Oil analysis is a critical shipboard tool for the early detection of problems that have the potential to damage vital systems and for enabling the efficient allocation of maintenance resources. Current onboard tests typically duplicate lab-based titration methods, which are relatively time-consuming, involve considerable reagent and solvent costs, and require testers to work with hazardous chemicals. It is possible to reduce the use of these chemicals with modern test kits, but doing so necessitates a major upgrade to new equipment.

A number of military and commercial shipping organizations switched to portable instruments that operate on the same principles as laboratory instruments while substantially reducing analysis time, eliminating the need for reagents and solvents, and avoiding the need for hazardous chemicals.

One fleet lowered its costs with this approach and reduced manpower requirements to perform oil analysis by 25% and analysis costs by 75%, eliminating the need to purchase, ship and dispose of hazardous chemicals. This technology is of great interest to vessel operators but with a higher initial investment than for the existing solution, how can a business case be built to leverage these savings?

Portable instruments: a new approach
A new generation of instruments eliminates the need for hazardous chemicals and operator interpretation of the results to greatly reduce the cost and time involved in shipboard oil analysis. The portability of the new instruments makes it possible to bring them to the machinery that is being tested. Test results can be obtained in just 2.5 minutes, which saves considerable shipboard manpower. Only a few drops of oil are required for analysis, which dramatically reduces waste. The instruments greatly simplify the process of testing oil and do not require any interpretation by the operators, so results are more accurate and repeatable. The instruments store test results and provide automatic alarms, so the need for manual logging is eliminated.

How it works
The FluidScan Q1000 is a rugged, handheld infrared spectrometer that measures a range of key oil condition parameters in synthetic and petroleum-based lubricants and fluids. It can determine lubrication contamination, degradation and cross-contamination at the point of use by measuring key oil condition...
The Spectro-Visc Q3000 reports kinematic viscosity at a standard operating temperature of 40°C. The device requires no reagents, just a shop rag or paper towel, and only 60µl of sample. It operates as a capillary viscometer. By taking advantage of capillary effects and highly repeatable mechanical spacing, the operator can open the capillary tube to obtain it instead of running solvents down a glass capillary tube and drying as is typically done with laboratory viscometers. Each sample is measured at a constant temperature for consistent accuracy without pre-test measurements.

**Case example**

A naval fleet performed an evaluation of the new oil analysis technology to compare it with the test kits previously used. The field evaluation program showed that the new approach eliminates the use and disposal of hazardous waste involved in fluid sampling.

The labor, operations and maintenance savings were estimated to be 260 man hours per ship, potentially saving US$175,000 per year with full deployment. The business case analysis shows a return on investment of less than 18 months. Higher accuracy and immediate results from the portable instruments provide multimillion-dollar savings in increased asset availability. This is because many critical items currently test until laboratory analysis confirms that the fluid is acceptable before it is used. The faster speed, lower cost and simpler operation of the portable instruments make it possible to monitor engines and components that currently rely on time-based changeout. Problems with equipment can be identified immediately, potentially greatly extending equipment life.

**Promising future**

The portable infrared spectrometer and kinematic viscometer enable efficient allocation of scarce resources by planning maintenance based on actual need rather than at set intervals. The potential for major cost reductions and improved monitoring capabilities is real.

**About the author**

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