Written by Ray Thibault, CLS, OMA I & II Contributing Editor Thursday, 01 March 2007 00:00



Oil analysis is a very powerful technique in a Reliability Centered Maintenance Program. Previous articles in this publication have discussed the use of oil analysis in a condition-based program being both predictive on equipment condition and proactive on lubricant condition. Sampling is the first step-and a key element-in determining oil and equipment conditions. Since bad data may lead to the wrong conclusions and cause either an unnecessary or wrong action, it is critical to sample properly. As an example, let's say you visit a physician for a blood test to determine your cholesterol level. Clearly, it is going to be very important for the doctor to get a good "representative sample" to make the correct diagnosis. One hour before the exam, however, you eat a double cheeseburger with fries. In all likelihood, your results will come back positive for high cholesterol and the doctor may put you on medication and a strict dietary program. If you've not had problems in the past, the correct course of action would be to take another sample. If it is a good representative sample and comes back positive, you can rest assured that your doctor took the right course of action from the outset. On the other hand, if the second blood test comes back negative, there is a possibility that the first sample was not truly "representative"and that your doctor took the wrong course of action.

Our cholesterol test example is very similar to what can happen with oil analysis. If a sample is not taken properly, it may lead to the wrong conclusions. Therefore, you never shut down a piece of equipment based on the results of just one sample. You should always resample when unusual results come back on an oil analysis report.

The main objectives of a sampling program are to:

maximize data concentration;

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- minimize outside interferences;
- sample at proper intervals.

Important considerations in an effective sampling program are:

- sampling location
- sampling hardware
- sample bottles
- sample procedure

Oil analysis provides the following basic information:

- oil condition
- equipment condition
- contaminant type and amount

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OBJECTIVE	OIL ANALYSIS TESTS	INFORMATION PROVIDED
Oil Condition	Viscosity Emission Spectroscopy Acid Number FTIR	Oxidation/thermal degradation Additive depletion Oxidation Nitration/oxidation
Equipment Condition	Emission Spectroscopy Direct Read Ferroraphy	Initial wear Ferrous wear large and small particles
	Analytical Ferroraphy	Particle morphology indicating wear type and location. This is the only technique justifying equipment shutdown.
	Particle Count	Possible wear debris
Contamination	Karl Fischer	Water content
	Particle Count	Solid contaminants
	Fuel Dilution	Fuel in engine oil
	Soot	Soot in engine oil
	Viscosity	Contamination with higher or lighter viscosity component
	Emission Spectroscopy	Silicon from dirt and coolant leak in engine oil

Table I. Summary of Oil Analysis Testing & Information Provided

Fig. 1. Preferred live zone sampling done at an elbow or T for good mixing (*courtesy of Slater Trico*)



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Fig. 2. Primary sampling location within return line of a circulating system (courtesy of Dalley Predict)

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Fig. 3. The most common static system sampling technique via a vacuum gun with plastic tubing

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Fig. 4. Plastic collecting tube wrapped around steel rods helps ensure consistent reservoir sampling When etching the destribution of the state of

MACHINE TYPE	NORMAL USE	INTERMITTENT USE
Diesel Engines	Monthly, 500 Hrs	Quarterly
Natural Gas Engines	Monthly, 500 Hrs	Quarterly
Gas Turbines	Monthly, 500 Hrs	Quarterly
Steam Turbines	Bi-monthly, Monthly	Quarterly
Air, Gas Compressors	Monthly, 500 Hrs	Quarterly
Refrigeration Compressors	Start, Mid & End of Season	Start, Mid & End of Season
Gears, Bearings	Bi-monthly, Monthly	Quarterly
Hydraulics	Bi-monthly, Monthly	Quarterly

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Fig 5. Better reservoir sampling technique incorporating a sample

tube (contest Slater Trice) Physical and a second second