YANMAR SERVICE NEWS

Subject	**LO Purification Control for HFO Spec. Generator Engine** (Measure Against Premature Clogging of LO Back-wash Filter)		No. 01-2-G-01-002-O-Rev. 1 Date: April 2010
Engine Model	All HFO Spec. Generator Engines	Use	Marine Aux. Engines
		Engine Nos.	————————

Premature malfunctioning of LO back-wash filter differential pressure alarm arose often in the market. One of the causes for this malfunctioning is considered to be the LO purification degree of the centrifugal LO purifier equipped to the ship.

To keep lube oil properly purified is very important for controlling wear of moving parts of engine and extending the service life of these parts. HFO includes many nonflammable impurities and the contents are several times of those in MDO. This means that the use of HFO will produce overwhelmingly large combustion residues in comparison with the use of MDO and that since entry of combustion residues into lube oil is inevitable, lube oil will be quickly contaminated in the trunk piston engines. In order to prevent this situation, LO needs to be purified appropriately for maintaining the purification good at all times.

If the LO purification is insufficient, wear of the bearings, piston rings, cylinder liner, turbocharger and other moving parts will be accelerated, which will cause the service life of parts to be shortened, engine performance malfunctioning and premature clogging of LO filters including the automatic back-wash filter.

1. LO Purification System

There are following 3 purification systems with the use of the centrifugal LO purifiers. Yanmar recommends the use of the overflow system.

Table 1

№	Purification System		Outline
1	Overflow System	Continuous	Constant and continuous circulation of sump oil of all D/Gs for purification via the overflow tank. Yanmar recommends this system.
2	Direct System	Continuous	The sump oil of the operating unit only be purified and returned directly to the sump tank by valve operation. Special measures are required for the operation.
3	Batch System	Intermittent	Engine be stopped after a certain period of time for purifying all sump oil.

When employing the direct system, operate the system as follows:

1） In order to prevent the loss of lube oil due to switching mistakes of the sump tank inlet and outlet valves, raise the caution plates or make other measures.

2） In order to detect the switching mistakes of the sump tank inlet and outlet valves at an early stage, provide the fluid level alarm (High/Low) in the sump tank.

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Approved	Checked	Drawing
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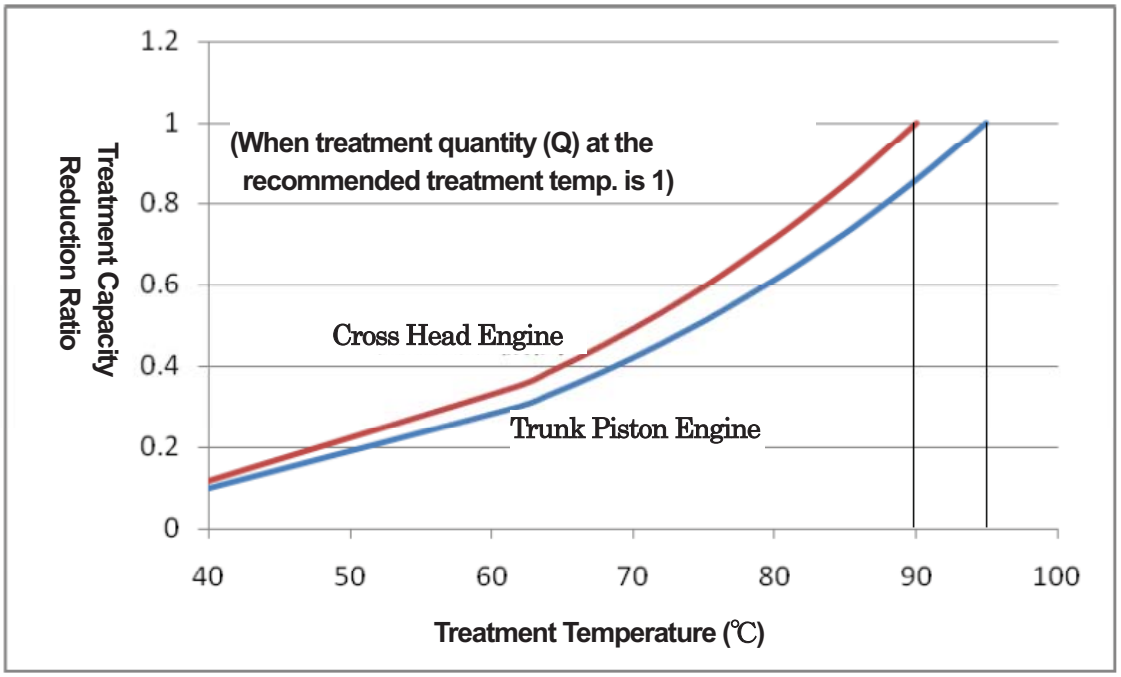
2. Setting of Centrifugal Purifier

In any purification system, it is necessary to operate the purifier at an optimum setting to maintain the satisfactory purification effect. Since the treatment capacity of the purifier is largely dependent on the lube oil temperature as shown in Table 3 below, it is also necessary to keep the LO temperature at an appropriate level.

