UNDERSTANDING YOUR REPORT

You don't need to be an expert. The built-in diagnostics do it for you!

The test results and diagnostic comments have been generated using the latest technological advancements in oil analysis. The diagnostic statements come from spectroscopic measurements to report on both the physical condition of the oil and the engine. These measurements consist of 6 wear elements and 3 contaminant elements which are microscopically suspended in the oil. These are formed by friction between moving parts, abrasion or corrosion. When ionized, these suspended oil particles are analyzed in the **On-Site Analyzer MotorCheck™, TruckCheck™** or **MicroLab™** and measured in parts per million (ppm). These results are scientifically matched against known engine characteristics and reported in the diagnostic section of the report. The diagnostic statement takes into account the combination and severity of the wear metals and distills a complex science into an easy to understand statement. The condemning limits (or break points) are dependent on time on oil and time on the engine since new or overhaul. **It is the time on oil that determines if a NORMAL, ABNORMAL or SEVERE** is noted**.** Oil serviceability and contamination levels are determined by the Physical Properties of the oil for gasoline, diesel and CNG/LNG engines.

Wear Metals indicate the overall condition of an engine: The use of additional diagnostics will help pinpoint severe engine conditions. Below is a guide to understanding engine wear by using oil analysis.

Diagnostics:

Air Filter:. A damaged air intake system can show high SILICON levels. Ingestion of dirt, resulting from a failed or torn air filter can lead to piston, ring, cylinder and bearing wear.

Bearings: Abnormal LEAD and TIN are the first indicators of bearing failure. Bearing wear can come from localized oil starvation from a blocked oil passage. Dirt, abrasive particles, or the presence of corrosive chemistry caused by overheating or over-extending an oil drain can lead to SEVERE bearing wear.

Bushings: Abnormal and Severe COPPER plus IRON indicate piston pin, valve guide or crankshaft thrust bushing wear.

Crankshaft: Abnormal IRON combined with LEAD, TIN and COPPER are associated with crankshaft wear, most often caused from a severe bearing failure.

Cylinders: CHROMIUM, ALUMINUM, and IRON combine to show cylinder wear. Abrasive particles (Dirt) and coolant in the combustion chamber are the most common causes of cylinder wear.

Engine Block/Head/Cylinder Liner: The presence of Coolant in the oil may indicate a crack in a cylinder block wall or cylinder head allowing coolant to mix with the oil. This can be caused by extremely low or high operating temperatures. Cylinder liner pitting can be caused by incorrect coolant or over extended coolant drain interval.

Piston Rings: Abnormal CHROMIUM is the first indicator of piston ring wear resulting in low compression.

Pistons: Abnormal ALUMINUM can be caused by burned pistons. ALUMINUM, CHROMIUM and IRON indicate Severe piston wear. Abrasive particles (Dirt) and coolant in the combustion chamber can lead to premature piston wear.

Valve Train: IRON alone at abnormal or severe levels indicates camshaft, valve lifter, timing chain/gear or rocker shaft wear.

Coolant Contamination: Abnormal or severe POTASSIUM plus SODIUM (Conventional Coolant) or SODIUM plus SILICON (Long-Life Coolant) indicate that engine coolant may be present in the engine oil. This can be caused by leaks from EGR valve, EGR cooler, intake gasket, blown head gasket, cracked engine block/cylinder head or perforated cylinder liner. Coolant contamination in engine oil destroys an oils ability to lubricate and can leads to piston, ring, bearing wear and can cause localized oil starvation; leading to eventual catastrophic engine failure.

Oxidation/Nitration: Abnormal OXIDATION or NITRATION can be caused by over-extending an oil drain interval, too high of operating temperature or corrosive oil additives like chlorine.

Fuel Content: Abnormally high FUEL content in the oil can be caused by leaks in internal fuel lines, failed fuel pump diaphragm, leaking fuel injectors, plugged air filters, worn spark plugs and low engine compression. Further engine tune-up diagnostics are recommended.

TBN: Total Base Number is a measurement of effective oil will be at suspending wear-causing contaminants and counteracting corrosive acids. The higher the TBN, the longer and oil can be continued to be used. TBN numbers below 3 are totally exhausted and severe engine wear can result. On most oils with a TBN measured above 6.0 can consider extending the oil drain schedule.

Contaminants / Physical Properties:

Aluminum contamination commonly comes from piston, timing chain cover or camshaft bushing wear. Aluminum may also come from engines that have aluminum blocks or cylinder heads.

Chromium is commonly found in piston rings.

Copper can be found in bearing backing material, thrust bushings and piston pin bushings. Some oil coolers are also made of copper.

Iron can come from many places in an engine. It is the combinations of wear metals that will indicate whether the iron is from the cylinders, crankshaft or valve train.

Lead is the primary surface coating in camshaft, main and connecting rod bearings. The addition of COPPER and IRON will give an indication of the severity of the bearing wear.

Potassium is found in antifreeze. It should NOT be present in engine oil at any abnormal level.

Silicon is a part of abrasive DIRT. It can also be from seal material or Long-Life coolant. RTV sealants can leach SILICON into the oil.

Sodium is found in airborne road grime, coolants as well as part of some new oil chemistries. Some aftermarket oil additives may also contain sodium.

Tin is the secondary surface coating in camshaft, main and connecting rod bearings.

Molybdenum is seen as an anti-wear additive or an alloy in bearings / piston rings.

Fuel in engine oil, can indicate faulty combustion, rich air/fuel mixture or leaks. A low level of diesel fuel contamination is difficult to detect without the use of a viscometer. Abnormal fuel should not be present in engine oil.

Glycol may contain Potassium, Sodium or Silicon, and is used in most commercial antifreeze blends. Glycol will only show up when liquid coolant contamination is SEVERE and will NOT show up if coolant is burned in combustion chamber.

Water Contamination can come from a cracked engine block/cylinder head, leaking head/intake gasket, water pump seal, or ingestion of water from operating vehicle in flood conditions.

Viscosity Is a measure of an oil's resistance to flow, typically referred to as the "Weight" of the oil. Proper oil viscosity is critical to the operation of any Equipment, providing protection against excessive metal wear and heat buildup.
The presence of fuel dilution, excessive soot or water, and shearing are some of the factors that adversely affect an oil's viscosity.

Proper Engine Oil Services will greatly increase the life of your engine. Over-extending the drain intervals will cause oil condition failure due to contamination and lead to premature engine failure.

Additional Diagnostic Services may be needed if Severe results are indicated.

Retest the oil in 1,500 miles or 50 hours to see if Abnormal condition persists.