

S.O.SSM Fluid Analysis

Our Goal Is Simple! We want you to be 100% satisfied with the analysis that we've completed today! If you have any questions regarding the interpretation, recommendations or anything else (*no matter how small!*), please call us.

CONTACT: **OIL ANALYSIS at 508-482-5700**
e-mail: oil_analysis@miltoncat.com

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** – monitors and tracks metal wear particles, contaminants and oil additive package elements.
- **Oil Condition/Contaminants** – compares new to used oil to see if it is providing adequate lubrication and protection. Detects if water, glycol or fuel is in the oil.
- **Particle Count** – used for transmission and hydraulic system oil samples, determines the level of wear particles in the oil and if the contaminants are causing accelerated wear.

EXPLANATIONS AND SOURCES OF INCREASED READINGS

WEAR 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 contamination or fuel contamination.

Iron (Fe) – present in cylinder 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 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 in oil as a consequence of a coolant leak.

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

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

Calcium (Ca), Barium (Ba) and Magnesium (Mg) – sometimes used as detergent, dispersing and/or anti-oxidant additives for lubricants.

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

Potassium (K) – naturally present in some crude oils. Usually present in oil as a consequence of a coolant leak.

PARTICLE COUNT *(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 samples from the same compartment, they can be the first indication of a problem.

OIL CONDITION AND CONTAMINANTS

Soot (ST) – Reported in terms of % allowable. Only found in engine oil. Heavy concentration of soot can cause bearing damage. Indication of lugging; over fueling; air inlet restriction; or extended engine idling. Can lead to filter plugging.

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

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. If it continues unchecked, it 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 contamination 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).

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.

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

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

pH LEVEL

- **Level too Low:** Coolant will attack ferrous metals and solder
- **Level too High:** Coolant will attack aluminum