Use engine oil analysis—
to extend the life of your engine!

Laboratory analysis of oil is an effective preventive maintenance tool. Why? Oil analysis helps determine the extent of wear and the presence of contaminants in the oil in a variety of systems, including diesel and gasoline engines, transmissions, hydraulic machinery, and compressors.

This example should demonstrate the value of oil analysis. As part of its equipment maintenance program, an Oregon lumber company placed one of its diesel engines on a regular oil analysis schedule. An early analysis indicated that the oil was contaminated with antifreeze.

The problem, a broken water pump, was quickly fixed.

Later, after 18,000 hours of operation, the scheduled oil analysis showed a sudden increase of iron, aluminum, and lead in the oil.

The company examined the engine and discovered a problem with one main bearing, which was replaced. The original crankshaft was still usable.

At a cost of 4 hours' downtime and a new set of bearings, the company got 6,000 more hours out of the engine.

Without the timely warning from the oil analysis, the engine would likely have broken down and required a complete overhaul, at much greater expense and a lot of lost time.

Oil analysis, then, makes it possible to predict problems before they become serious, and it provides a basis for maintenance recommendations that extend engine life and minimize the chance of a serious, and often expensive, breakdown.

Once a fisherman, farmer, or woodland owner establishes a regular oil analysis program, the oil analysis laboratory will be able to:

1. identify component wear, the extent of the wear, and (in some cases) the cause of the wear;
2. determine the presence and level of contamination and the effect of the contamination on the machine components and the lubricating oil; and
3. determine the condition of the lubricant.

Keep in mind, however, that oil analysis is not a substitute for a good maintenance program. Don't put off maintenance until an oil analysis indicates a problem! Rather, regular maintenance combined with oil analysis will help you get maximum use from your machinery.

What is oil analysis?

Oil analysis involves testing the used lubricating oil of machinery to identify and measure minute wear-related particles called wear metals and to monitor the condition and contamination of the oil.

A single oil analysis will determine if the oil is contaminated. But a series of at least three samples taken at regular intervals is required to obtain an accurate picture of wear-related problems.

In a regular oil analysis program, the sample of lubricating oil is taken periodically, usually during a scheduled oil change. The sample is sent to a commercial laboratory for analysis.

The analyst checks especially for wear metals in your oil (copper, iron, chromium, aluminum, molybdenum, lead, silicon, tin). These are the products of friction, corrosion, abrasion, and deterioration of engine components.

The analyst can establish an engine-wear trend by comparing the concentration of wear metals over a series of analyses.

In addition to wear metals, your analyst will test for the room temperature oil viscosity, the degree of additive depletion, and the contaminants in the oil, such as antifreeze, fuel, soot, and—as occurred during the Mt. St. Helens eruption—abrasive volcanic ash.

After the tests are completed, the analyst interprets the results to determine which parts of the system show wear or are not functioning properly and to what extent damage may be occurring.

If any one contaminant (more likely, a pattern of contaminants) is out of line, the analyst can pinpoint the trouble.

If the problem requires immediate action, the analyst phones to warn you and recommends corrective actions.

Finally, the analyst records the complete test results and specific maintenance recommendations on a report form and mails it to you.

Getting started

This is easy. If you're the person responsible for the maintenance of a piece of equipment, you simply decide to begin and maintain a regular oil sampling program.

How frequently your samples are taken depends on the type of system involved, the way your equipment is used and operated, and the operating environment.

The laboratory, working with you, will arrange a sampling interval based on the specific needs of your particular operation.

Oil sample kits are usually available from commercial oil analysis laboratories on a prepaid basis. A kit contains a sample bottle, a unit identification and data sheet, and a return mailer.

You draw the sample, fill out the data sheet, put bottle and data sheet in the mailer, and drop it in a mailbox.

Depending on the laboratory and the kind and quantity of tests it performs, the cost of a routine oil analysis will range from $7 to $15 per sample (1984 figures).

Collecting samples

Take oil from your unit only while it is still warm from operation, usually within 15 minutes after the unit is shut down. Or it may be necessary to run the engine for 5 to 10 minutes, depending on how long it has been idle, before collecting a sample. This will insure that the sample is well-mixed and really represents the system being tested.

You can draw oil samples from several different locations. One method is to take a sample through a petcock valve installed on the oil line before it reaches the oil filter. Be sure the petcock valve is free from dirt; allow some oil to flush out before taking the sample.

Another method involves drawing oil from the dipstick entrance with a suction
device and tube supplied by the testing laboratory (figure 1).

A third method, used primarily if you take your sample during an oil change, takes oil through the oil drain plug (figure 2). If you take the sample during an oil change, allow the oil to drain for a short time before collecting, so the grit that has accumulated near the drain plug does not become part of the sample. Four to 6 fluid ounces are needed for analysis.

In addition, you may be asked to supply samples of unused lubricating oil and engine coolant to help the laboratory narrow the field of substances that may be present as contaminants.

After you take an oil sample, carefully fill out the form that goes with it to the lab. Included with every oil sample should be information on hours of engine or component operation since the last oil change; size, age, and type of engine or component; and name and type of oil.

The effectiveness of an oil analysis program depends on the accuracy and completeness of the sample information you supply.

Some limitations

Although oil analysis can be a powerful preventive maintenance tool, several factors can limit its accuracy. A small percentage of breakdowns can be attributed to sudden or fatigue failures. These are stress-related failures and are not detectable in oil samples. Unlike wear-related failures, they cannot be predicted.

Other limitations include poor sample quality because of contamination introduced at the time the oil sample was taken, inaccurate or insufficient engine or sample information, and lack of adequate information about maintenance performed.

Remember, too, that the first sample (or a one-time only sample) does not supply enough information to establish wear-related problems. You need a series of at least three samples taken at regular intervals to obtain an accurate picture of wear-related problems.

How to obtain an oil analysis

A number of commercial testing laboratories are located in the Pacific Northwest, including one in Portland and one in Eugene. To establish a regular oil analysis program, contact your local diesel engine distributor, farm machinery dealer, or automobile dealer. They will put you in touch with the appropriate testing laboratory.

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