level not to exceed twenty (20) in order to ensure that sufficient Cylinder Oil additives are added to the blended oil to achieve required properties even for blended oils of TBN 40.

Best regards
MAN Diesel A/S

Kjeld Aabo

A handwritten signature in blue ink that reads "Kjeld Aabo". The signature is written in a cursive style with a long horizontal stroke at the end.