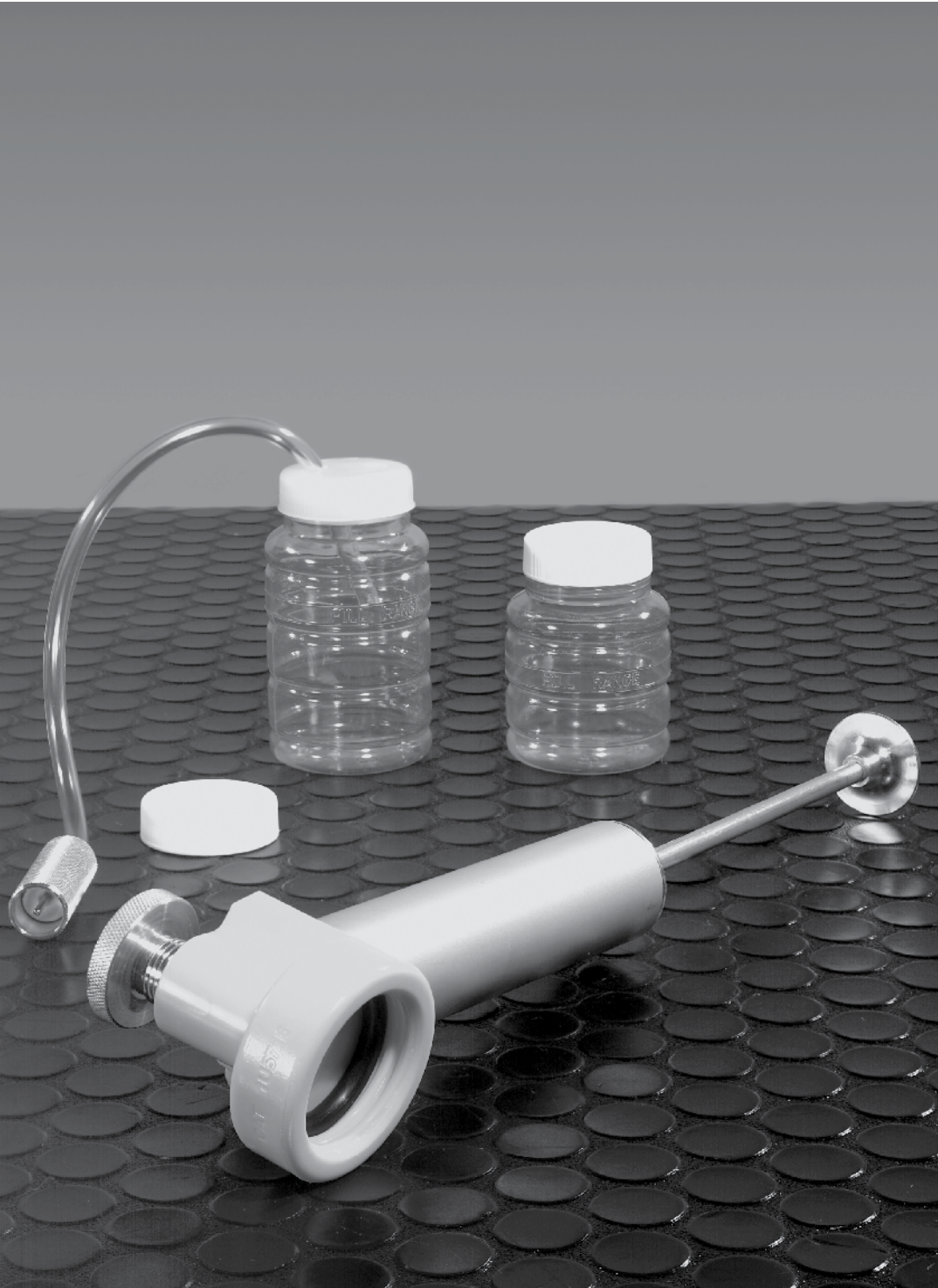


Cat[®] S·O·SSM Services

Management Guide

- Accurate Analysis
- Improved Cost Control
- Optimized Performance



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Committed to keeping your equipment moving

Like all Cat® Dealer services, the S-O-SSM Services program is a mutual commitment to protect the performance and value built into your Cat machines. The S-O-S Services program offers you valuable resources for better equipment management. Working together with your Cat® Dealer, you can take the simple process of fluid sampling and combine it with state-of-the-art analysis and clear, easy-to-understand reporting to create not only optimized machine performance, but also improved cost control.

