

Quality requirements for lube oil

3.3.5

Lube oil for operation on gas oil and Diesel oil (MGO/MDO)

The specific power output offered by today's Diesel engines and the use of fuels, which more and more often approach the limit in quality, increase the requirements placed on the lube oil and make it imperative that the lube oil is chosen carefully. Doped lube oils (HD oils) have proven to be suitable for lubricating the running gear, the cylinders, the turbochargers and for cooling the pistons. Doped lube oils contain additives which, amongst other things, provide them with sludge carrying, cleaning and neutralization capabilities.

Only lube oils, which have been released by MAN B&W, are to be used. These are listed in Table 3.

Specifications

Base oil

The base oil (doped lube oil = base oil + additives) must be a narrow distillation cut and must be refined in accordance with modern procedures. Brightstocks, if contained, must neither adversely affect the thermal nor the oxidation stability. The base oil must meet the limit values as specified below, particularly as concerns its aging stability.

<i>Properties/characteristics</i>	<i>Unit</i>	<i>Test method</i>	<i>Characteristic value</i>
Structure	-	-	preferably paraffin-basic
Behaviour in cold, still flowing	°C	ASTM-D2500	-15
Flash point (as per Cleveland)	°C	ASTM-D92	> 200
Ash content (oxide ash)	Weight %	ASTM-D482	< 0.02
Coke residue (as per Conradson)	Weight %	ASTM-D189	< 0.50
Aging tendency after being heated up to 135° C for 100 hrs	-	MAN-aging cabinet	-
n-heptane insolubles	Weight%	ASTM-D4055 or DIN 51592	t< 0.2
evaporation loss drop test (filter paper)	Weight% -	- MAN-test	< 2 must not allow to recognize precipitation of resin or asphalt-like aging products

Table 1. Lube oil (operation on MGO/MDO) - characteristic values to be observed

Doped lube oils (HD-oils)

The base oil, which has been mixed with additives (doped lube oil) must have the following properties:

Additives

The additives must be dissolved in the oil and must be of such a composition that an absolute minimum of ash remains as residue after combustion. The ash must be soft. If this prerequisite is not complied with, increased deposits are to be expected in the combustion chamber, especially at the outlet valves and in the inlet housing of the turbochargers. Hard additive ash promotes pitting on the valves seats, as well as valve blow-by and increased mechanical wear.

Additives must not facilitate clogging of the filter elements, neither in their active nor in their exhausted state.

Detergency The detergency must be so high that the build-up of coke and tar-like residues forming during the combustion of fuel is precluded.

Dispersancy The dispersancy must be selected such that commercially available lube-oil cleaning equipment can remove the detrimental contaminations from the used oil.

Neutralisation capacity The neutralisation capacity (ASTM-D2896) must be so high that the acidic products which result during combustion are neutralized. The reaction time of the additives must be matched to the process in the cylinder crankcase.

Evaporation tendency The tendency to evaporate must be as low as possible, otherwise the oil consumption is adversely affected.

Further conditions The lube oil must not form a stable emulsion with water. Less than 40 ml emulsion are acceptable in the ASTM-D1401 test after one hour.

The foaming behaviour (ASTM-D892) must meet the following conditions: after 10 minutes < 20 ml. The lube oil must not contain agents to improve viscosity index. The fresh oil must not contain any water or other contaminations.

Lube oil selection

Engine	SAE-Class	Viscosity mm²/s at 40 ° C or 100 ° C
20/27*, 23/30, 28/32	30**	preferably in the upper range of the SAE-class applicable to the engine
25/30	40	
32/36 through 58/64	40	

* Applies to engines with year of manufacture from 1985 on. For engines delivered before 01 Jan. 1985, lube oil viscosity as per SAE 40 continues to be valid.

** If the lube oil is heated to approx. 40° C before the engine is started, SAE class 40 can also be used if necessary (e.g. on account of simplified lube-oil storage).

