

S•O•SSM

Fluid Analysis Program

The S•O•S Program was introduced by Caterpillar in 1971 and soon became recognized as the leader in oil analysis. Its concept was simple...reduce unnecessary downtime and the cost of operating equipment and engines. Through wear metal, oil condition, oil cleanliness and coolant analysis, abnormal wear and problems are caught before they progress to a complete failure. Since its inception, the S•O•S Program has grown to include 147 CAT dealer laboratories worldwide, processing over six million samples per year. H.O. Penn Machinery Company, Inc. is proud to be part of this dealer network...the only one in the industry to offer this service in house.



Taking an oil sample.

You bet! Those fluids say a lot about your machinery. At H.O. Penn Machinery Company's Fluid Analysis Laboratory, your samples are put through very specific tests designed to give you the most thorough analysis possible. Our lab is conveniently located in our Newington, CT office and contains some of today's most advanced oil and coolant analysis equipment. Results are typically available within 24 hours of arrival in the lab. Should a critical situation be identified, you are notified immediately by telephone or the quickest means possible. Let us show you how to save money by using fluid analysis as a maintenance tool.



Our trained technicians analyze and interpret your samples.

Can a few ounces
of fluid tell you
something about
your equipment?

Here are a few benefits of using S•O•S fluid analysis:

- S•O•S Fluid Analysis detects problems early so they can be repaired before they become major failures.
- S•O•S Fluid Analysis shortens repair time by troubleshooting key areas and allows service technicians to get to the root of the problem.
- S•O•S Fluid Analysis allows you to schedule downtime to fit into your workload.
- S•O•S Fluid Analysis can determine the extent of a problem and assess the equipment's ability to last through a job.



Wear Metal Analysis

Analyzing wear metals in new and used oil.

Inductively Coupled Plasma (ICP) measures the concentration of key elements in new and used oils. These concentrations are listed in parts per million (ppm). To put a ppm into perspective, one is equal to: one minute in two years; one apple in 2,000 barrels; or one bogey in 25,000 holes in golf! By looking at wear particles this small, we can catch problems when they're just beginning, allowing you to become proactive rather than reactive to a failure. Different combinations of key elements allow us to pinpoint areas of abnormal wear.

Oil Condition Analysis



The condition of used oil is determined by Infrared Technology.

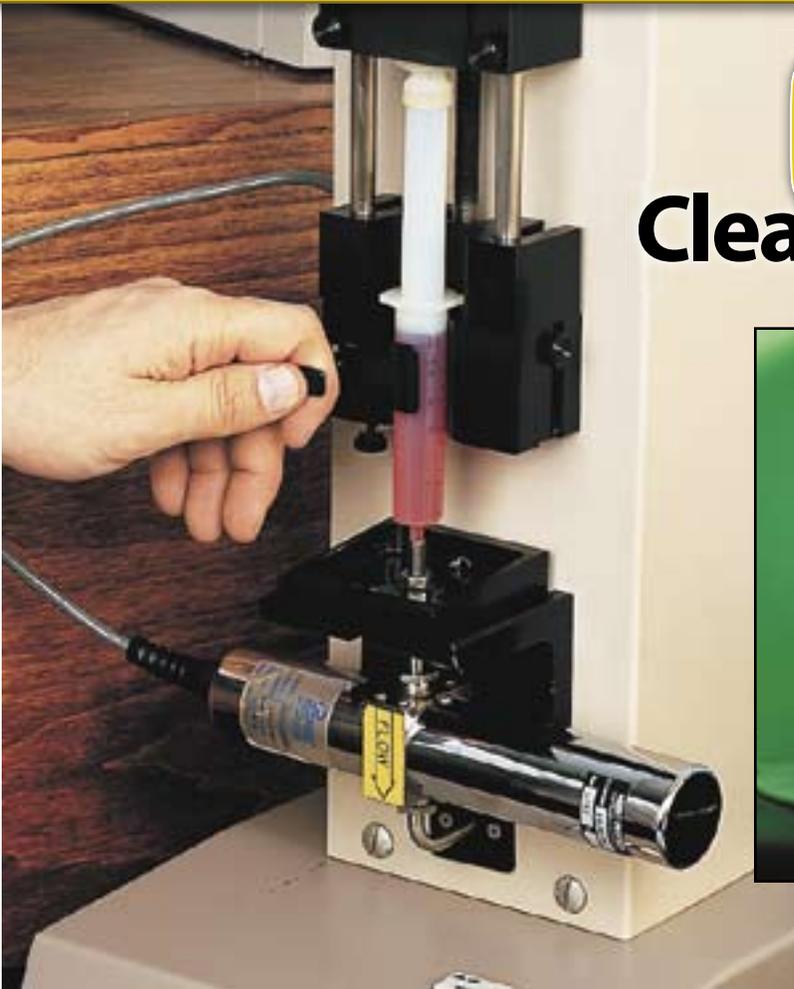
Infrared analysis compares new oil to your used oil which determines soot, oxidation, nitration, and sulfur products. A sample of new unused oil is needed to perform this test. The test is run on engine, hydraulic, and transmission oils. In short, we can monitor the condition of your oil at the time of sampling and tailor oil drain intervals to fit your application. Test results are reported in percent allowable; samples at or above Caterpillar guidelines indicate the oil has reached the end of its service life and should be changed. Successive readings at these levels show more serious problems. Heavy soot – caused by lugging or plugged air filters – can act as an abrasive causing increased wear and shortened service life.



