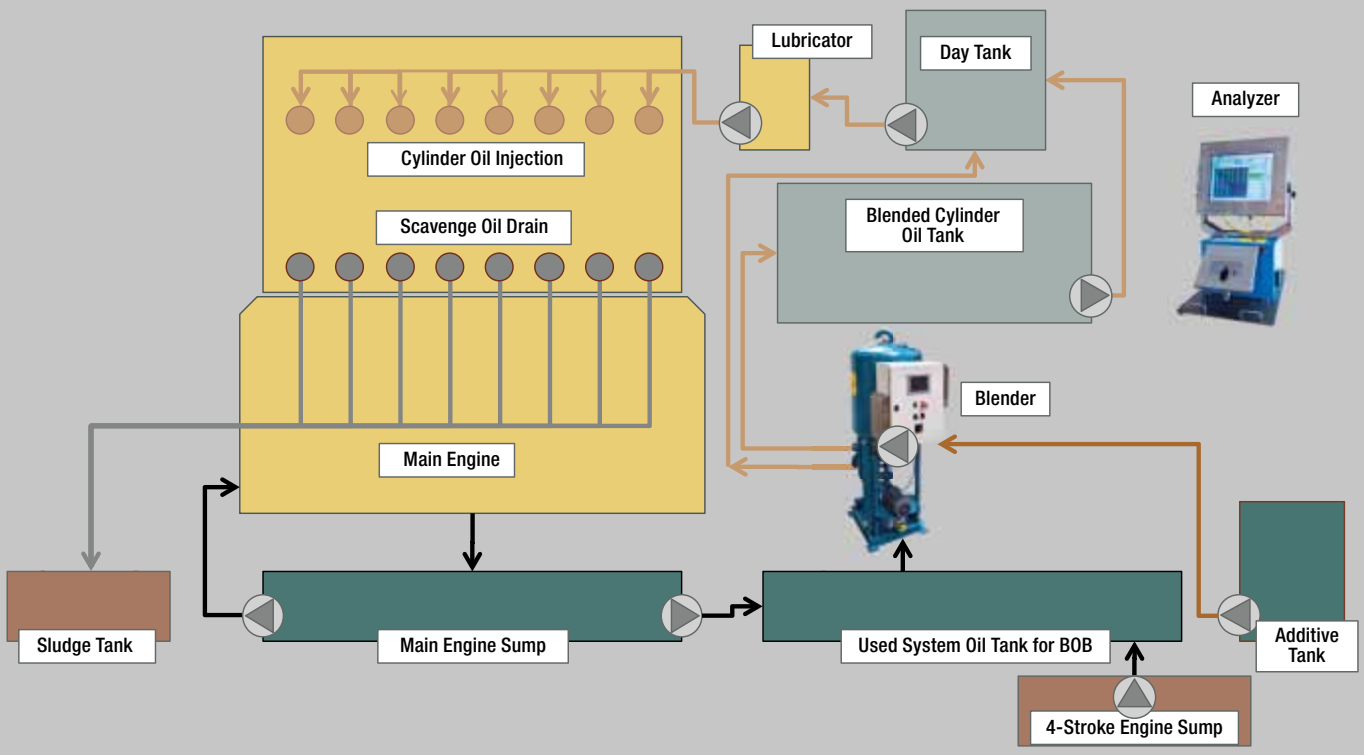
WÄRTSILÄ **Engine Services**

ENERGY ENVIRONMENT ECONOMY

OPTIMIZED 2-STROKE ENGINE LUBRICATION MANAGEMENT WITH WÄRTSILÄ BLENDING ON BOARD



Optimize the overall engine lubrication performance and costs with the help of the Wärtsilä Blending on Board (BOB) system and Engine Lubrication Management support services. The cylinder lubricating oil is blended from used system oil and additives for achieving the required properties. This enables the lowest possible feed-rate and keeps the engine clean.

BACKGROUND

Engine operation versatility in terms of operation load and heavy fuel oil quality is of paramount importance for operation costs. Furthermore, constraints related to emissions controlled areas and new fuel regulations call for more flexibility while ensuring reliable engine operation.

High sulphur fuel and harsh operation conditions require increased cylinder oil performance for neutralization, detergency and dispersancy. Extended engine operation with low sulphur fuel, or even MDO or MGO, is also required.

These conflicting requirements are usually addressed by the operators by the use of 2 cylinder oils (typically 40BN and 70BN) and a sulphur dependent feed rate adjustment according to the engine builder's recommendation to be able to cope with the variability of the fuel's sulphur content, in particular in reduced load operation.

