



Case Study
Centrifuges
for Marine
Applications

FM400LF Centrifuge for Marine Applications

Enhanced engine lube oil cleanliness and increased operational and cost saving benefits with the use of a centrifuge.



Problem

Insufficient lube oil cleanliness, engine wear and increasing service costs



Application

Marine auxiliary engine



Outcome

Successfully met application challenge and exceeded cost savings in lube oil service as well as maintenance



Background

A shipping company was looking for a solution to provide better lubricating oil cleanliness of their auxiliary diesel engines. Oil was changed on average every 43 days and oil filters every 25 days. There were two clear objectives for the centrifuge field trial and subsequent installation throughout the fleet:

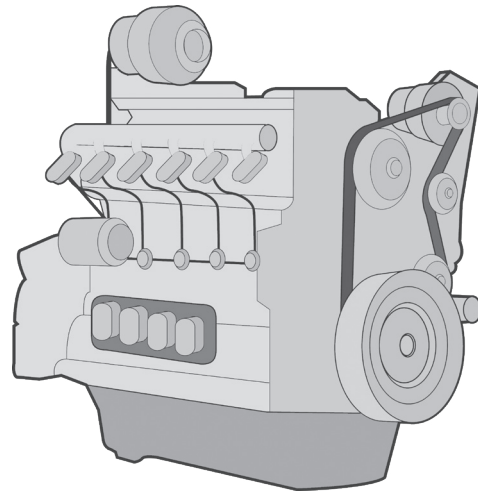
1. Cost saving benefits through oil and filter life extension
2. Potential operational benefits through reduced engine wear rates

Situation

Most Engine OEM's offer our centrifuges installed as an OE fit option during initial purchase. For this particular diesel engine the FM200 is provided as an option. If a centrifuge has not been selected initially it can be retrofitted instead. In this instance we recommended our larger FM400 Low Flow (LF) which provides more contaminant holding capacity, better cleaning performance and an easier product to clean, especially when the engine is burning HFO (Heavy Fuel Oil).

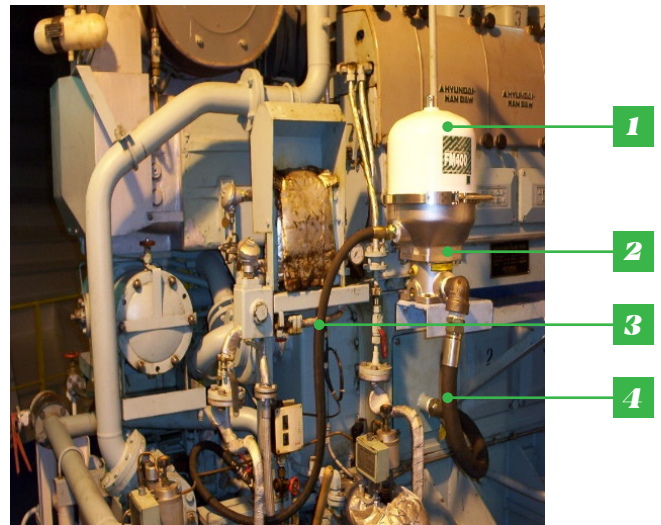
Application Details

Performance	Values
Make	GT 57,000 oil tanker
Engine	Auxiliary Diesel Engine
Annual hours	13,600 hours engine
Sump capacity	500 liter
Oil pressure	4.4 - 3.4 kg/cm ²
Oil temperature	64 °C
Oil type	Castrol TLX Plus 303
Engine load	75% (profile purifier available)



Centrifuge Selection

Performance	Values
Engine oil flow rate (A)*	17 m ³ /h or 283 l/min
Recommended flow rate for bypass filtration	10% or approx. 28.3 l/min (engines have 20% to 30% excess oil)
FM400LF flow rate	30 l/min or 10.6% of (A)*
Engine sump capacity	500 liter
FM400LF throughput	30 l/min x 60 min = 1,800 l/h
No. sump turns per hour	1,800 l/h / 500 = 3.6 (3-4 sump turns per hour is recommended)



- 1** MANN+HUMMEL FM400LF centrifuge
- 2** Remote mounting base
- 3** Oil feed to centrifuge (pressurized supply preferably before cooler and filters)
- 4** Oil drain line (return through modified crankcase door)

Remote Mounting Base

For retrofit applications where direct engine mounting of the centrifuge is difficult, MANN+HUMMEL offer remotely mounted designs, which use air pressure to assist the clean oil to return to the sump. This option is suitable only for applications where a supply of compressed air is available.

The FM400LF centrifuge was installed using our RMB (remote mounting base) technology taking an old feed directly after the engine oil pump (before standard filters and cooler) and returning the oil back through a modified crankcase door.

Results

Initial test samples were taken at 720 hours before the centrifuge was installed and again following 798 running hours with the FM-400LF.

- Spectrometry results:
Reduction with the centrifuge of 82% iron, 43% nickel, 46% silicon, 50% chromium, copper, lead, 42% aluminum and 75% tin (particles less than 10µm)
- Analytical results:
Total base number (TBN) was 12% higher with the centrifuge (22.7 mgKOH/g compared with 20.2 mgKOH/g). Viscosity at 100 °C dropped 2% from 13.96 mmµ/s to 13.68 mmµ/s.
- Particle counting:
0.1 µm – 5 µm = 87% reduction
5 µm – 300 µm = 90% reduction

Conclusion

Following impressive initial field tests (5 kilogram contaminant collected after just 600 hours of operation) the customer decided to do a one year test using Castrol and their 'Caremax' program to determine via oil analysis the oil and filter change frequency based on a combination of TBN, viscosity and particulate. Over the next twelve months, the customer was able to achieve an extension from 600 to 1,005 hours for the filter change interval and an extension from 1,042 hours to 1,634 hours for the oil change interval resulting in a payback period of less than nine months for their investment.



Operational and Cost Saving Benefits Analysis

	Without centrifuge	With MANN+HUMMEL centrifuge
Total work hours	4,523 h	4,523 h
Filter service interval	600 h	1,005 h
Annual service interval	7.5 / y	4.5 / y
In-line filter service cost	1,250 €	1,250 €
Annual in-line filter service cost	9,375 €	5,625 €
Oil change interval	1,042 h	1,634 h
Annual oil service frequency	4.34 / y	2.7 / y
Oil service cost	1,000 €	1,000 €
Annual oil service cost	4,340 €	2,700 €
Total annual cost for oil and filter service	13,715 €	8,325 €
Total savings after one year operation		5,390 €



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