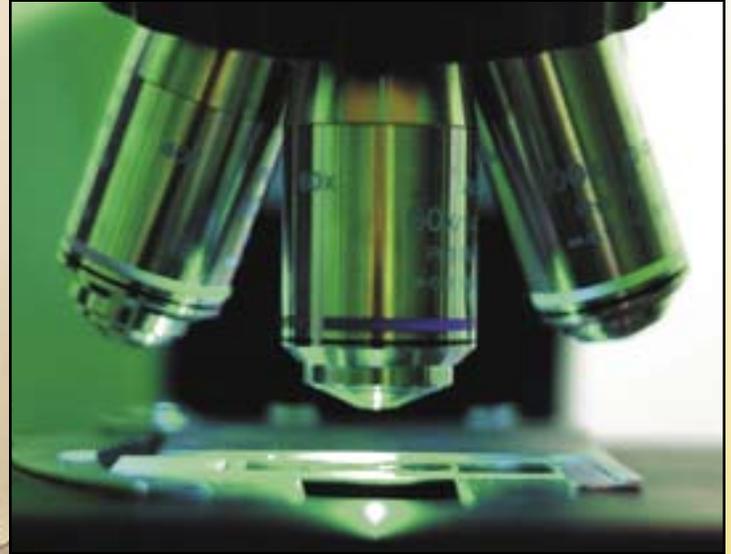
High oxidation levels are caused by heat and extended oil drains; this leads to plugged oil filters and component varnishing. In gas engines, nitrogen products are released during combustion. As a result, oil thickens and filters become plugged. High-sulfur fuels, crankcase blow-by, and moisture all lead to high sulfur products. When sulfur mixes with moisture, sulfuric acid forms which chemically attacks engine components.

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Oil Cleanliness Analysis



Particle Count Technology determines the amount and size of particles in non-engine samples.



We use particle count technology to measure the size and quantity of metallic and non-metallic debris in non-engine components. Oils with few particles are considered clean and will promote extended component life. In contrast, oils with an abundant amount of particles will increase filter changes and component wear. By trending these particles over a series of samples, we can spot abnormal wear and identify an impending failure. Particle count complements our wear metal analysis nicely – it can quantify wear particles greater than 15 microns while wear metal analysis identifies specific wearing components. This technology is especially helpful

in identifying failures in transmission clutches made of non-metallic friction materials. Traditional wear metal analysis simply cannot identify these material in the oil, however, particle count can. Samples with higher than typical particle counts are analyzed under the microscope. This allows us to identify particles by type (i.e. metal, dirt, clutch material, etc). A copy of the picture is provided when appropriate.

