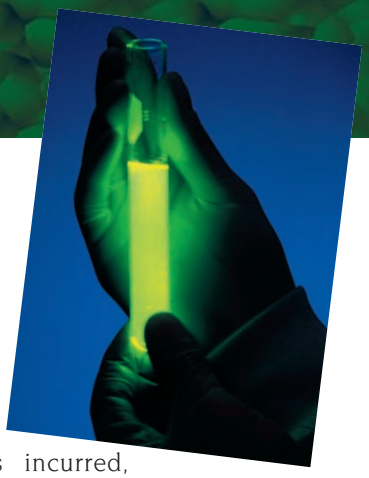

Breaking down the process of interpreting data

By Jack Poley

We have begun to explore the significance of oil analysis test data, as well as the evaluation of that data toward practical maintenance and equipment management decisions and action. Distilling this down, there are two specific processes: Rating Data and Interpreting Data.

Rating dataæassessing 'severity'

This is primarily a mathematical treatment based on statistical limits and trending. However, the context for such analysis is extremely important and includes such things as:

Application in which the component* is used

- Application is arguably the most important attribute in terms of assessing a component's data levels and trends. A simple example would be to contemplate a certain diesel engine, "A," operating in a piece of mobile equipment in a quarry operation versus that same engine make/model operating as a constant-speed generator in a relatively clean, enclosed environment. Clearly the risk of 'dirt' (abrasives) entry alone would suggest that the mobile application would result in greater wear; but there are additional aspects such as intermittent engine revving or varying load conditions that also affects contamination and wear metals levels/trends. (It is usually correct to have separate boundary tables and trend limits when applications are significantly different).

*For this discussion's purpose, "component" is a single-lubricated compartment such as a bearing or turbine or hydraulic system, not the entire equipment, such as a bulldozer, which will have an engine, hydraulic system, transmission, gear drives, etc. At times multiple mechanisms within the component are lubricated by the same oil, (e.g., transmission-brakes). This would still be considered a single component. Such components are frequently found in off-highway equipment.

Time or mileage on the lubricant (Aging the oil drain)

- It is reasonable to expect that the longer an oil is left in service, the greater the wear metals levels should be. However, such a development will not usually be linear, nor should such an assumption be made. There tends to be an equilibrating point dependent on oil consumption, sump size relative to the surfaces lubricated and present wear trauma experienced by the component. Further there are side conditions, such as filtration effects or amounts of residual lube left in the compartment at drain that may preclude a 'perfect' progression. What is important is to be aware of these possibilities and compensate appropriately.

- Differences of less than 20% are probably not significant in most cases, but each situation should be assessed in its own context. A default time or mileage may have to be imposed if the sampler fails to provide these data. Most times this forced assumption does not result in a blown diagnosis, but it obviously poses a modicum of risk.

Time or mileage on the component (component age)

- There is a general theory or expectation that an initial 'wear-in' period is incurred, followed by a leveling-off period, finally culminating in an accelerated wear-out period. The wear-in period is the shortest; the level period is the longest and the wear-out period is somewhere in between the other two. As with mileage data, some interpretation must be considered in as much as there is frequent deviation or exception to the theoretical pattern.

- Similar to the caveat for time/mileage on the lubricant, a number of samples may be analyzed without mileage information either from broken hour meters or lack of diligence on the sampler's part. In such instances one should again consider making the forced assumption that the component is in its 'sweet' life or level period and proceed accordingly.

Careful: a conscientious evaluator may notice a previously provided component time/mileage figure and diligently calculate or estimate the apparent time/mileage of the current sample. What if the component had been, in fact, overhauled prior to the current sample? Then such an assumption could result in a poor diagnosis. Best policy is to demand the information, then disclaim the interpretation/evaluation to the extent of the lack of such information. Customers have minimum responsibilities in the oil analysis program chain of information and events. A decent sampling procedure, including appropriate accompanying information, is part of that responsibility.

In some applications, such as off-highway, it could be reasonable to refer to the component by its equipment type (e.g., dozer) because the same component, regardless of having been manufactured by other than the original equipment manufacturer (OEM), is used throughout that product line. Thus, one might successfully evaluate such components without every knowing the actual component manufacturer. This is a shortcut, clearly, and could backfire if the OEM changes vendors for its component and fails to make this information readily available. The OEM is not particularly concerned with individual components so much as the marriage between all the components to produce the best performing equipment it can under competitive market conditions.

There are also technical considerations within the analytical process that sometimes get overlooked:

1. The quality and limitations of the sample taking and handling.

- At the time sampling occurs. Even with near-perfect sampling technique, the final sample is not a 100% accurate representation of the entire (effective) sump. As an obvious example, recall we noted that water is almost never evenly distributed in an oil system.

- When an aliquot is removed from the sample container for testing at the laboratory, the technician might carelessly fail to shake the sample sufficiently to attempt to get the best homogeneity possible, resulting in slightly skewed answers.

Testing instrumentation itself has inherent limits, also discussed earlier in this series. The point to keep in mind is that a given number has a testing tolerance. It is important for the evaluator to know what that tolerance is for each type of instrument involved.

Bottom line of the above discussion:

1. Test result numbers must be properly and completely qualified rather than accepted at face value.

2. Once this process is accomplished with high confidence, one is ready to actually conduct an evaluation of component and lubricant condition. **<<**

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