What WeTest

Wear Metal Analysis

Wear Metal Analysis is used to determine the concentration of microscopic (<10 microns) wear elements and contaminants using **I.C.P. (Inductively Coupled Plasma)** reporting in parts per million (PPM). It is very important in monitoring the condition of the oil and plays a key factor in determining what goes on to the report that goes out to each customer.

PQI (Particle Quantifier Index) Analysis

Particle Quantifier analysis is used on all oil samples to determine the total level of ferrous material in the sample. Samples with very high PQ values are good candidates for further examination for large metal particle presence to determine exactly what may be failing.

Water (H^2O)

A simple positive/negative water test is carried out on all oil samples. This is accomplished by dropping a small amount of oil onto a hotplate at a temperature of 150 degrees C. Any water in the sample boils off, causing bubbles to appear. The amount of water present is reported by comparing the number of bubbles in the sample to that of Standards. For an extra cost, our lab technicians can perform the **Karl Fischer Moisture Test** on the sample to determine the precise amount of water present reported in PPM or percent.

Infra-Red Analysis

(FTIR) This is carried out on all engine oil samples to test actual oil condition compared to the new oil used. Levels of Soot, Oxidation, Sulphation and Nitration in used oils are measured. Test also indicates any suspected fuel, water or antifreeze contamination. Selected transmission oils are tested for oxidation level, which may be of concern if extending the oil change interval.

Infra-Red Analysis focuses on:

SOOT (ST)

is found only in engine oil. It is the insoluble residue of partially burned fuel. It is held in suspension by the oil additive package and causes engine oil to turn black. When soot drops out of suspension in the oil, it contributes to additive depletion and eventually increases oil viscosity. Heavy concentrations of soot can cause bearing damage by starving contact surfaces of lubrication.

SULPHATION (SUL)

Occurs in all gas oil fired diesel engines and comes from the sulphur content of the fuel. Excessive Sulphation levels, when combined with moisture, generate acid which can cause pitting corrosion within the engine.

OXIDATION (OXI)

occurs in transmission, hydraulic and engine oils when oxygen molecules chemically join with oil molecules. Oxidation causes the oil to thicken, form acids, and lose lubrication qualities, which threatens the life of your components. Oxidized oil will cause deposits on engine pistons and valves, ring sticking and bore polishing. In hydraulic systems and transmissions, it can cause valve scuffing and sticking.

NITRATION (NIT)

occurs in all engine oils but is generally only a problem in natural gas engines. Nitrogen compounds from the combustion process thicken the oil and reduce its lubricating ability. If nitration continues unchecked, it can result in filter plugging, heavy piston deposits, lacquering of valves and pistons, and eventual failure.

ANTIFREEZE (A)

The glycol in antifreeze causes rapid oxidation of the oil and usually indicates a cooling system leak. Severely oxidized oil becomes "sticky" and forms sludge that plugs the filter. Any amount of glycol contamination in the oil is unacceptable. Engines, hydraulics or transmissions using water-to-oil coolers may become contaminated with coolant if a leak develops in a cooler tube or seal.

WATER: (W)

If infrared analysis indicates the presence of water, the approximate amount is determined by placing a drop of oil on a plate heated to between 230° and 250° F. If water is present the oil will bubble and sputter. By comparing the amount of bubbling to laboratory control samples, experienced laboratory technicians can determine the quantity of water in the sample. Any amount over 0.5 percent is considered excessive.

TBN (Total Base Number)

Is a measure of the reserve alkalinity of the oil and is an indicator of the oils remaining ability to neutralise the acids which can be generated by the sulphur in the fuel after the combustion process? This process is not a routine test and incurs extra cost.

TAN (Total Acid Number)

Is a measure of the quantity of acid or acid-kike derivatives in the oil. An increase in the TAN from that of the new lubricant should be monitored. The TAN of a new oil is not necessarily zero, since some oil additives can be acidic in nature. This process is not a routine test and incurs extra cost.

FUEL (F)

(Only tested for if the viscosity results are very low) in the engine oil reduces its lubricating properties. Small amounts of fuel are common as a result of the combustion process. But if fuel levels exceed recommended levels, we will suggest a check for defective fuel injection nozzles and other sources of leakage. Fuel dilution is generally the result of extended idling, incorrect timing, or a problem with the fuel injectors, pumps or lines.

Viscosity Test (V40 or V100)

A viscosity test is carried out on all samples. Viscosity is measured in Centistokes at 40 degrees Centigrade and at 100 degrees Centigrade (if required) and is the most important physical property regarding lubrication. Viscosity index can also be calculated and reported if required which is valuable in confirming the multi-grade properties of the oil.

Fuel Dilution Test [Fuel (%) Wt]

Conducted where possible fuel presence is detected by a fall in the viscosity. Actual percentage of fuel in sample is determined by a drop in the flashpoint of the used oil compared to that of the new oil.

Particle Count (ISO test)

Particle Count Analysis is carried out on all Hydraulic/Steering/Brakes and some Transmission oil samples. The instrument counts and sizes all particles present in the sample and reports an internationally recognised cleanliness code (ISO 4406). Recently, there has been increased recognition of the importance in assuring the cleanliness of oil, particularly within hydraulics and transmissions. Greatly increased component life can be expected by maintaining oil cleanliness at a certain level.

Magnetic Test

On completion of all other tests, a magnetic dip test is carried out if abnormal readings such as high **PQI** are indicated. This involves stirring a magnet in the oil to attract pieces of ferrous metal which are too large to pick up with I.C.P. analysis. This gives the interpreter valuable visual information on the particles present in the sample. We also now do a visual appearance test on all samples to help determine the condition of the oil.

Microscopic Examination (At the discretion of the interpretation staff)

Results are based on ferrous particles in oil. Samples with very high PQ values and where certain wear elements are high, further examinations may be undertaken to determine large metal particle presence. Slides are prepared and viewed under a light microscope. Images from which, can be "grabbed" and printed out if required. The shape colour and size of abnormal particles helps to determine exactly what may be failing.

Common Abbreviations Used in Our Tests

Elements

Al Aluminium	**B** Boron	**Ba** Barium	**Ca** Calcium	**Cu** Copper	**Cr** Chromium
Fe Iron	**Mg** Magnesium	**Mo** Molybdenum	**Na** Sodium	**Ni** Nickel	**P** Phosphorous
Pb Lead	**Si** Silicon	**Sn** Tin	**Zn** Zinc	**Ag** Silver	**Ti** Titanium
V Vanadium	**W** Tungsten	**Be** Beryllium	**Sb** Antimony	**Cd** Cadmium	

Tests

FTIR (Infrared) **ST** = Soot **OXI** = Oxidation **SUL** = Sulphation **NIT** = Nitration
W = Water **F** = Fuel **A** = Antifreeze

V40 = The Kinematic viscosity @ 40 deg C in Centistokes
V100 = The Kinematic viscosity @ 100 deg C in Centistokes (Only used by special request)

Fuel (%) Wt = The percentage of fuel dilution found by weight
TAN = Total Acid Number
TBN = Total Base Number
Water (%) Wt = Percentage Water content by weight
PQI = Particle Quantifier Index. An index number representing the level of ferrous particles of all size groups in the sample.