Viscosity

Oil Sampling



The viscosity of all oil samples is tested at 100 c and reported in centistokes (cST). Viscosity is the measure of the time it takes a set amount of fluid at a certain temperature to flow through a set orifice. The higher the value the more viscous the fluid. Water, oxidation, soot, and antifreeze cause the oil's viscosity to increase or thicken. Fuel causes the oil's viscosity to decrease. Extended oil drains may do either; high soot and oxidation will thicken an oil and extreme temperature may cause a multigrade oil to shear down to its lowest number. A change in viscosity of more than ± 3 centistokes from the original indicates a serious problem.



Glycol, Water, and Fuel Detection

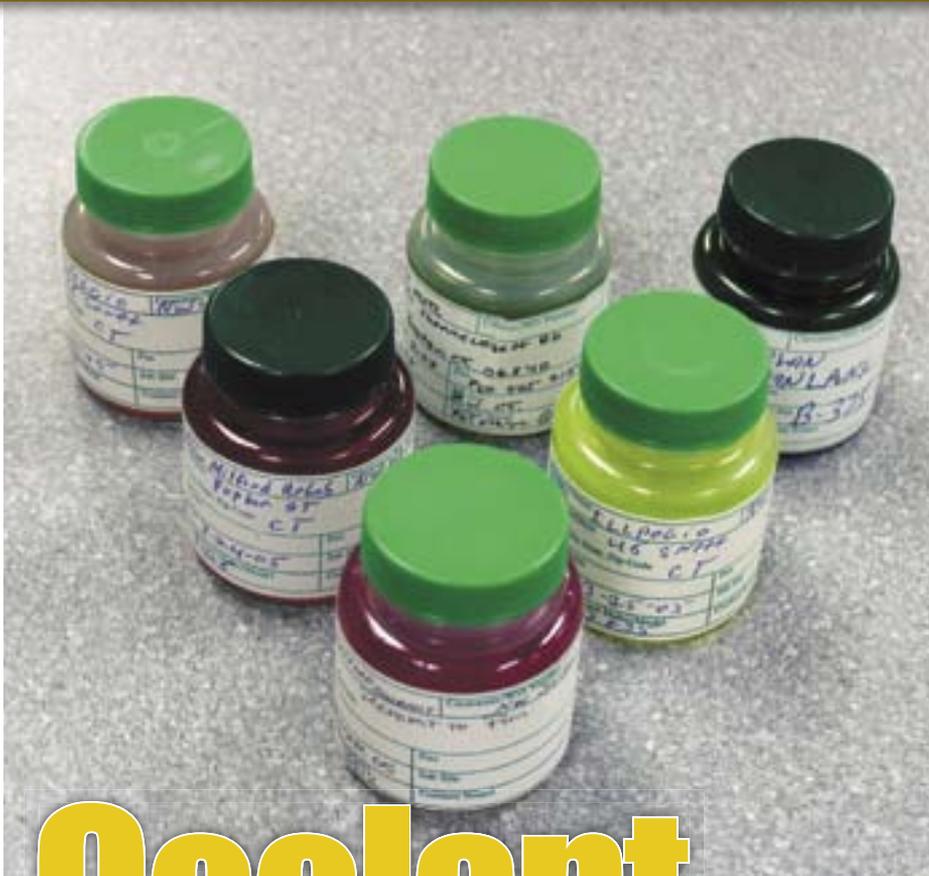


The presence of diesel fuel in the oil is verified and measured with a Rapid Tester.

The presence of water in the oil is verified and measured by the Sputter Test.

