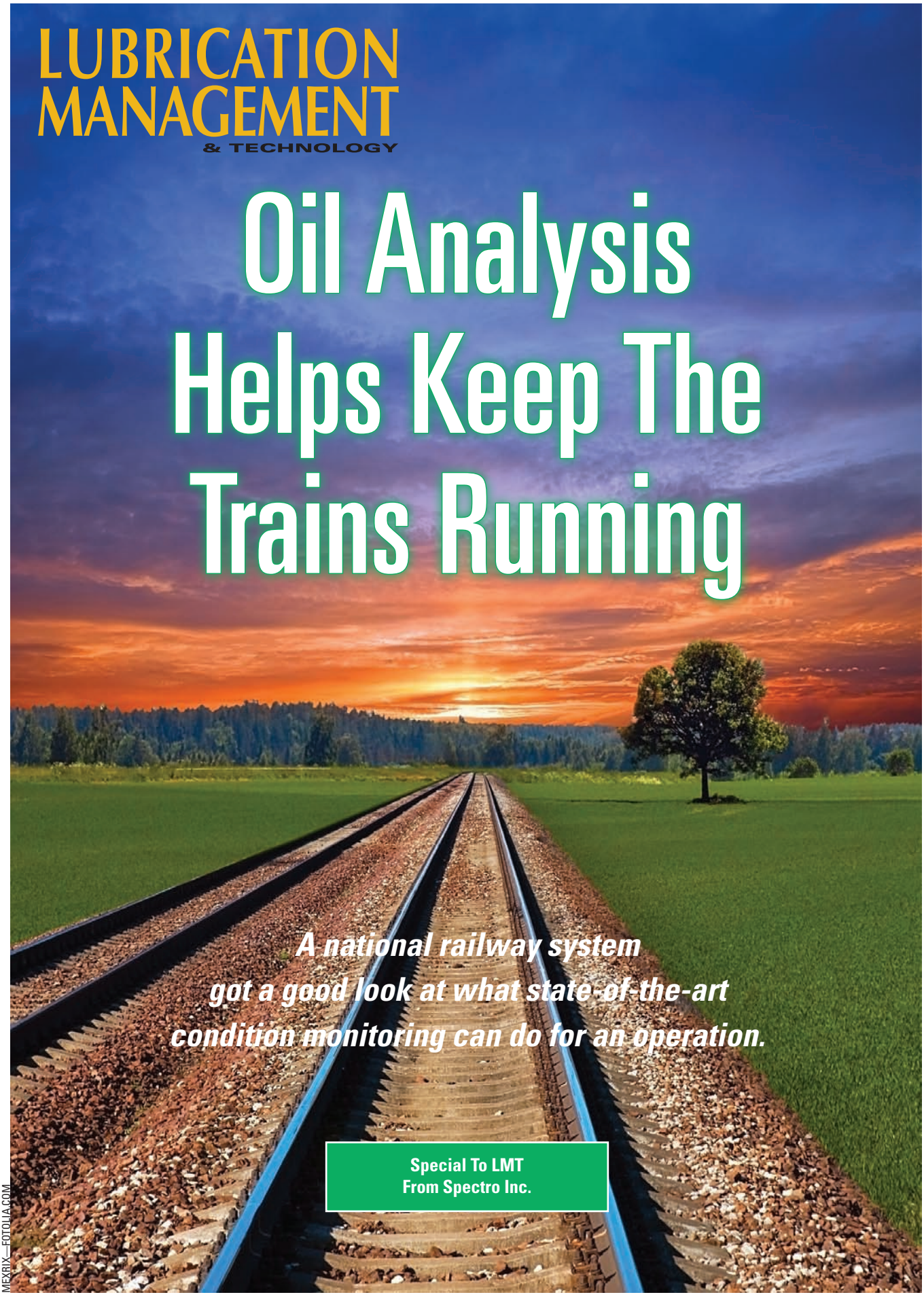
LUBRICATION MANAGEMENT
& TECHNOLOGY

Oil Analysis Helps Keep The Trains Running



A national railway system got a good look at what state-of-the-art condition monitoring can do for an operation.

