# COOLANT ANALYSIS

## INTERPRETATION GUIDE

Typical Coolants are carefully formulated mixtures of water, glycol and corrosion inhibitors, designed to regulate the temperature of combustion engines. Without proper monitoring, cooling system issues can progress and cause serious damage or complete engine failure. The Fluid Life Coolant Test Package is designed to meet major engine OEM requirements, provide maximum value and can be supplemented with specialized tests when appropriate.

| TESTS | FUNCTION OR EFFECT |
|---|---|
| **Refractive Index** | • Refractive index is used to determine % glycol, freeze point, and boiling point of coolant. |
| **% Glycol** | • Glycol is used to suppress the freezing point and elevate the boiling point of a coolant.<br>• Glycol level will vary depending on the coolant brand and type selected for each application. |
| **Freezing Point** | • Freeze Point indicates the temperature (°C) at which the coolant mixture will freeze.<br>• In general, freeze point should be a minimum of 5°C (9°F) below the lowest expected ambient temperature.<br>• Serious damage to the engine and radiator can occur when the water in the coolant freezes and expands. |
| **Boiling Point** | • Boiling Point is the temperature (°C) at which the coolant will start boiling.<br>• In general, boiling point should be a minimum of 5.6°C (10°F) above the maximum operating temperature of the cooling system.<br>• Boiling will dramatically reduce the heat transfer properties of coolant.<br>• Boiling point decreases 1.5°C (3°F) for every 300 m (1000 ft.) above sea level, and increases approximately 1.5°C (3°F) for each system psig (1 psig = 7 kPa). |
| **pH** | • An indication of the acidity/ alkalinity of the coolant.<br>• The acceptable pH range depends on the type of coolant used.<br>• High pH may be a sign of excessive additive treatment or a blend of conventional and long life coolants.<br>• Low pH can indicate glycol breakdown, combustion blow by, local hot spot or air leak.<br>• Improper pH levels can lead to metal corrosion. |
| **Conductivity** | • Measure of the coolant's ability to conduct electrical current.<br>• Current is measured in microsiemens per centimeter (µS/cm).<br>• High conductivity can reduce the effectiveness of coolant inhibitors and accelerate cooling system corrosion and/or pitting. |
| **Color** | • Color should resemble that of the original coolant used.<br>• Any change is indicative of a mixing of coolants, contamination, and/or degradation.<br>• Different types of coolant should not be mixed because the additives may react and the coolant may lose its properties. |
| **Odor** | • Unusual odors in coolant can be an indication of contamination such as: diesel fuel, residual cleaners, or adverse conditions such as general or localized overheating. |

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| **Clarity** | • Coolant should be clear and bright.<br>• Any change is indicative of contamination and/or degradation. |
| **Precipitate** | • Precipitates are solids that can become present in coolant.<br>• Precipitates are often caused by using non-distilled/deionized water, over concentration of coolant inhibitors, air leaks, or defective electrical grounds.<br>• Solids in the cooling system can lead to water pump and seal abrasion and subsequent leakage, liner pitting, copper and aluminum corrosion and a plugged oil cooler and radiator. |
| **Magnetic Precipitate** | • Magnetic Precipitate is a sign of wear in the cooling system from overheating or inhibitor break-down. |
| **Nitrites** | • Primary inhibitor for iron protection; used to prevent cavitation of wet sleeve liners.<br>• Reported as a concentation in parts per million (ppm).<br>• Alarms are based on comparison with new coolant reference or levels typical of coolant type.<br>• Many conventional and extended life coolants (ELC) include nitrites for metal corrosion and protection from cavitiation/pitting.<br>• Rapid depletion of nitrites and an increase in glycolates indicates general overheating of the cooling system, a localized hot spot or air ingress. |

| OPTIONAL TESTS | FUNCTION OR EFFECT |
|---|---|
| **Carboxylates** | • Some ELCs are formulated with a combination of organic acids including Carboxylic Acid in the corrosion inhibitor package.<br>• Coolants that contain carboxylates are typically Nitrite free.<br>• Carboxylate detection is an optional test recommended for coolants that contain Carboxylates as part of the corrosion inhibitor package.<br>• Nitrite Free coolants that include Carboxylates are generally red, red/ orange, or blue in color. |
| **Reserve Alkalinity** | • A measure of how much buffer is still available in the coolant to neutralize acid formation. Note that the pH of a coolant will not change much until the buffer package is depleted.<br>• Reported in milliliters (ml) of acid required to neutralize the coolant sample.<br>• High Reserve Alkalinity (RA) is an indication of over concentration of additives; low RA is an indication of over dilution or neutralization of additives.<br>• RA is generally not required for modern coolant formulations that are typically premixed, have very stable additives and are entirely replaced when degraded.<br>• Alarms are based on comparison with new coolant reference. |

## ADDITIONAL INFORMATION

- Mixing coolants at any time is not recommended and may lead to a loss of protective ability, damage to the cooling system and engine, and/or reduced coolant service life.
- Change coolant as per engine manufacturer's instructions.
- Coolant Analysis is recommended every 250 hours in order to detect premature degradation of coolant that can lead to more serious equipment problems.
- Adequately completed coolant sample information is important for accurate test flags and recommendations.

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