All samples are tested for the presence of water. An amount of over 0.5% is considered unacceptable. Water can contaminate the system from the outside by condensing or can enter from the cooling system in combination with glycol. Water reduces the oil's ability to lubricate. It forms sludge that plugs filters. All water-cooled compartments are tested for the presence of glycol (antifreeze). Glycol causes the rapid oxidation of the oil and indicates a cooling system leak. Diesel engine oil samples are tested for the presence of 4% or more fuel. (CAT Spec.) Fuel reduces lubrication, which causes metal-to-metal contact.

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Coolant Analysis

Engines, transmissions, and hydraulic systems all suffer from poor coolant condition. H.O. Penn included S•O•S Coolant Analysis to address this problem. Nearly half of all engine failures are caused or accelerated by poor cooling system maintenance. If the coolant is not properly conditioned, the oil will overheat resulting in lost lubricity and rapid deterioration. Piston ring, liner, and bearing wear soon follow. Hydraulic systems and transmissions also depend on a properly functioning cooling system. Hydraulic oil that overheats will lose lubricity and anti-wear additives.

Shortened pump life, valve wear, and seal failures are the results of these effects. Transmission oil will also deteriorate as a result of overheating. A loss of viscosity allows clutches to slip – ultimately shortening transmission life. Let our Level 1 Coolant Analysis show you how to properly maintain your cooling system and extend component life.

