

## S·O·S<sup>SM</sup> Coolant Analysis



Fifty percent of all engine downtime is associated with cooling system problems. S·O·S coolant analysis helps pinpoint problems early and prevent failures.

### ***A little time now could save money later***

Cooling system maintenance is often neglected or overlooked, especially since Cat® ELC™ (Extended Life Coolant) has increased maintenance intervals. But the fact remains: Problems that begin in your cooling system can spread throughout your engine, transmission or hydraulic system. The most effective and economical way to monitor your cooling system is with S·O·S coolant analysis from your Cat Dealer. A regular schedule of coolant sampling:

- Verifies the proper chemistry of your coolant
- Diagnoses the condition of your cooling system
- Allows you to correct coolant or cooling system problems before costly failures occur



# S·O·S Coolant Analysis

## ***It pays to monitor your coolant***

Almost everyone recognizes the need for regular oil and filter changes, but many people overlook cooling system maintenance and monitoring. The cooling system is critical to the efficient performance and long life of your diesel engine. Proper cooling affects many machine systems, including the transmission and hydraulics, which are cooled by heat exchangers.

With S-O-S coolant analysis, your Cat Dealer offers a quick, low-cost way to evaluate the effectiveness of your coolant, check for contaminants and monitor the condition of the cooling system and other major engine systems. S-O-S coolant analysis is performed by trained technicians who are cooling system experts, so you can count on accurate, dependable lab results, interpretations and recommendations.



**Left undetected, corrosion (as shown on this cylinder liner) can cause costly damage and downtime.**

## ***Investing in performance***

S-O-S coolant analysis can quickly pay for itself in improved efficiency, longer component life, fewer repairs and less downtime. Instead of allowing components to fail, you become aware of problems early, before major repairs are needed. S-O-S coolant analysis is an excellent equipment management tool that allows you to identify shortcomings in operational practices and maintenance procedures. It saves money by permitting you to optimize your coolant drain intervals.

## ***Keep it cool and keep it running right***

Engines are the most likely to suffer from cooling problems. For example, overheating can reduce the lubricating properties of engine oil, leading to excessive wear and failure of rings, liners, bearings and valves. In hydraulic systems, overheating can oxidize and deplete additives in hydraulic oil, resulting in valve wear, shorter pump life and seal failure. When transmission oil becomes overheated, clutch slippage increases, reducing transmission life.

All of these systems depend on a properly maintained and efficient cooling system to function at optimum levels. S-O-S coolant analysis helps you achieve this goal.

## ***Even Extended Life Coolant needs maintenance***

Cat ELC is specially engineered to reduce maintenance by lasting twice as long as the previous Cat® DEAC (Diesel Engine Antifreeze/ Coolant). However, this does not exempt ELC users from monitoring and maintaining their cooling systems. In fact, the longer the coolant remains in the engine, the more important it is to evaluate the coolant at regular intervals. While ELC performs significantly better than DEAC, maintenance and operational problems can destroy any coolant (and your engine) if not caught in time.



### Two-level program

The goal of the S-O-S coolant analysis program is to spot problems before damage occurs. These problems – and related costs – caused by poor coolant or cooling system performance can be avoided when you use this two-level program.

#### Level 1 Analysis

Level 1 consists of four basic maintenance tests and four physical evaluations that can reveal major problems with the coolant and predict some cooling system problems. For example, Level 1 Analysis can identify a drop in pH caused by glycol oxidation or exhaust gas blowby — and reduced pH increases the potential for corrosion. Level 1 results may indicate the need for Level 2 Analysis.

#### Level 2 Analysis

Level 2 involves an extensive chemical evaluation of the coolant and the overall condition of the inside of the cooling system. These comprehensive tests can identify coolant degradation products and subtle cooling system problems, determine probable causes, and help prioritize repairs.

Detectable system problems include positive or negative stray current, contaminant entry, a faulty block heater and exhaust gas entry. Poor operational practices such as excessive lugging or improper shutdown procedures may also be indicated with Level 2 Analysis.

