S·O·S℠

Analytical Services

OIL ANALYSIS

MONITOR YOUR EQUIPMENT'S HEALTH

Introduced in 1971, the S•O•S program is the world's leading oil analysis program for earthmoving equipment and diesel engines. Since its inception, the S•O•S program has grown into the largest oil analysis program in the world.

By performing a series of scientific tests on a properly collected sample, the S•O•S interpreters can read that record and provide a specific description of the problem and recommendations for corrective actions. Within 48 hours of receiving a fluid sample, a report is generated which can warn the customer of a wide variety of problems going on inside their equipment.

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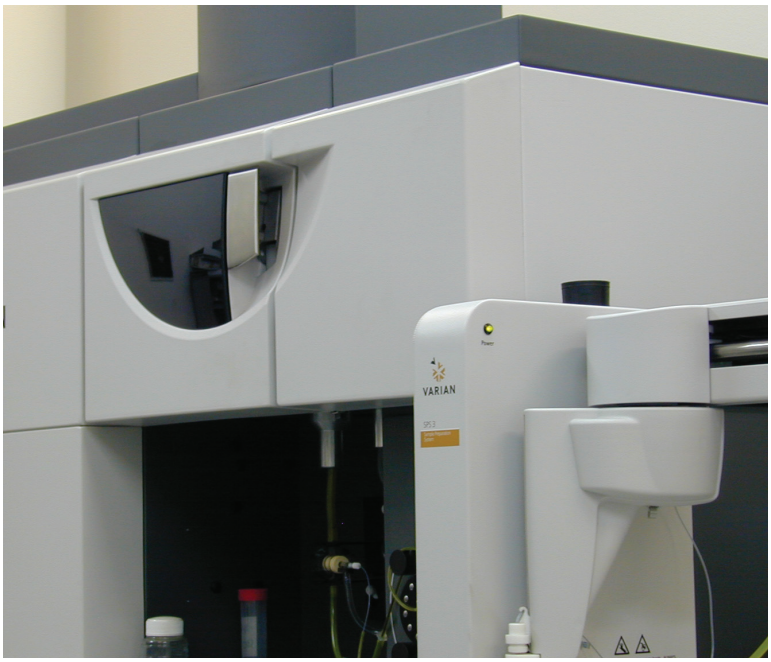
ELEMENTAL ANALYSIS

Cavpower's S•O•S Elemental Analysis reports on the concentration of 18 different elements. The elemental testing via ICP (Inductively Coupled Plasma) spectroscopy detects elemental wear metals and additives that are sized 10 microns and smaller.



ELEMENTAL ANALYSIS	Reported in ppm (parts per million), the presence of each element will fluctuate according to hours/ miles in use, oil added, recent repairs and other factors
Below is a brief description of some of the more important S•O•S elements	
Copper (Cu)	Bearings, bushings, thrust washers and brass parts. Engine readings may vary dramatically.
Iron (Fe)	Rust, gears, shafts, cylinders, valve train components and liners in some applications.
Chromium (Cr)	Piston rings, chrome plated crankshafts, some exhaust valves, roller and ball bearings.
Lead (Pb)	Found in many bearings, rod, turbo, camshaft and some bushings. Gasoline additive.
Aluminium (Al)	Bearings, thrust washers, converter, pump bushings and pistons. Dirt entry from clay soils.
Tin (Sn)	Piston plate coating. Overlay of connection rod and crankshaft main bearings.
Nickel (Ni)	Wear indicator in some bearings, shafts or valves.
Silver (Ag)	Wear of some bearings, secondary indicator for cooler.
Titanium (Ti)	Alloy in high quality gears and bearings.
OTHER CONTAMINANTS	
Sodium (Na)	Inhibitor from cooling system or oil additive. Environmental contaminates (salt water).
Silicon (Si)	Caused by dirt, dust entry or seals.
(ADDITIVES)	
Molybdenum (Mo)	Piston ring coating in some engines or anti-wear additive in oil.
Boron (B)	Additive in certain coolants.
Potassium (K)	Additive in certain coolants.
Phosphorus (P)	Anti-rust agent, deposit reducer.
Zinc (Zn)	Anti-oxidants, corrosion inhibitor, anti-wear, detergent, extreme pressure agent.
Calcium (Ca)	Detergent, dispersant, acid neutralizer.
Magnesium (Mg)	Dispersant, detergent, alloying metal.