As your local Cat Dealer, we back up our fluid analysis with our reputation for excellence and the expertise of trained Analysts. Enrolling in the S-O-S Services program is your assurance that you'll get accurate analysis. Only your Cat Dealer S-O-S Analysts have access to the expertise of Caterpillar design specifications and engineers. The S-O-S lab completes testing quickly and provides comprehensive maintenance advice in easy to understand terms. Make the commitment and get the benefits of working with the people who know your Cat equipment best.



Making the most of S-O-S Services

In order to be a useful and effective management tool, S-O-S Oil Analysis results must be timely, accurate and reliable. Following are steps you can take to assure that every sample provides usable information about your engines and machines.

Provide samples for trending

A single oil sample may spot a serious problem such as dirt entry or contamination by fuel or coolant. But to get the full value from the S-O-S program, it is essential to perform sampling at regular intervals. It takes a minimum of three samples to establish a meaningful trend for each system. Every engine and machine system has a trend “signature” for wear metals and oil condition parameters. Watching the progress of each system by trending greatly increases the accuracy of data analysis.

Stay close to the sampling schedule

The suggested S-O-S sampling intervals have traditionally been 250 hours for engines and 500 hours in other compartments. But in some applications or when you are determining optimal oil change intervals, 250-hour (or more frequent) sampling intervals are recommended for all compartments. All test results are “normalized” to reflect the scheduled number of hours of wear on the oil. This allows your S-O-S Analyst to accurately compare results from several sampling periods and identify trends over time. Talk to us to find out the best sampling intervals for your equipment.

Use sampling valves when possible

Most Caterpillar® engines have sampling valves installed at the factory. Samples taken from these valves are more reliable



because they come from a consistent, known location where the fluid is well mixed and circulated. If the oil flow is slow at low idle, it may be necessary to have someone accelerate the engine to high idle while extracting the sample. Do not take your oil sample from the drain stream, because dirty oil from the bottom of the compartment will contaminate the sample. Likewise, never dip an oil sample from an oil container or pour a sample from a used filter.

Upgrade older machines—install fluid sampling valves

Sampling by valve provides you significant advantages over other sampling methods (see box to the right). Many machine owners are upgrading their older machines by installing fluid sampling valves to take advantage of these benefits. Talk to us about the installation options for your older Cat equipment.

Take samples from the new oil source

Whether you store your oil in drums or bulk storage, take samples from the source to confirm your oil storage practices are not contaminating the oil.

Keep sampling supplies clean

Dirty supplies will contaminate your samples and cause inaccurate test results. Keep new sample bottles capped and store them in dust-free plastic bags. Be sure your vacuum pump, tubing and valve probes are protected from dust during storage.

Use a tube cutter for oil sample tubing

Using the tube cutter (1U7648) is better than a pocket knife. It gives you a clean cut while using only one hand and is less likely to transfer contamination. Replacement blades (1U8589) are also available.

Advantages of using sampling valves

More reliable

- Samples taken from a continuous flow of fluid at a known location make comparative data more reliable.
- Samples taken using a valve better represent fluid condition because the fluid has been well mixed and circulated.

Faster and more convenient

- The probe allows the valve to be quickly flushed prior to taking the oil sample.
- Sampling by valve is two times faster than using a sampling gun.
- Maintenance personnel are more likely to take samples because the valve method is much more convenient than using a sampling gun.

Inspect the filters

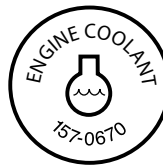
You can get valuable information about your equipment by cutting open used filters. The 4C5084 filter cutting tool may be purchased for this purpose.

If metal particles are present, a magnet can be used to determine if they are iron or steel. Also be alert for pieces of synthetic friction material or rubber seals, which may indicate a problem.

Use protective dust caps

Rubber dust caps should be kept on all sampling valves. These black rubber caps indicate the system being sampled and help protect the valve from contamination that could taint test results. If a dust cap is missing, promptly order the appropriate replacement.