CONCEPT

The Wärtsilä Blending on Board provides a unique, flexible solution to these challenging requirements. The concept is to keep the constant low cylinder oil feed rate optimal, while adjusting the base number (30-120 BN) according to the fuel sulphur content in relation to the relevant regulations and the engine operation load pattern.

Additional significant advantages of the BOB system include the replenishment of the main engine with new system oil and the auxiliary 4 stroke engines oil with new lubrication oil. The XRF analyzer will also allow a continuous monitoring of various engine fluids including the analysis of true Fe content, both corrosive and abrasive iron wear.

SOLUTION

Used main engine system oil will be blended with a specially formulated additive package in order to produce cylinder oil matching the requirements of the operator.

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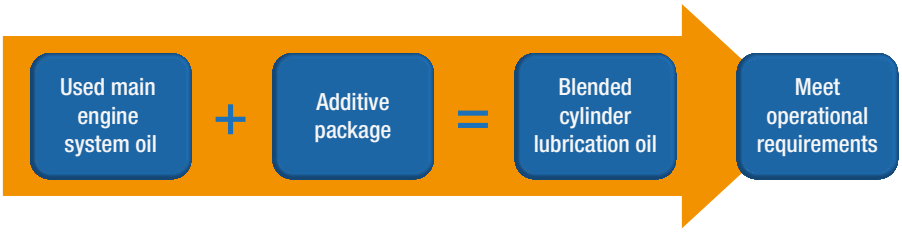

The Blending on Board system has been designed in a modular way in order to allow easy installation onboard the vessel.

The BOB system consists of a blender with a control panel, and a XRF analyzer (either with or without the ability to detect cat fines).

The system is compact enough to be transported through a normal door. Some modifications to the existing piping and tank allocation will be necessary but no new tank installations are required. The Blending on Board system has been ABS and Lloyds Register approved.

Once the Blending on Board system is installed, the operator needs to purchase only main engine system oil and the additive package. Initially, the condition of the used main engine system oil will be evaluated with the XRF analyzer. Then, depending on the chosen tank layout and operational requirements, the blended cylinder oil is pumped to the cylinder oil tank or directly to the cylinder oil day tank.

Wärtsilä provides full support and advice in required layout, installation and commissioning, and piping/tank adaptations.

We also offer a range of support services, from operational advice and overall lubrication optimization programs to supply of additives and system oils. The system supply and support services can also be packaged in an Engine Lubrication Management Agreement, which will provide additional guarantees and benefits.

OVERALL BENEFITS

- Producing blended cylinder oil from used system oil plus additives results in lower costs compared to using commercial cylinder oil.
- Obtaining the optimal constant low cylinder oil feed rate by variable BN blending, matching the fuel sulphur content.
- Engine “cleanliness” and reduction of deposits (crankcase, liners, piston rings, reduced system oil separator operation, maintenance) due to the regular replenishment of new system oil in both the main and auxiliary engine.
- Reduced frictional losses with positive effects on fuel oil consumption.
- Re-use of used system oil instead of its disposal reduces overall lube oil consumption and usage of BN.
- Additives bunkered for a minimum of one year operation creates operational flexibility as there is no need to buy commercial cylinder oil in expensive ports. Improved supply security by sourcing of system oil.
- Positive environmental impact (harmful metals reduced through BN optimization, low emissions).
- Payback time on investment within 2 years depending on engine type and operating conditions.
- Controlled cylinder liner and rings wear during harsh operation conditions such as slow steaming.

ANALYZER BENEFITS

- Early wear detection (liner scuffing) with access to wear metal, cat fines (M3000) and BN information.
- Analysis of HFO for cat fines and fuel sulphur level (confirm HFO prior to bunkering).
- Analysis results generated in 6 minutes.
- Analysis including all lubricated systems (maneuvering systems, ancillaries).
- Conduct used lube oil and fuel oil analysis can be done onboard instead of using laboratory services.
- Ability to trace each sample point’s history and forecast problems by observing trends.

Onboard blender

Onboard analyzer

- Ability to confirm lube and fuel separator efficiency through cat fines measurements (M3000).
- Measurement of key elements (Ca, V, Cr, Fe, Ni, Cu, Zn, Pb, S). Cat fines detection only with the Analyzer SEA-Mate® M3000 tests Si and Al down to 5ppm combined.
- Reduce cylinder oil feed rate to minimum, due to the ability to know the true iron wear in the cylinders.

Wärtsilä Blending on Board is based on the cooperation between Wärtsilä and Maersk Fluid Technology and utilizes the following SEA-Mate® systems:
– Blender: SEA-Mate® B3000
– XRF Analyzer: SEA-Mate® M2000 or M3000

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