Special To LMT
From Spectro Inc.

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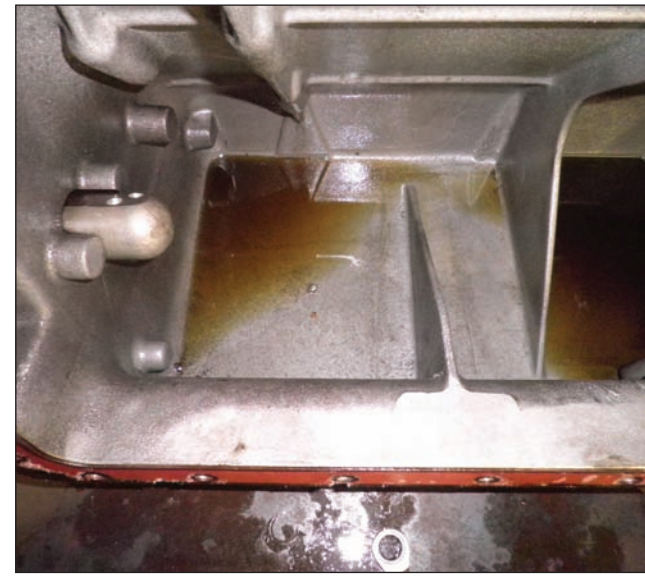
Based in Tullow, Ireland, T.E. Laboratories ("the Laboratories"), provides oil, fuel and environmental analysis services for a variety of customers, including Irish Rail, Ireland's national railway system. It regularly uses equipment from Spectro, Inc., including the Spectroil Q100 spectrometer. When the analysis of oil samples from a main locomotive showed a large amount of severe wear particles—*indicating that a catastrophic failure was imminent*—Irish Rail took the Laboratories' advice and brought the engine in for repair. An overhaul showed chunks of metal visible to the naked eye in the sump and that the bearings were about to fail. In this case, oil analysis saved the railroad both the expense of a more extensive engine overhaul and potential expenses associated with a breakdown. The tally of these avoided costs more than paid for the cost of oil analysis for Irish Rail's entire fleet for a year.

The power of oil analysis

From a custom, 40,000-sq.-ft. facility, T.E. Laboratories provides a machine-care predictive-maintenance system based on condition monitoring through oil analysis. For machine operators, the process is easy: They need to spend only a few minutes to obtain an oil sample and ship it to the lab for identification of potential problems. These include abnormal wear in lubricated metallic components, dirty fuel and coolant contamination. Using oil analysis, machinery can be analyzed over a period of time to identify trends that can be used to plan maintenance based on actual need as opposed to simple intervals of time. The Laboratories' services include transformer oil analysis, fuel analysis for microbial contamination and water and soil analysis. Regular customers include trucking, rail and marine shipping fleets; mining, quarrying and construction operators; industrial units; manufacturing plants and heavy-equipment operators.