Table 2.

№	Item	Optimum Setting
1	Oil Circulation Volume	Adjust the volume with the manufacturer's recommended value as the max. volume.
2	LO Treatment Temp.	90～95℃; temp. fluctuation should be within ±2℃.
3	Gravity Plate	Select the gravity plate that matches the density, heat temperature and circulation volume of the treatment oil according to the instructions of the purifier installation manual.
4	Sludge Discharge Interval	If the discharge interval is too long, sludge will harden and will not be discharged. The sludge will deposit on the bowl of purifier and cause the purifier imbalanced and endangered. Since the appropriate discharge interval can vary depending on the state of the treatment oil, check the contamination of the bowl before adjustment.

Table 3: Reduction of Treatment Capacity According to Treatment Temp. Reduction (Literature of Purifier Manufacturer)



3. Circulation Volume Required for Purifier (Overflow System & Direct System)

The LO circulation volume may vary depending on the lube oil pan capacity of the engine, but set the circulation volume of the engine lube oil at the volume that will circulate 4 times a day, (6 times a day in the case of 6N165L). Table 3 shows the circulation volume required for each engine model.

Table 4

Model	Oil Pan Capacity(L)	Circulation Time Required for a Day	Circulation Volume Required (L/Day)	Circulation Volume Required (L/h/Unit)
6N165L	470	6	2820	**118**
6N18(A) L	900	4	3600	**150**
6EY18(A) L	1000	4	4000	**167**
6N21(A) L	1000	4	4000	**167**
8N21(A) L	1200	4	4800	**200**
6EY26L	2200	4	8800	**367**
8EY26L	2800	4	11200	**467**
6N330L	3400	4	13600	**567**
8N330L	4800	4	19200	**800**

When LO was purified during engine operation by the overflow or direct system, LO temperature inside the engine can rise due to LO heating during purification. However, as far as LO circulation volume remains to be the volume as specified above, there is no problem with the temp. rise since the temp. control is conducted appropriately by the oil cooler installed with the engine.

4. Cleaning of Sump Tank

Even when LO is circulated appropriately by the purifier, sludge will subside and accumulate on the bottom of the sump tank as time advances and insoluble content in lube oil increase. Since the subsided and accumulated sludge cannot be removed by the circulation purification, we need to remove the sludge directly on a periodic basis.

Discharge lube oil inside the sump tank every **2000 hrs'** operation of the engine, open the cleaning manhole and clean inside the sump tank completely. Remove all sediments on the sump tank bottom.

5. Batch Treatment System

Yanmar recommends the use of the overflow continuous purification system for the use of HFO.

In the batch treatment system, LO is not purified while the engine is being operated, but LO is purified while the engine is stopped. Since all amount of the combustion residues are accumulated in the lube oil, it is necessary to purify lube oil completely to be ready for the following engine operation.

The procedures for the batch treatment system are as follows:

① Interval of LO Purification

When HFO is used, conduct LO purification every 200~300 hrs.

② Purification Treatment Procedure

Transfer all amount of contaminated lube oil inside the sump tank to the settling tank. Supply lube oil already purified stored in another settling tank to the sump tank to the specified quantity.

③ Circulation of Contaminated LO for Purification

Circulate contaminated LO of the settling tank through the purifier for purification. Adjust the circulation quantity, heating temperature, etc. optimum as shown in Table 2.

④ Time of Purification

Adjust the circulation quantity with the manufacturer's recommend value as the max. volume and continue purification so that all amount of lube oil to be purified is circulated for more than 20 times.

⑤ Purification without Using the Settling Tank

Yanmar recommends the use of the settling tank in order to obtain the satisfactory purification effect in the batch treatment system. However, when this is not possible, the circulation purification has to be conducted between the sump tank and the purifier. In this case, locate the LO take-out position of the sump tank as far possible from the LO return position. If the distance between these positions is close, the return LO can shortcut to flow to the purifier again and the amount of lube oil that locates far from the LO take-out position will not be purified.

6. Centrifugal Bypass Filter

The engine-mount centrifugal bypass filter is effective in controlling lube oil contamination of the engine being operated. In particular, in the batch treatment system, since circulation purification of lube oil is not conducted during engine operation, equipment of the centrifugal bypass filter is indispensable. The purification capacity of the centrifugal bypass filter lowers remarkably when the thickness of sludge deposited on the rotor exceeds 15mm. Accordingly, we need to disassemble the filter and remove the accumulated sludge when the thickness exceeded 10mm. Check the sludge accumulation and establish the disassembly and cleaning interval. The standard interval is every 100~250 hrs.

7. Replacement of Lube Oil

The maximum hours of use of lube oil is 6000~7000 hours. The asphaltene and vanadium in HFO, that entered in lube oil after long hours′ use, lower the purification dispersibility of lube oil, enlarge the combustion residues and give adverse effect to the moving parts of engine. The lube oil needs to be replaced with new oil after 6000~7000 hours′ use even when there is no problem with the results of property analysis of lube oil used.