#### Separate vacuum pumps

When taking fluid samples, it is important to designate separate vacuum pumps for oil and coolant samples. Although the fluid does not enter the barrel of the pump, a small residue of glycol from the coolant remains and can contaminate the oil sample. Likewise, oil residue can contaminate coolant samples, resulting in false readings. *Coolant samples should be taken from the radiator, not from the overflow tank or drain valve.*

#### Complete sample information

Before you mail your sample, make sure to fill out the entire label on the bottle. It's particularly important to report the number of hours, miles or kilometers the coolant has been in use. See sample label below.



Several in-depth tests are performed on coolant samples to determine the health of the cooling system.

#### Easy-to-use test kits

There is no substitute for the professional quality of S-O-S coolant analysis. However, Caterpillar offers two coolant test kits that allow you to make occasional on-the-spot checks. Both kits check coolant nitrite levels to ensure adequate protection from cavitation damage and corrosion, as well as the glycol level for corrosion, boil and freeze protection. Kit No. 8T5296 uses liquid chemicals to check the nitrite level. Kit No. 4C9301 provides easy-to-use test strips.

Engine Coolant Analysis		
<i>Do not take sample from overflow tank</i>		
Dealer Name <i>St. John's Tractor Co.</i>	Date Sample Taken <i>08/27/97</i>	
Owner Name <i>Lane Construction</i>	Address or Phone Number <i>Kansas City, MO 64108</i>	
Machine Serial No. <i>8XC00280</i>	Engine Make & Model <i>CAT D350C</i>	Equipment No. <i>807</i>
Meter/Reading <i>7303</i>	Hours/Miles/Km on Coolant <i>2067</i>	Job Site <i>Shop</i>
Coolant type: <input checked="" type="checkbox"/> Extended Life Coolant <input type="checkbox"/> Conventional Antifreeze		
Was coolant additive or extender added at this sample time? <input type="checkbox"/> yes <input checked="" type="checkbox"/> no		
Was coolant changed at this time? <input type="checkbox"/> yes <input checked="" type="checkbox"/> no		
<i>Take sample after coolant has circulated</i>		PEEP 5032

It's critical to fill out the S-O-S coolant analysis label with complete information for the most accurate results possible.

***Every sample tells a story***

Here's some of the valuable information S-O-S coolant analysis can determine from your sample.

<b>LAB RESULT</b>	<b>CAUSE</b>	<b>EFFECT</b>
Glycolate and Formate	Overheated coolant (overheated glycol)	Corrosion
High Glycol Level	Too much concentrate added	Poor heat transfer and solder attack
High Lead	Overheated coolant and/or high lead solder used	Solder attack
Low pH with High Iron	Piston blowby or overheated coolant	Severe corrosion
High Copper	Negative stray current or inadequate flushing after cleaning	Ammonia attack of copper radiator/coolant cores
All Metals High with Low Glycolate	Positive stray current	Severe metal attack
Precipitate	High glycol level and/or unacceptable source water	Radiator/cooler tube block or water pump seal leakage
Unacceptable Hardness Level	Unacceptable source water	Precipitation of additives
Oil in Coolant	Cavitation through liners or heat exchanger leak	Engine seizure
High Chlorides	Contamination by source water or atmosphere	Iron corrosion
Low Sebacate	Standard coolant or water added to ELC+	Iron and solder attack
High Silicate and/or High Phosphate	Too much Supplemental Coolant Additive (SCA)*	Water pump seal leakage
Low Glycol Level	Too much water added*	Cavitation, corrosion, reduced freeze point
Low Nitrite and/or High Iron	Not enough SCA added*	Cavitation and corrosion
High Aluminum	Overheated coolant or low SCA*	Aluminum attack

+ Applies only to Cat Extended Life Coolant (ELC)

\* Applies to Standard Diesel Engine Antifreeze/Coolant (DEAC)

***Contact your Cat Dealer to get started***

It's easy to get started with S-O-S coolant analysis. Just contact your Cat Dealer to obtain bottles, sample cards and mailers. Your very first samples could save you money and help you avoid potential problems and downtime.