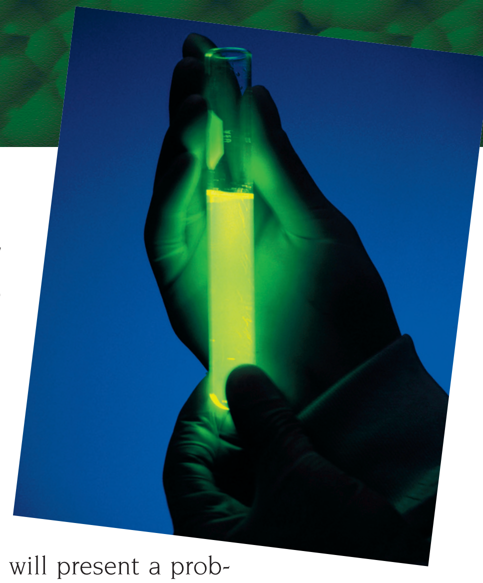

Limitations concerning spectrometric metals

by Jack Poley

Discussed in our last column, Spectrometric Metals Analysis (SMA) arguably is the single most useful test one can perform on a used lubricant because of its prodigious yield: 20-30 metals dealing with wear, contamination and additive metals. Nevertheless, the primary benefit of this test is to identify wear metals concentrations, with contamination and additive information as welcome bonuses.

But what if there are large wear particles (greater than 5 micron) in significant quantities that SMA simply can't detect them? Then we want to employ different procedures and tests. We've discussed instrumentation for these procedures previously, so let's now examine how such procedures are applied.

Note: We are not recommending abandonment of SMA testing in any situation. Rather we are relegating SMA testing to a parity or secondary position in terms of importance while highly recommending additional testing in the instances noted below.

Our first consideration in selecting any test always should be the type of component we are monitoring, with further consideration given to the application, environment and lube chemistry. If a filtration system is involved, a particle count often is very useful.

HYDRAULIC SYSTEMS

Other than basic gear pump systems, these can be very complex in terms of wear surface variety and lube circuitry. But in nearly all instances there is some form of rather sophisticated filtration; ergo a particle count is an excellent choice to start investigating large-particle buildup. If particle count is excessive, it is relatively easy to distinguish and separate contamination from wear utilizing some form of microscopic analysis.

A micropatch analysis also is an appropriate follow-up to an abnormal-to-severe particle count. Use of microscopy is a great idea with every sample, but such testing, unless deemed necessary for clarification, is relatively expensive. However, the particle count has proved very serviceable as a sophisticated screening device at the routine testing level, as well as a traffic cop for general contamination in systems.

In the absence of non-particulate contamination such as water, solvent or oxidized lube, particle count also serves as a decision-maker for lube filter changes, offline filtration or drains. Particle count, therefore, is a rather encompassing test for hydraulic systems. One caveat is that the sampling method and subsequent sample handling in the laboratory are critical to arriving at a count that is representative of the component's circulating oil.

GEAR SYSTEMS

Many gear systems have no provision for filtration, and, although a particle count has shown some value in certain installations, it is clear that securing a representative sample of particulate distribution poses great difficulty. Screening tests, such as Particle Quantifying Analysis (PQA) or DR Ferrography (DRF) are good inspections in concert with SMA in order to cover all bases in terms of particle size.

Non-ferrous wear, of course, still will present a problem where large particles are concerned. For example, many screw-type gears are bronze. In such cases it may be wise to invoke micropatch or analytical ferrographic testing on a regular basis, perhaps quarterly or as system utilization and criticality dictates.

Irrespective of the strategy chosen, one should ensure that the system is adequately monitored for large particles to minimize the risk of missing a failure-development indicator. SMA also should be employed.

For example, suppose a system is being regularly monitored with SMA, and there is a slight increase in two primary metals (one being iron) but not enough change to cause more than a blip in a graph, perhaps also escaping most limits tables in use. One would have no reason to invoke additional tests, let alone recommend any action.

Suppose, however, that PQA or DRF results also were routinely available and that these results showed a steady upward, abnormal trend. Now the primary metals from SMA have meaning, i.e., it is reasonably likely that those large particles have iron and the second primary metal as their compositional constituency. SMA now will help point toward the problem area exposed by either PQA or DRF. That's quite a difference in a conclusion drawn without the added large-particle data. <<

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