Analyzing hybrid techniques

By Jack Poley

In previous columns I discussed the emergence of oil monitoring (OM) sensors as a viable, cost-effective means for monitoring machinery. However, OM technology does not yet show sufficient capability to supplant all other forms of condition monitoring (CM).

OM sensors certainly can enhance and complement other CM tools: offline oil analysis, vibration, thermography, sonics—and let's not forget such available common sense data as pressure, temperature, noise, leaking fluids, etc.

The drive toward obtaining revealing data from monitoring tools at the machine site and, particularly, from the machine itself, certainly will continue. Accordingly, OM sensors will get increasingly more sophisticated and capable. This continuing effort suggests it is reasonable to speculate that OM sensors one day will replace routine offline oil analysis, although not for awhile.

Should we maintenance managers wait until sensors get smarter than they already are? Not at all. The cost of equipment nowadays, not to mention the economic stakes for maximizing productivity, dictates preventive and proactive measures at unprecedented levels of effort and sophistication—a situation not likely to change soon. Maintenance management should always be looking toward strategies that are best for the operation, and that will surely include sensors.

Looking at oil analysis, one aspect of CM, what probably makes the most sense is using combinations or hybrids of the various methods available to achieve the best level of protection—the ability to detect issues in time to take effective corrective action at a reasonable cost and effort.

Sensors are instruments that perform oil analysis, just as laboratory instruments do. The primary limitation of a sensor is its single-datum output; thus, as technology presently stands, if one is interested in ferrous wear debris, water and viscosity, one must install three sensors to achieve three measurements.

This is not a trivial consideration, although some sensor manufacturers have bundled sensors into a single composite package. Such packages are, however, quite expensive, so the economic value of these kinds of decisions must be carefully weighed. This brings us to the notion of reliability centered maintenance (RCM).

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A burgeoning concept introduced by John Moubray, RCM is changing the way one looks at equipment maintenance. One notion that can be drawn using Moubray's ideas is that of worrying about or concentrating on the most critical machinery, even more than the supporting machinery. Critical machines that fail catastrophically or otherwise are unavailable represent a safety hazard or production halt to a significant or lengthy extent.

Once all critical machines are identified, a super-concentrated effort can be made to monitor them at a greater level, resulting in higher but thoroughly justifiable CM costs for those machines. As oil analysis has gained more sophistication in terms of instrumentation and available data, it has become too expensive to provide every type of test to every monitored machine. Critical machines, however, can justify over-monitoring, including shortened sample intervals.

This becomes one of the fulfillment steps in RCM and has nothing but good outcomes. If critical equipment doesn't fail, the insurance program (the oil analysis) performed well. If the critical equipment was about or beginning to fail and a catastrophic event type was averted, the monitoring program performed well. It's all about safety and money, isn't it? A win-win situation!

Venues such as aviation, marine, plant and remote (such as pipeline or wind farm) exacerbate the criticality factor, but each equipment situation is unique and must be considered in the context of its acquisition cost, function, maintenance cost and downtime consequences. In other words, each piece of machinery must be given its own criticality test.

Next we'll look at strategies and sequences for the hybrid monitoring concept. TLT

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