FA-ST Filtration Analysis Services Technology Ltd

OIL FILTRATION SOLUTIONS FOR

Lube Oil Analysis

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Our PRE-PAID Standard LUBEKIT1 for testing, **Gear, Hydraulic, Turbine, Transmission Engine etc**. The sample kit contains, 60ml PETG bottle, sample tubing, bottle & equipment ID labels and Postal Jiffy Bag and PRE-PAID return addressed Postage Label (Please note the Jiffy Bag and return address label are not included in our international kits (OMKLUBE)). Price is inclusive of the analysis and report. All reports are issued in pdf format by e-mail. Turnaround time from receipt of the sample in our laboratory is 2 working days. Analysis covers Wear, Contamination & Chemistry along with our analysts' comments and where appropriate any actions or recommendations.

For wear the LUBEKIT1 tests for;

- A large range of different metals Aluminium, Chromium, Copper, Iron, Lead, Nickel, Silver, Tin, Vanadium and Titanium.
- Also the **Ferrous Wear Index** gives an indication of the total measure of Iron (regardless of size) in the sample. This technique is used to determine early component wear.

The contamination tests include;

- **Particle Count (ISO) –** Particle counting is actually a test for particle contaminant levels and not specifically for wear debris. It does not distinguish between wear and dirt particles, but if it can be determined that nonferrous contamination has remained stable, then an increase in the particle count must be attributable to wear.
  A magnet can be used to modify the particle count to count ferrous debris only. There are various ways of doing this, but essentially a magnet holds back the ferrous debris while the nonferrous debris is flushed from the sample, after which a ferrous debris particle count is performed.
  Particle counts are invariably reported according to ISO 4406:17. Other standards do exist, but they are not as commonly used. ISO 4406:17 returns a three-digit solid contamination code.
  The method of particle counting is not as important as performing the test properly. It is important to note that only results from the same method should be compared.

- **ISO 4406 Standard:**
  The ISO 4406/2017 classification of particle contents was introduced to facilitate comparisons in particle counting. Sudden breakdown in an oil system is often caused by large particles (>14 micron) in the oil while slower, progressive faults, e.g. wear and tear, are caused by the smaller particles (4-6 micron).This is one of the explanations why the particle reference sizes were set to 4 micron, 6 micron and 14 micron in ISO 4406/2017.
  A typical sample contains in every 100 ml of oil:

- 450,000 particles >4 micron
- 120,000 particles >6 micron
- 14,000 particles >14 micron

Introduced in the ISO classification table (below), this oil sample has a contamination class of 19/17/14

ISO 4406 Standard Classification table		
Particles From	Particles To	ISO Number
80,000	160,000	24
40,000	80,000	23
20,000	40,000	22
10,000	20,000	21
5,000	10,000	20
2,500	5,000	19
1,300	2,500	18
640	1,300	17
320	640	16
160	320	15
80	160	14
40	80	13
20	40	12
10	20	11
5	10	10
2.5	5	9
1.3	2.5	8
0.64	1.3	7
0.32	0.64	6
0.16	0.32	5
0.08	0.16	4
0.04	0.08	3
0.02	0.04	2
0.01	0.02	1

- **Water K. Fischer** – The Karl Fischer test measures the exact amount of free and dissolved water molecules contained in the oil sample. The Karl Fisher test is reported in a numerical value.

- **Boron -** Used as a corrosion inhibiter, anti-wear and anti-oxidant additive. Concentration levels vary greatly depending on oil brand. Also Boron is used in extreme pressure compounds and dispersants. It can also appear as a contaminant as it can be used in the manufacture of coolant conditioners. Boron can come from a few areas; it can come in with water, coolant, from worn seals or airborne dust.

- **Silicon -** Although silicon is usually seen as an indication of dirt entry it can have many different sources. Silicon is part of a chemical added to oils to stop them foaming so silicon can be an additive. It is usually found in a concentration of 5 to 10 ppm, so do not be surprised to see silicon in new engine oil samples. Do not panic, this is not due to dirt. Silicon is found in chemicals used in coolant conditioners so it can show up as a contaminant if there is an internal coolant leak, along with sodium.

- **Sodium** - The most common chemicals contain sodium so this is the first indication of an internal coolant leak. Other chemicals found in coolant conditioners contain elements such as molybdenum, phosphorus, chromium, boron and silicon. Elements that make up the physical structure of the cooling system and can leach into the oil (from either the water or the oil side of the cooler) include copper, tin, lead and silver. Sodium can also be found as an additive in some engine oils (often replacing calcium or magnesium) but this is a lot rarer than it used to be. Some greases contain sodium as part of the soap and sodium will be evident if the oil is contaminated with sea water.

The Chemistry tests include;

- Testing for Calcium, Magnesium, Molybdenum, Phosphorus, Zinc and Manganese to check the level of additives within the oil to make sure that they are in spec.

- **Oil Viscosity -** Monitoring oil's viscosity is a critical factor in extending a machines life and overall reliability, accurate monitoring and managing of oil's viscosity can also prevent costly breakdowns. The viscosity of an oil is the most important physical effect of an oil and plays a role in energy efficiency.

Tests can be carried out in the following ways:

  - **40 degrees Celsius -** Viscosity, or oil weight, examines the thickness or thinness of the sample oil. The test measures the time for a volume of liquid to flow under gravity, determining the kinematic viscosity of oil at 40°C. Equipment manufacturers specify viscosity when indicating machine tolerance, bearing loads and the rate of heat removal.
  - **100 degrees Celsius (additional test) -** The Viscosity 100° C test measures the thickness of the oil at a high operating temperature. Viscosity, or oil weight, examines the thickness or thinness of the sample oil. The test measures the time for a volume of liquid to flow under gravity, determining the kinematic viscosity of oil at 100°C.
  - **Viscosity Index -** (VI) can be calculated from viscosity measurement at 40°C and 100°C using ASTM D2270. The VI can be trended and compared with new oil specifications to detect changes in the lubricant condition. With new, high speed used oil viscometers available, measuring the oil sample at both temperatures is very cost effective.

There are several additional tests e.g. TAN/TBN/VISC100 etc. that may be required for certain types of lube oils and our laboratory can carry out all of these on request.