Table 2. Viscosity (SAE class) of lube oils

Doped grade Doped lube oils (HD oils) corresponding to international specifications MIL-L 2104 D or API-CD, and having a base number (BN) of 12-15 mg KOH/g are recommended by us. (Designation for armed forces of Germany: O-278)

The content of additives included in the lube oil depends upon the conditions under which the engine is operated, and the quality of fuel used. If marine Diesel fuel is used, which has a sulphur content of up to 2.0 weight % as per ISO-F DMC, and coke residues of up to 2.5 weight % as per Conradson, a BN of approx. 20 is of advantage. Ultimately, the operating results are the decisive criterion as to which content of additives ensures the most economic engine operation.

Cylinder lube oil In the case of engines with separate cylinder lubrication, the pistons and the cylinder liner are supplied with lube oil by means of a separate oil pump. The oil supply rate is factory-set to conform to both the quality of the fuel to be used in service and to the anticipated operating conditions.

A lube oil as specified above is to be used for the cylinder lubrication and the lubricating circuit.

Speed governor

In case of mechanic-hydraulic governors with separate oil sump, multi-grade oil 5W-40 is preferably used. If this oil is not available for topping-up, an oil 15W-40 may exceptionally be used. In this context it makes no difference whether multigrade oils based on synthetic or mineral oil are used. According to the mineral oil companies they can be mixed in any case.

(Designation for armed forces of Germany: O-236)

The oil quality specified by the manufacturer is to be used for the remaining equipment fitted to the engine.

Lube-oil additives

We strongly advise against subsequently adding additives to the lube oil, or mixing the different makes (brands) of the lube oil, as the performance of the carefully matched package of additives which is suiting itself and adapted to the base oil, may be upset. Also, the lube oil company (oil supplier) is no longer responsible for the oil.

Selection of lube oils/
warranty

Most of the mineral oil companies are in close and permanent consultation with the engine manufacturers and are therefore in a the position to quote the oil from their own product line that has been approved by the engine manufacturer for the given application. Independent of this release, the lube oil producers are in any case responsible for quality and performance of their products. In case of doubt, we are more than willing to provide you with further information.

Examinations

We carry out the examinations on lube oil in our laboratories for our customers who need only pay the self-costs (net-costs). A representative sample of about 1 dm³ is required for the examination.

Manufacturer	Base Number (mgKOH/g) 12 - 15 ¹⁾
ADNOC	Marine Engine Oil X412
AGIP	Cladium 120 - SAE 40 Sigma S SAE 40 ²⁾
BP	Energol DS 3-154 Vanellus C3 ²⁾
CASTROL	Castrol MLC 40 Castrol TLX 154 Castrol MXD 154 Rivermax SX 40
CHEVRON Texaco (FAMM, Caltex)	Taro 16 XD 40 Delo 1000 Marine SAE 40
DELEK	Delmar 40-12
ENGEN	Genmarine EO 4015
ERTOIL	Koral 15
ESSO / EXXON	Exxmar 12 TP 40
IRVING	Marine MTX 1240
MOBIL	Mobilgard 412 / SHC 120 (MG 1SHC) Mobilgard ADL 40 / Delvac 1340 ²⁾
PETROBRAS	Marbrax CCD-410
REPSOL	Neptuno NT 1540
SHELL	Gadinia Oil 40 Sirius FB 40 (Sirius/Rimula X) ²⁾ Gadinia AL
STATOIL	MarWay 1540
TEBOIL	Ward S 10 T
TOTAL LUBMARINE	Disola M4015

- 1) If Marine Diesel fuel of poor quality (ISO-F-DMC) is used, a base number (BN) of approx. 20 is of advantage.
- 2) If the sulphur content of the fuel is < 1%.

Table 3. Lubricating oils which have been released for the use in MAN B&W Diesel four-stroke engines running on gas oil and Diesel oil