



## Lubrication oil analysis

**The modern diesel engine is a technically complex system, requiring expert operation and fault finding capabilities by the onboard operators. With increasing power outputs and levels of complexity, the ever-increasing levels of technical understanding rise on an annual basis.**

Lubrication oil testing is well known throughout the industry as it has been around for some time now. Results made available by the reports should be carefully examined in order to determine the correct condition of the oil. However, in the modern diesel engine, considerable understanding of the contaminants that may be present is required.

### **Why do we test every three months?**

Most marine engineers are well versed in the pros and cons of correct lubrication oil management, and several will have stories about various failures. Modern diesel engines feature

heavily in Loss Prevention Bulletins, particularly those which utilise system oil as a hydraulic medium.

An oil is designed to satisfy a particular task for a finite period of time. Exceeding these limitations may impair the reliability of an oil, often resulting in catastrophic failures. Such failures do not come cheaply and may be the difference between the success and failure of a company.

### **How are samples tested?**

Firstly, we should consider from where we should draw the sample, as this is important to gain a good understanding of the condition of the oil. Most lubricating oil suppliers will perform a site survey and identify on each the ideal locations for drawing a sample.

The representative sample should be taken from a high traffic area such that we may consider the sample to be typical. The sample connection should be flushed through before taking



Poor sampling location: not on the main line and not a clean pipe with shape edge to prevent dirt build-up

**LP FOCUS IS PRODUCED BY THE CLUB'S LOSS PREVENTION DEPARTMENT AND EXAMINES IN DETAIL TOPICAL ISSUES REQUESTED BY MEMBERS.**

the sample and then sealed and identified with the type of oil and location sample number it was drawn from.

The sample is submitted to the testing facility, usually via a courier travel pack, and the results are forwarded to the technical managers within a few days. Grading of the oil quality, normally using the "traffic light" system, is recorded on the report. Appropriate guidance is normally detailed in the comments section. The overview of the technical managers is very important. However, this is sometimes neglected, to the detriment of the ship's machinery.

### What can the results show?

Lubrication oil testing follows industry standard protocols, including viscosity, particle analysis, lubricity and water content. Other contaminants may be tested for, but these are the main items.

Viscosity (an oil's ability to resist shear) is an indication of a fluid's ability to lubricate efficiently within a particular temperature range.

A typical trunk engine oil would be "SAE 30" indicating the index to be "30". The manner in which it maintains its viscosity is determined by its "viscosity index". The larger this figure, the more stable the oil over a particular temperature range.



Lubrication oil sample

### Trend analysis

Every sample is tested individually and the exact results are discussed in a concise form within each report. The historical values for each parameter are recorded graphically within the report and may identify a particular trend.

Alteration of the viscosity, particularly on medium speed engines, may be prevalent. Contamination either by fuel oil (or marine gas oil) may be particularly troublesome, mainly due to the SECA areas globally requiring the operator to change the fuel grade for emissions reasons.

In addition, contamination due to "blow past" of exhaust gases may have an adverse effect on the particle analysis

count, which may also have a similar effect on the apparent viscosity. An increase in the "PQ" number may indicate rising levels of blow past, which could indicate decreasing sealing between the pistons, cylinder liners and ultimately piston rings.

Blow past is, of course, progressive and any indications that this is occurring should be investigated promptly. Remedial repairs should be carried out before the risk of potentially expensive damage becomes apparent.

### Correct conditioning

A lubrication oil should be cared for continuously. Regular exchanging of filtration devices, overhauling of centrifugal separators and where applicable, oil exchange, should be performed strictly in accordance with the PMS guidelines.

Examination on a daily basis of the engine operating parameters including the lubricating oil inlet pressure and cylinder head lubrication should be verified.

Water content should also be checked at least on a weekly basis, and continuous centrifugal purification carried out as required by the manufacturer's operating/maintenance manuals.

### Guidance

Interpretation of a lubrication oil analysis report requires experience and a good understanding of oil chemistry. Contaminants that may be identified within a report may not identify a particular breakdown, but collectively and over time, they may jointly identify a particular failure.

Evaluation of key contaminants, such as aluminium, chromium, copper, iron, lead and tin may lead to a requirement for additional specialist testing, which could give rise to a requirement for a full or partial oil exchange or further testing.



**By Adam Lewis**  
Marine Engineer Consultant,  
TMC London



**& Mike Wilson**  
Marine Engineer Consultant,  
Director TMC Melbourne



The London P&I Club



Published on behalf of The London Steam Ship Owners' Mutual Insurance Association by  
A. Billbrough & Co. Ltd.,  
50 Leman Street, London E1 8HQ, UK.  
Tel: +44 (0) 20 7772 8000  
Fax: +44 (0) 20 7772 8200  
E-mail: london@londonpandi.com  
www.londonpandi.com