8C3445	Dust Cap (Engine)
8C3447	Dust Cap (Transmission)
8C3451	Dust Cap (Hydraulic)
157-0670	Dust Cap (Engine Coolant)
6V0852	Dust Cap (Blank)
8C8456	Seal Cap (Stops leaks)



Provide complete sample cards

It is impossible for an S-O-S Analyst to give accurate recommendations without all the required information on the sampling card. Fill out as much information as possible before you begin taking samples, then add the meter reading when you get to the machine or engine. You'll find your cards are more legible and the job will take less time. For optimal results, record the hours or miles on the fluid and the amount of make-up fluid added since the last fluid change.

Submit your sample promptly

Send your sample to the lab without delay. The sooner we have your fluid sample, the sooner you will receive valuable maintenance advice.



Good equipment health...it keeps you going

Building a maintenance relationship

The S-O-S program can be an excellent tool for better communication with us. S-O-S test results help us know your equipment better so we can make more accurate maintenance suggestions. For example, studies show that 40 percent of all oil changes are performed either too soon or too late. Through the S-O-S program, we can provide expert feedback to reduce risks to your equipment and save you money.

Understand your S-O-S Analyst's requests

Occasionally, your S-O-S Analyst may ask for more information or a second oil sample. It is important to fulfill this request because:

- Your S-O-S Analyst may want a shorter-term sample (perhaps half the oil change interval) to verify a trend.
- Your Analyst may need repeat samples from two adjacent compartments to check for possible oil transfer.

- Your Analyst may ask you to change the oil and filter, run the machine for a short period, then sample again. This determines debris carryover and establishes a baseline for future samples.
- The original sample may be suspect because it might have been accidentally contaminated when drawn or taken "cold."
- The volume of the original sample may have been too small to perform the necessary tests.
- Your Analyst may forward the sample to Caterpillar for analysis beyond the standard S-O-S tests.

Retain the value

Machines and engines which have been using S-O-S Services generally bring a higher return upon trade-in or sale. For example, some owners of on-highway truck fleets have found that they can command a higher price for their trucks at trade-in or at auction if they can produce comprehensive S-O-S records. Auctioneers of Caterpillar machines often hold up a stack of S-O-S reports and inform the buyers that a particular machine has greater value because it has been using S-O-S Services.

This increase in value will more than make up for the cost of S-O-S Services.



Get added protection with S•O•S Coolant Analysis

Inadequate cooling system maintenance can eventually lead to system problems or even engine failure. For these reasons, we also offer a Coolant Analysis Program. This two-level program is used to determine if your coolant has the right chemical balance for maximum protection and efficiency. It can also spot problems in your engine and other water-cooled systems.

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 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. Ask us for details.

A coolant sampling valve can be installed on your engines to permit taking a well-mixed sample safely.



The S-O-S Services program is one element of a condition monitoring philosophy that you can put into place with your equipment to monitor the impact of your maintenance program. The S-O-S Services program, combined with regular inspections, analysis of your equipment's site conditions, electronic data and service history, will enable you to evaluate your equipment's health. You can perform a maintenance program on your own, or you can enlist the assistance of your Cat Dealer to perform any level of preventive maintenance that will keep your equipment running at peak performance.

How fluids get contaminated...and how you can control it

How oil gets contaminated

Improper storage and handling can add harmful contaminants to your equipment fluids. Contaminants can get into a system during service through dust and particles sticking to filler caps, funnels, transfer pumps and replacement parts. Use caution to avoid introducing dirt into your machines and engines.

During operation, dirt can get into engines through damaged air filter elements, bad seals, faulty hose clamps, cracks in air induction systems or other damaged parts. Also, dirt sticks to cylinder rods in the normal operation of equipment. If a rod or wiper seal is damaged, dirt can enter the fluid system. Dirt can also enter at leaking seals, cracked tubes or seeping gaskets so if oil can get out, dirt will get in.

In general equipment operation, the presence of water, fuel and glycol are most often indicators of internal system problems. With S-O-S oil contaminant testing, you can identify these problems early and perform maintenance before they turn into downtime and additional expenses.

Your hydraulic systems are vulnerable

Contamination is the number one enemy of hydraulic systems. When contaminants enter the system, they accelerate component wear and reduce system efficiency.