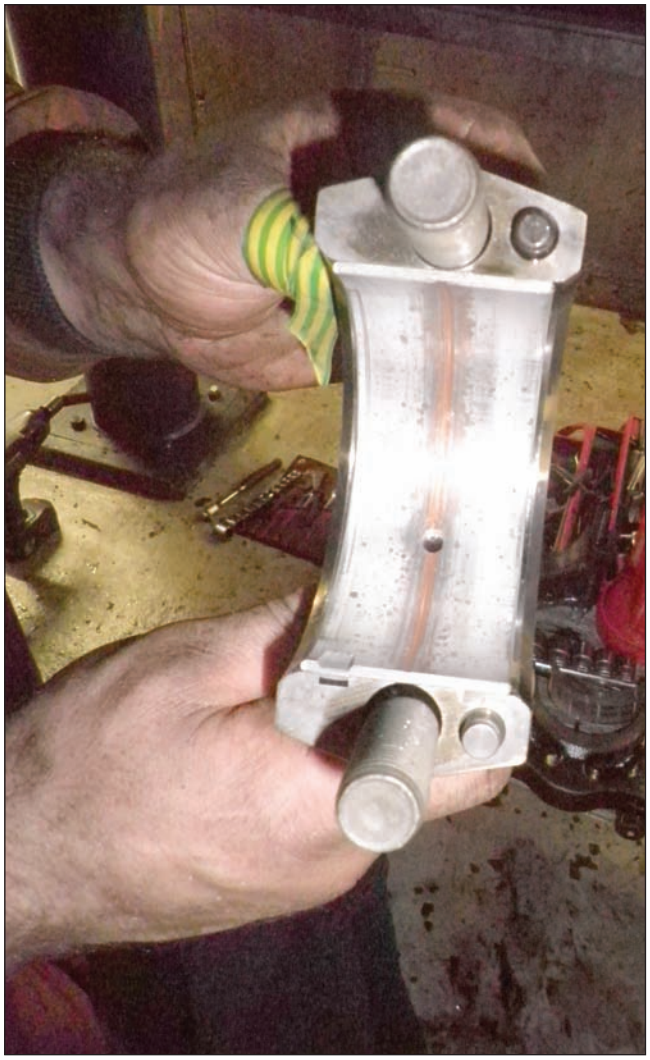
"As the only oil analysis lab in Ireland, we handle a large number of samples and must deal with them efficiently," says Mark Bowkett, T.E. Laboratories' General Manager. Recent upgrades at the company include implementation of the SpectroTrack laboratory information management system that replaced the company's former "home-grown" system. SpectroTrack offers the built-in ability to interface with the Spectro Inc., line of viscometers and spectrometers. It can also integrate with instruments from other suppliers for vibration, thermographic and performance data. The database is configured to track asset information relating to service intervals, maintenance actions, locations, status and other issues.



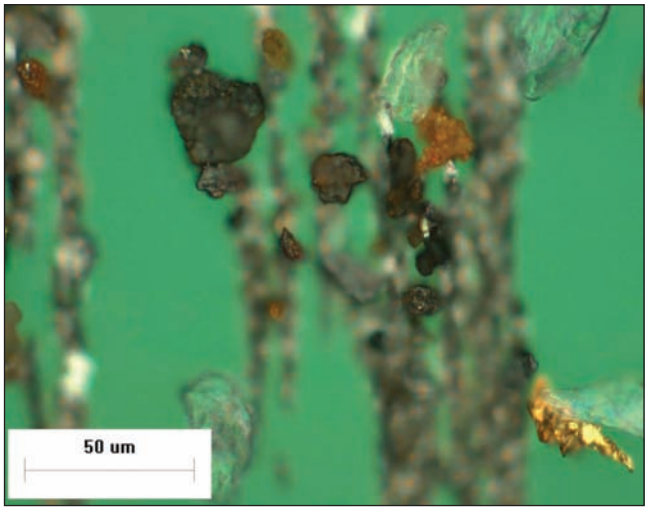
Visible chunks of metal in the sump of the disassembled engine

SpectroTrack also provides the Laboratories' customers with security-protected access to their sample results. "The railroad makes extensive use of SpectroTrack Web access to obtain their test reports and to plan maintenance," says Bowkett. "However, we don't wait for customers to notice a problem. When we see something bad, we immediately notify them."

For example, a recent analysis of 18 different wear metals on a liquid-cooled diesel locomotive engine revealed several warning signs. According to the Laboratories' report, the analysis uncovered "the presence of large