OIL CONDITION ANALYSIS

S•O•S WEAR RATE ANALYSIS

Prevent Problems and Reduce Costs by Knowing Wear Rates

Wear Rate Analysis is an integral part of our S•O•S Program that helps you maintain equipment performance and maximize availability. Through regularly scheduled testing of oil samples from your engine, hydraulics and power train systems, Wear Rate Analysis detects metal particles caused by component wear. By monitoring trends in the type and quantity of particles, you can get early warning of problems before major damage occurs.

Understanding Wear Metals

Every oil-washed system - engines, hydraulics, transmissions, and final drives - produces wear metals in everyday operation. If wear accelerates, the concentration of wear metal particles increases, signalling a problem. Wear Rate Analysis allows you to find problems before they result in major repairs or machine failure.

Wear Rate Analysis can detect particles that range up to about 10 microns in size. Wear metal concentrations are expressed in parts-per-million (or ppm). The S•O•S Oil Analysis program tests for at least 18 different elements: e.g. Copper, iron, chromium, lead, tin, aluminium, molybdenum, silicon and sodium. All are wear metals found in machines and engines except silicon (which generally indicates dirt) and sodium (which indicates water or coolant). Certain elements in a sample may be from the oil additive package rather than from wear within the system. Skilled dealer interpreters can tell the difference between normal elements and those that indicate abnormal wear.

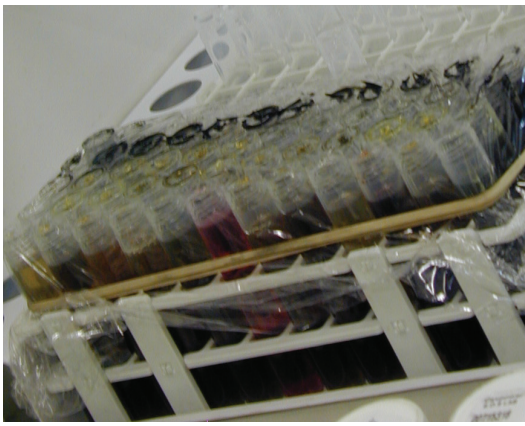
S•O•S OIL CONDITION ANALYSIS

Maximise Performance by Knowing Your Oil Condition

Oxygen exposure, heat and contaminants cause all oils to degrade. Engine oil is particularly susceptible to degradation by sulphur, nitration, by-products of combustion, high temperatures, and water from the combustion process or condensation. Oil Condition Analysis, part of the comprehensive S•O•S Oil Analysis program, helps prevent component damage by monitoring your oil and keeping track of its degradation. Oil Condition Analysis also allows you to correct problems that affect oil performance. The bottom-line benefit: maximum oil performance, optimum oil change intervals and reduced repair costs.

Understanding Oil Condition Analysis

Oil Condition Analysis is similar to Wear Rate Analysis with one important exception: it evaluates chemical compounds in the oil rather than wear element particles. Oil Condition Analysis is important for oil from all systems - transmissions and hydraulics, as well as engines.



OTHER OIL CONTAMINANTS

Contaminants result from outside sources or from chemical changes in the oil. Contaminants such as fuel, water, ethylene glycol and soot are from outside sources. Oxidation, sulfation and nitration are from chemical changes in the oil.

FUEL

Fuel contamination is confirmed using viscosity and flash point test in which the used oil is heated to a prescribed temperature in a closed cup, then subjected to an ignition source. Fuel vapours driven off by the heat will flash if the dilution exceeds four percent. Fuel in the engine oil reduces its lubricating properties. Small amounts of fuel are common as a result of the combustion process. 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, or a problem with the fuel injectors, pumps or lines.

WATER

If infrared analysis indicates the presence of water, the approximate amount is confirmed by placing a drop of oil on a plate heated to 120°C. 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. Water can contaminate a system by leaking in from the outside or condensing in the engine's crankcase or compartment. When water combines with oil, it reduces the oil's ability to lubricate and forms a sludge that plugs filters. Water passing between very close components can create "hot spots." If the water gets hot enough, it causes tiny steam explosions that can fracture metal.

VISCOSITY

Viscosity is the measure of the oil's ability to lubricate. If the viscosity changes, the oil no longer lubricates and is unable to protect surfaces efficiently. If the oil is running too hot or if the oil change interval is extended, the oil can oxidize. This will cause the oil to thicken and the viscosity to increase. If fuel is getting into the crankcase, the oil will be thinned. This will cause the viscosity to decrease. The S•O•S program measures the viscosity of all oil compartments. Any changes, either an increase or decrease, will be detected and corrective action can then be initiated.

For further information on Oil Analysis or to discuss any of our other services, please contact our laboratory on **(08) 8343 1426** or by email **analyticalservices@cavpower.com**

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