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AMERICAN FILTRATION & SEPARATIONS SOCIETY

How Well Does my Filter Work?

Contamination control is the key to a cost-effective maintenance operation for hydraulic or engine systems. You depend on your filters, whether hydraulic, lube or fuel, to keep your fluids clean, to keep maintenance costs down, and to ensure reliable operation. At some point, you probably will ask yourself whether or not your filters are really working and doing what they were designed to do. There are different ways to answer this question.

The easiest (and least reliable) way to answer the question is to review the filter's performance claims. Typically, these will describe the filter's ability to remove contamination, the application it is intended for, pressure drop, and capacity or life claims. Unless these claims can be substantiated, however, let the buyer beware. Unsubstantiated performance claims are simply advertising, not technical data.

The easiest way to substantiate performance claims is by means of filter test data obtained using industry-approved test standards. ISO, NFPA, SAE and ASTM (industrial standards organizations) have developed test standards for hydraulic and engine filter applications. They provide a basis for making objective comparisons of different products in terms of critical performance characteristics, such as removal efficiency, pressure drop, dust-holding capacity, etc. It is important that only approved industrial standards be used. Occasionally, non-standard tests are used to make a product look good. Do not to use non-standard tests as a basis for comparison. Such methods have not gone through the extensive review that industry-approved standards receive and non-standard tests may have inherent bias towards a specific product. When using standard filter test data to substantiate performance claims, there are a few things to keep in mind. First, make sure that products being compared have been tested the same way using the same filter test standard. Next, make sure that the standard is appropriate for the application. Use industrial hydraulic filter tests, such as ISO 16889, for comparing hydraulic filters and not a fuel, water or air filter test method. Be sure that the most recent version of the standard was used. In 1999, the hydraulic and engine industries transitioned to a new NIST particle counter calibration method, ISO 11171. This is the only acceptable method for determining contaminant size. Standards that do not reference ISO 11171 should not be used. In some situations, obsolete filter standards may be used to make products seem to appear to have higher performance. Finally, performance claims should be supported by actual test data. Upon request, filter manufacturers should be able to provide data to support performance claims.

For applications where effective contamination control is essential to profitability, it may be appropriate to directly monitor contamination levels in order to verify performance or to design an optimal contamination control program. This is possible by using portable contamination monitors or in-line particle counting systems. There are monitors that rely on a variety of operating principles, such as light extinction, pressure drop, etc. Using monitors, samples can be collected and analyzed for contamination level on-site or even on-engine. Some monitors connect directly to the lines of an operating system, providing real time measurement of contamination levels. When using monitors, care is needed to avoid artifacts and misinterpretation of the data. For example, electrical noise, flow and pressure surges, coincidence error, even how the instrument is hooked up may affect the results.

Selection of the location of sampling points and an awareness of operating conditions at the time of sampling are critical in interpreting the results. Implementation of an on-line monitoring program is neither trivial nor cheap, but the results provide a means to gage the effectiveness of the filters and a more effective, affordable maintenance program could result.

Fuel filter with sample port for contamination monitoring

Barry Verdegan, Cummins Filtration

Barry Verdegan received his Ph.D. from University of Wisconsin-Madison and has over 30 years of industry experience. Barry is a Research Fellow for Cummins Filtration Inc. responsible for developing new engine filtration technology and patent strategy. He has served as Chair of the NFPA Contamination Technology Committee; project leader for the ISO 11171 particle counter calibration standard and for the ISO 11500 field sample analysis standard for hydraulics; and Chair of the American Filtration & Separations Society. He has taught numerous short courses on filtration and particle counting. Barry has published more than 50 technical papers, 2 book chapters, and holds 34 patents.

Keywords
Filter testing
Testing standards
Filtration performance evaluation
Contamination control
Hydraulic, and engine filter