The effects of contamination on hydraulic systems are often difficult to detect because efficiency losses occur slowly over time. For example, the hydraulic system efficiency of a loader or excavator reaches about 20

percent before a skilled operator notices a difference. When this happens, your machine must work for five days to deliver the productivity of approximately four. These efficiency losses can also increase fuel consumption and significantly increase your operating costs—ultimately reducing your profit.

After repairs—take “baseline sample”

When a major repair has been performed, it is a good idea to take a baseline oil sample after several hours of operation to assure new oil cleanliness. It could prevent thousands of hours worth of needless wear.



You can control contamination

How you maintain your equipment can contribute to contamination problems, especially in hydraulic systems. To make sure you are doing your part to control contamination:

Change oil filters regularly and carefully

Because oil filters contain contaminants, it is important to remove them carefully. Proper removal ensures that contaminants do not re-enter a system. It is also important to keep new filters free of contaminants by leaving them in their packaging until you are ready to use them.

Change air filters only as indicated by the service indicator

The Cat Air Filter Service Indicator provides an accurate and continuous reading of the air filter's condition. The indicator eliminates guesswork when servicing air filter elements, saves money and reduces the number of times a system is opened.

Use the proper filters

Filters that do not meet the efficiency requirements of your machines can allow dirt to circulate within the systems. To avoid this problem, we recommend installing Cat filters. They meet all the specifications of your Cat machine.

Use Ultra High-Efficiency (UHE) filters after the system has been open

UHE filters have ultra-fine media that trap even tiny contaminants. By installing these filters after the hydraulic or drive train systems have been open for maintenance or repair, you can remove any contaminants that may have entered the system. Use UHE filters every 250



service hours or after any maintenance or service invasion.

Never fill a filter with oil. Install all filter elements "dry." Filling an element with oil before installation can introduce contaminants in the system.

Change oil regularly and properly

Drain oil when it is warm and agitated (contaminants are stirred up so more are removed during the oil change). One of the options available through S-O-S Services is optimized oil change intervals. By monitoring S-O-S oil analysis results, we can work with you to establish proper oil change intervals.

Use a transfer filter cart

Never transfer oil directly from a drum to a machine system. Ask us for more information on Caterpillar filter carts.

Use tight-fitting drum covers

Airborne particles and water can enter oil drums. Fitting drums with protective covers can help eliminate this problem. The small cost of drum covers is more than offset by the savings from preventing contamination problems. Ask us for part number information. For the best protection, store drums indoors.