A bearing from the engine on the verge of failure

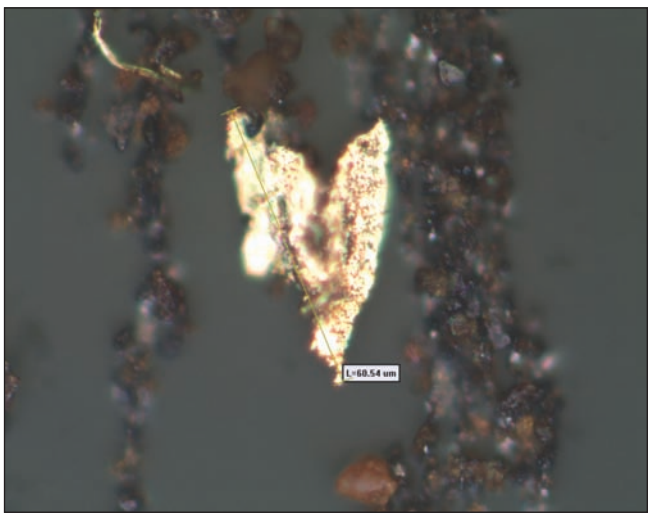


Ferrogram image showing dark metallo-oxides indicative of abnormal wear

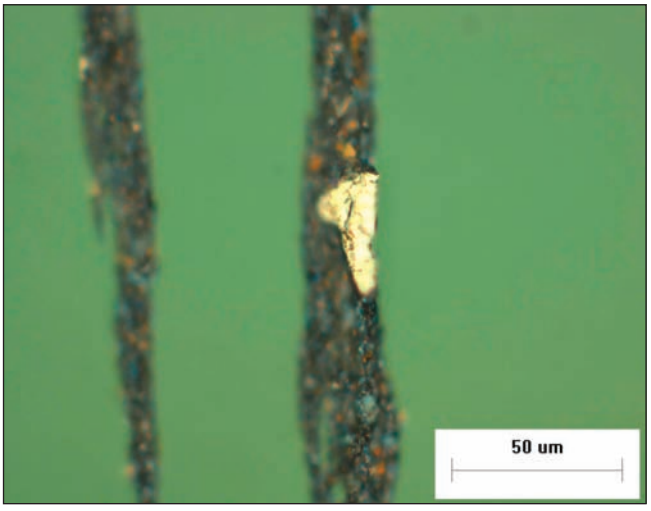
In this case, oil analysis helped Irish Rail avoid an extensive engine overhaul, a potential breakdown and much more.

sliding wear steel particles and some dark metallo-oxides," which indicates "a transition from normal to severe sliding wear and likely due to insufficient lubrication." Additional problems were also noted.

These results "were worrisome, but not necessarily cause for immediate action," says John McGrath, Sales Manager for T.E. Laboratories. But a closer look at the sample was ordered using the SpectroT2FM Q500 analytical ferrography laboratory. This technology uses a bichromatic microscope, video camera and image capture software for the separation and interpretation of wear and contaminant particles in used oils, hydraulic fluids, coolants and fuels. A bichromatic microscope equipped with both reflected (red) and transmitted (green) light sources was used to view and examine ferrograms so that the ferrogram could be illuminated from both above and below the microscope stage. With bichromatic illumination, metal particles that



Large copper chunk seen in ferrogram image



Cast iron fatigue chunk seen in ferrogram image

reflect light appeared bright red, while nonmetallic particles appeared green (because light transmits through them).

The ferrogram indicated that the problem had, in fact, reached an urgent stage. It showed a moderate to heavy amount of severe copper and white metal wear particles and a moderate amount of dark-metalloxides. These elements indicate lubricant starvation and abnormal wear. Red oxides were also present, which indicates water ingress. The analysis also showed large abnormal sliding wear particles in excess of 20 microns, copper chunks in excess of 20 microns, non-metallic crystalline particles including silica and rust, low alloy steel fatigue particles and cast iron fatigue chunks from a case-hardened part.

"The particles seen in the ferrogram were quite large and of a critical nature," says McGrath. "The engine was on the verge of destroying itself. It needed to be brought in for an immediate overhaul." When the engine was disassembled, he says, "It was obviously on the verge of a breakdown."

Bowkett believes in the use of cost-efficient oil analysis to prioritize maintenance by avoiding spending money on units that have reached a scheduled milestone, but don't need maintenance. At the same time, he observes, regularly scheduled oil analysis can point out units like the one described above that urgently need maintenance, even though they're not due for service. According to Bowkett, while it may not be possible to estimate the total amount of money saved in the above case by oil analysis, "It's clearly well above the cost of the company's oil-analysis program for its entire fleet." **LMT**

Spectro Inc.
Chelmsford, MA

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