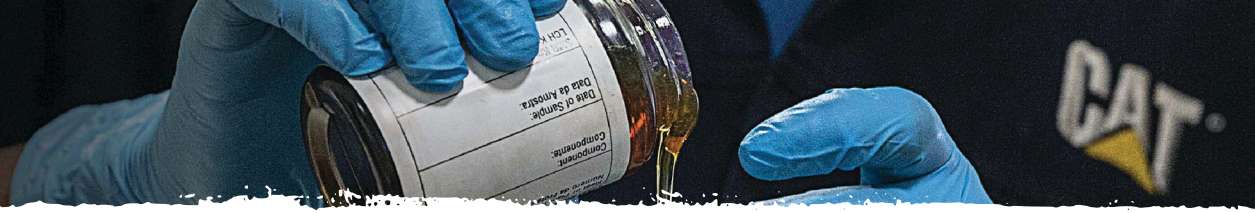
Ohio CAT

S•O•S℠ FLUID ANALYSIS

UNDERSTANDING THE S•O•S FLUID ANALYSIS TESTS



KNOW WHAT THE NUMBERS MEAN AND MAXIMIZE YOUR INVESTMENT. SOS fluid analysis is a valuable management tool that can maximize equipment life and productivity, and minimize operating costs and downtime. Three types of analysis are performed on engine, hydraulic and drive train oils: ***wear element rates***, ***oil condition/contaminants***, and ***particle count***.

EXPLANATIONS AND SOURCES OF INCREASED READINGS

WEAR ELEMENT RATES: monitors and tracks metal wear particles, contaminants and oil additive package elements *(reported in parts per million).*

Lead (Pb) - used as an overlay on main and rod bearings. Possible problem areas include lack of lubrication, coolant or fuel contamination.

Iron (Fe) - present in culinder liners, pistons and piston rings, valve guides, anti-friction bearing rollers and races, gears and gear teeth. Possible problem areas include abnormal operating temperatures, oil degradation, fuel/coolant contamination, stuck/broken piston rings or bearing fatigue/failure.

Molybdenum (Mo) - used in some diesel engines to plate upper piston rings. Present naturally in crude oils and used as an anti-friction additive in some lubricants. May appear as result of coolant leak from Molybdates present in some extended life coolants.

Chromium (Cr) - plating material for machinery components such as shafts, seals, piston rings, bearing cages and some bearings. Possible problem areas include blow by, oil consumption, oil degradation or hydraulic cylinder rod wear.

Silicon (Si) - Silica debris or cleaning fluids. Possible problem areas include dirt entry through the engine's air induction system, hydraulic cylinder wiper seals or suction lines in the hydraulic system. Used as anti-foam additive in some oils.

Aluminum (Al) - enters oil primarily from wear. Found in pistons, journal bearings, shims, washers, accessory casings, bearing cages of planetary gears and some engine blocks. Possible problem areas are bearing or piston wear. Aluminum also present in some clay soils.

Copper (Cu) - found in oil cooler cores, journal bearings, thrust bearings, cam and rocker arm bushings, piston pin bushings, gears, valves, turbocharger bearings and hydraulic pump pressure plates. Possible problem areas include oil degradation and contamination.

Sodium (Na) - naturally present in some crude oils, usually present as a result of a coolant leak.

Tin (Sn) - present in bearing alloys, brass, oil seals and solder.

Phosphorus (P) - naturally present in some crude oils and as an anti-wear additive in some lubricants. Its presence can also be the result of a coolant leak.

Potassium (K) - naturally present in some crude oils, usually present as a result of a coolant leak.

Calcium (Ca), Barium (ba) and Magnesium (Mg) - sometimes used a detergent, dispersing and/or anti-oxidant addivitives for lubricants.

Zinc (Zn) - present in brass components. Also an oxidation inhibitor that helps prevent viscosity increases and acid development.

OIL CONDITIONS/CONTAMINANTS: compares new to used oil to see if it is providing adequate lubrication and protections. Detects if water, glycol or fuel is in oil.

Soot (ST) - reported in terms of % allowable. Only found in engine oil. Heavy concentration of soot can cause bearing damage. Indication of lugging; air inlet restriction; or extended engine idling, possible filter plugging.

Oxidation (OXI) - reported in terms of % allowable. Occurs in all compartments and accelerated by heat, extended oil drain intervals and contaminants such as water and anti-freeze. Oxidation causes the oil to thicken and lubrication qualities.

Sulfation (SUL) - reported in terms of % allowable. During combustion, fuel sulfur oxidizes, then combines with water to form sulfuric acid. Acid corrodes all engine parts, but is most dangerous to valves and valve guides, piston rings and liners.

Viscosity (V100) - reported in centistokes (cSt @ 100°C). Measures a lubricant's resistance to flow. Viscosity changes indicate improper servicing, dilution, contamination or lubrication breakdown.

Nitration (NIT) - reported in terms of % allowable. Occurs in all engine oils, but is generally only a problem in natural gas engines. Nitrogen compounds from the combustion process reacts with water to form nitric acid and thickens the oil and reduces its lubricating ability. Can lead to filter plugging and heavy piston deposits.

Fuel Contamination (F) - reported either negative (N) or positive (P). Tests for more than 4% diesel fuel in oil. Fuel contaminatioin is generally the result of extended idling, incorrect timing, or a problem with the fuel injectors, pumps or lines.

Antifreeze Contamination (A) - reported either negative (N) or positive (P). Tests for more than .01% by volume ethylene glycol antifreeze in oil. Any amount of contamination in the oil is unacceptable. Usually a positive result indicates a cooling system leak.

Water Contamination (W) - reported either negative (N) or positive (P). Tests for more than .1% water by volume in oil. Possible problem area and causes are coolant leaks and condensation (due to low operating temperature).

PARTICLE COUNT: used for transmission and hydraulic oil samples, determines the level of wear particles in the oil and if the contaminants are causing accelerated wear (reported in particle counts per unit volume). Reported in the number and size (in microns) of particles in a volume of fluid. Particle counts are divided into size ranges, each based on a specific size particle. The ISO code is a kind of cleanliness "shorthand" that provides an instant identifier that sums up oil cleanliness in three numbers (X/Y/Z). The first factor (X) represents the number of particles larger than 4 microns, the second factor (Y) represents the number of particles greater than 6 microns and the third factor (Z) represents the number of particles greater than 14 microns. When establishing cleanliness standards, only the Y & Z channels are considered. As numbers change between tests of camples from the same compartment, the can be the first indication of a problem.

COOLANT ANALYSIS:

GLYCOL CONCENTRATION

Level too Low: Loss of freeze/boil control

Level too High: Loss of heat transfer capability

CONDUCTIVITY

Probable Cause: Poor source water, combustion gases in coolant, stray electrical current

Potential Damage: Metal pitting

pH LEVEL

Level too Low: Coolant will attack ferrous metals and solder

Level too High: Coolant will attack aluminum

NITRITE CONCENTRATION

Level too Low: Loss of corrosion/cavitation control. Liner pitting, corrosion of system metals and deposit formation

Level too High: Possible overdosing of SCA. Maintenance chemicals will precipitate out of coolant resulting in deposits

QUESTIONS ABOUT INTERPRETING YOUR RESULTS? OILLAB@OHIOCAT.COM 440-838-7258