Oil Analyzers INC.

Failure Analysis Program

The Oil Analyzers Failure Analysis Program helps find the root cause of equipment failures through used-oil analysis and Oil Analyzers Inc. technical expertise.

The source of equipment failures can be difficult to identify. One potential source is lubricant contamination. For example, water and coolant can accumulate in the lubricant sump, accelerating chemical breakdown. Another potential source is worn or defective parts that develop pitting and cracks, eventually causing the parts to disintegrate and the equipment to break down. Harsh operating conditions can also contribute to equipment failure, causing parts to fail unexpectedly and prematurely.

For optimal results, use this kit alongside equipment disassembly and parts inspection, review of maintenance records (or previous oil analysis) and other failure-analysis tools.

Once the root cause of equipment failure has been identified, an Oil Analyzers technical expert can help identify changes to routine maintenance to address the situation.

Kit Materials
- Instruction Guide • 3 Sample Bottles
- 3 Test Forms • 3 Shipping Return Mailers
- 1 Vacuum Pump • 25' Sample Tubing

Included Tests
- 24 Metals by ICP • % Fuel Dilution • % Soot (for diesel-oil samples)
- % Water • Viscosity • Total Base Number (TBN) for engines
- Total Acid Number (TAN) for non-engines • Oxidation • Nitration

HOW TO PULL SAMPLES

Taking a good oil sample (proper location and operating conditions) is critical to oil analysis. The oil sample should be collected at, or near, operating temperature within 15 minutes of shutting down. It is important to take the sample from the same extraction point and avoid introducing any contaminants like dirt or dust into the sample. Ideally, you would take oil samples under the same conditions every time; however, that is not always possible and as long as the sample is not contaminated, we can still effectively trend the results.

On an engine, a sample can be taken through the dipstick tube or from the sump. Taking samples from the dipstick tube is highly preferred as it reduces the likelihood of contaminants entering the sample. If taking the sample from the sump, be sure to allow some fluid to clear the drain before taking the sample to ensure deposits that have settled at the bottom do not contaminate the sample container. These deposits would alter the results and are not representative of the actual system in operation.

If the oil has been drained into a secondary container, taking a sample from this location would be acceptable as long as the container is clean and free from any contamination.

If pulling more than one sample from different locations, be sure the vacuum pump is clean and use new tubing each time. If new tubing is not available, purge a couple ounces of oil through the tubing before taking the second sample.

TAKING OIL SAMPLES

Sample 1: Take a sample from the package or storage container holding the same (unused) lubricant used in the failed equipment component. To ensure accurate analysis of all samples, it is beneficial to first submit a sample of the new oil for analysis. This analysis is used to validate the identity of the new-oil source and eliminate contamination (due to storage or other handling problems) as a potential source of failure.

If new oil from the original package or storage container is unavailable, submit a new-oil sample from a new, unopened package.

Sample 2: Take an oil sample from the failed equipment and submit it for oil analysis.

While it may be difficult to obtain an oil sample if the equipment is not running or the parts have been compromised, do your best to use the sample container to catch a sample while draining the fluid.

Samples 1 and 2 Results: When the oil-analysis reports are complete, an Oil Analyzers technical expert will contact you to discuss the results and help outline possible causes for failure. Test results will include wear metals, lubricant contamination and the oil's physical properties.

Results may indicate a clear issue. For example, high levels of sodium and potassium are a documented indicator of coolant contamination.

Be ready to discuss any pertinent data and other indicators of failure, including parts examination, equipment running conditions and mechanical inspections. Your Oil Analyzers technician will help you connect the lines using all available data, including the oil-analysis reports.

If the oil-analysis results do not point to a mechanical failure (wear metals and contaminants are not flagged severe), the Oil Analyzers technician may compare the physical properties of the used oil (viscosity, base number, oxidation) to the new-oil sample to rule out misapplication.

If the results of the used oil's physical properties do not match the new oil, it may indicate cross-contamination with another product or contamination from fuel, water, soot or coolant. In addition, an investigation into the new-oil storage containers should be conducted. If fluid is held in a secondary container, determine if the wrong fluid was added.

Sample 3: Once the root cause of failure has been determined and appropriate corrective action completed, take another oil sample from the equipment when it is back up and running. Ideally, this sample should be taken at the same interval (miles/km or operating hours) as sample 2.

Sample 3 Results: An Oil Analyzers technician will contact you to compare the results of this oil sample with the results from the failed component, providing good indication whether the issue has been resolved by the corrective action.

OVERALL FAILURE-ANALYSIS RECOMMENDATIONS

Oil analysis results are a supplemental tool for determining the root cause of equipment failure. Not every oil analysis will provide the exact source for the breakdown, and it is not meant to be a standalone tool. A parts failure should appear on oil-analysis reports as wear metals, based on the metallurgy of the moving parts that touched the lubricant.

A major failure may generate larger-sized particles (>10 microns) that do not appear on standard oil-analysis reports, highlighting the importance of parts inspection and other diagnostic testing. An additional test, such as analytical ferrography, may be recommended to help isolate the cause of failure.

The best practice is to use oil analysis as part of a preventive maintenance program, which can help increase equipment uptime by detecting issues early, before a major breakdown.

Oil analysis is key in early detection. As a preventive maintenance strategy, oil analysis should be considered alongside other common maintenance activities.

Participation in this program includes a custom oil-analysis report, provided by an Oil Analyzers Inc. technical expert by email, for every sample submitted. For further information on flagged data, report interpretation and guidance on failure analysis, call 715-395-0222 or email info@oaitesting.com.