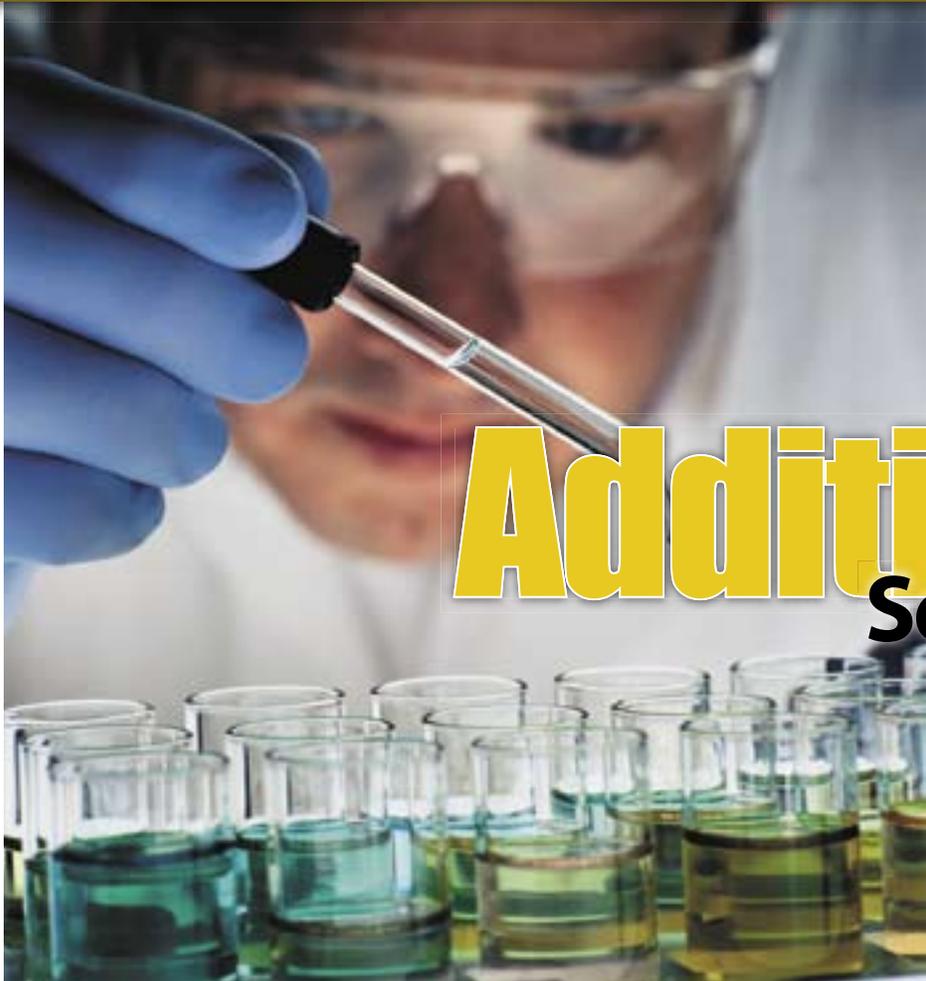


H.O. Penn S.O.S.SM Kit

Our oil sample kit provides you with everything necessary to take a good sample.

Our complete oil sampling kit comes with everything necessary to properly take a sample. Each kit includes oil sample bottles with labels for your vital information. Important data to include on your sample label are: equipment serial number, make and model, hours on unit and oil, recent repairs, and last oil change. This information helps us better analyze your oils and provides more meaningful recommendations. Also included are tubing and a suction pump permitting samples to be taken quickly and easily. The postage paid mailing containers allow you to send your samples without the hassle of paying for their delivery. Just take a sample and drop it in the mail. That's all there is to it! Contact your nearest parts department for quantities and pricing.

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Additional Services

Select oil and filters with proper performance for maximum component life.

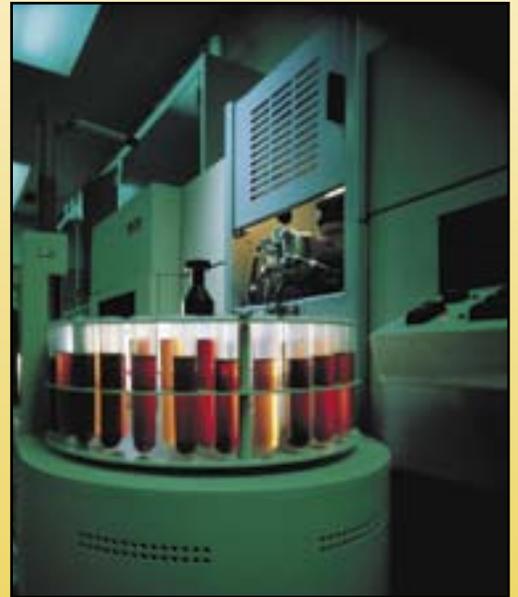
Additional Oil Tests

- Total Acid Number (TAN)
- Total Base Number (TBN)
- Salt Water Contamination

Additional Coolant Tests

- Level II – includes metals
- Miscellaneous
- Fuel Testing Packages Available

Please call the lab for pricing and availability.



Are All Fluid

Analysis Testing Labs the Same?

Not all testing labs are alike. Below are just some of the reasons why H.O. Penn's Fluid Analysis Lab offers the most for your money.

- **Turnaround Time** – Usually within 24 hours – the best in the industry.
- **Knowledge of Equipment** – Who knows equipment better than a heavy equipment dealer?
- **Accurate Analysis** – Our lab results are verified quarterly by Caterpillar – you know you're getting the right information.
- **Meaningful, Easy to Understand Recommendations** – We just give you the facts – not try to impress you with technical information.
- **Personal Attention** – Most labs, just by sheer volume, have your reports generated by a computer. At H.O. Penn, we have trained technicians compare and interpret data as well as study your machine histories and repair records.



The H.O. Penn Fluid Analysis Lab is committed to detecting failures at their earliest stage, exceeding customer expectations and saving you money.

Put our experience of over 25 years to work for you.

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Locations



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www.hopenn.com

Bloomingburg, NY
783 Bloomingburg Road
(845) 733-6400

Bronx, NY
699 Brush Avenue
(718) 863-3800

Holtsville, NY
660 Union Avenue
LIE (Exit 62)
(631) 758-7500

Newington, CT
225 Richard Street
Oil Lab
(860) 594-4860

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122 Noxon Road
(845) 452-1200