S-O-S Services Web

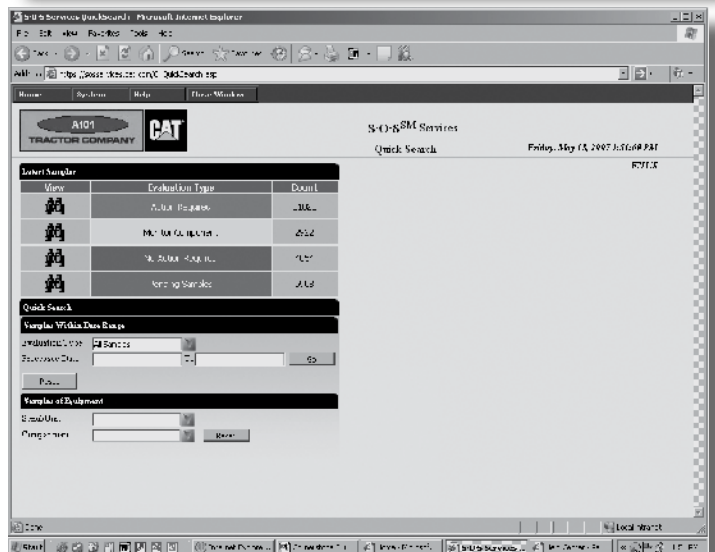
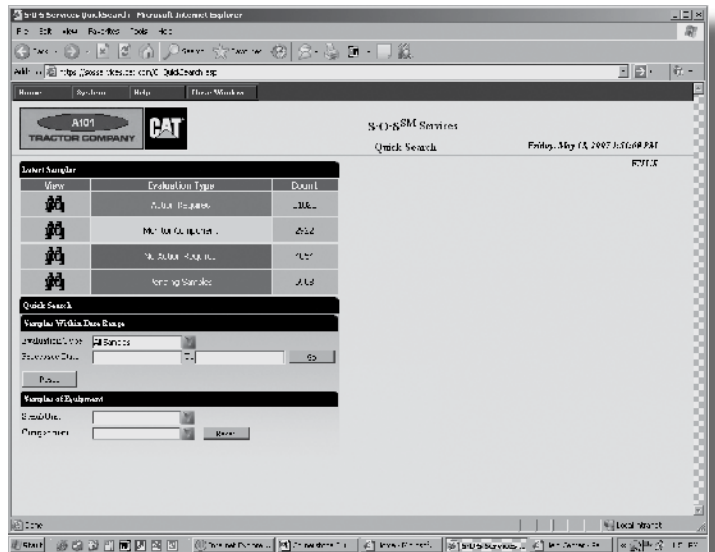
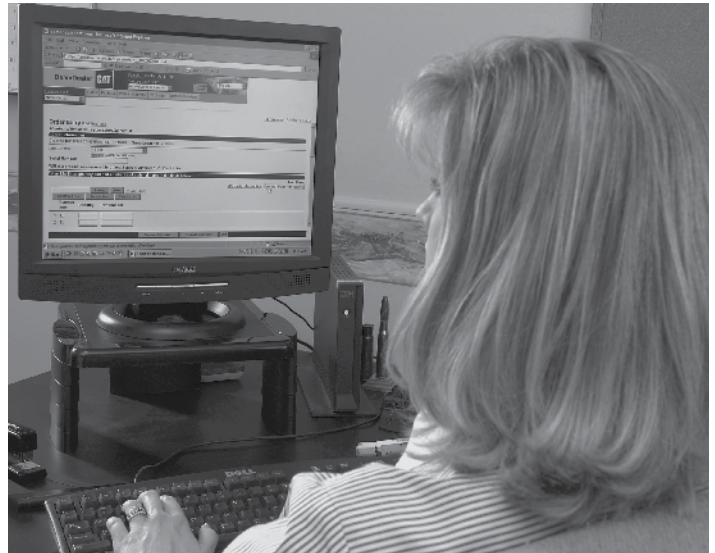
With S-O-S Services Web, it's fast and easy to monitor the effectiveness of your equipment maintenance program. From the opening screen you can view your current sample information by exception or by performing an advanced search by exception, jobsite, serial number, unit number, status, manufacturer, family, model or compartment.

Once the information is pulled up, a detailed description of the specific sample is available along with a history of previous samples from that engine or piece of equipment. This data can be used to create graphs for easy trend analysis of one compartment or even across models.

S-O-S Services Web also allows users to create and print out labels by pulling compartment information directly from the database and provides a built in messaging system and actions taken feature that keeps track of activities associated with each sample.

View and analyze fluid sample information online—anytime and anywhere

- Access information with an Internet browser on your Cat dealer's website—no additional software required.
- View current data—no waiting for uploads
- Access to oil, coolant and fuel sample data
- Minimize paper filing and storage, while maintaining the ability to generate and print reports and graphs when needed





Look for changes

Just as a doctor uses a variety of tests before making a diagnosis, you should look for other repair indicators to help you evaluate equipment problems and determine what needs to be done. When an S-O-S report indicates a potential problem, you should also look for changes in performance and operating conditions.

A change in performance

Is an engine smoking more than normal?

Has oil consumption changed?

Has there been a loss of power?

Is the transmission slipping?

Is there something different in the way the machine performs?

A change in operating conditions

Has there been a change in the brand or grade of oil you use?

Has there been a change in the way you use the equipment?

Is there a new operator who may be operating the equipment differently?

Seasonal changes may produce significant sample variations due to differences in temperature or humidity.

Working together with the same goal

We have the same goal as you: keeping your Cat equipment operating at maximum efficiency with the lowest operating cost. By enrolling in the S-O-S program and working with your dealer's trained Analysts, you'll take advantage of accurate fluid analysis backed up by the expertise of Caterpillar design specifications and engineers—and a reputation for excellence.

Talk to your Cat Dealer today about how to maximize the potential benefits of S-O-S Services and other preventive maintenance programs.

CAT® DEALERS DEFINE WORLD-CLASS PRODUCT SUPPORT.

We offer you the right parts and service solutions, when and where you need them.

The Cat Dealer network of highly trained experts keeps your entire fleet up and running to maximize your equipment investment.

