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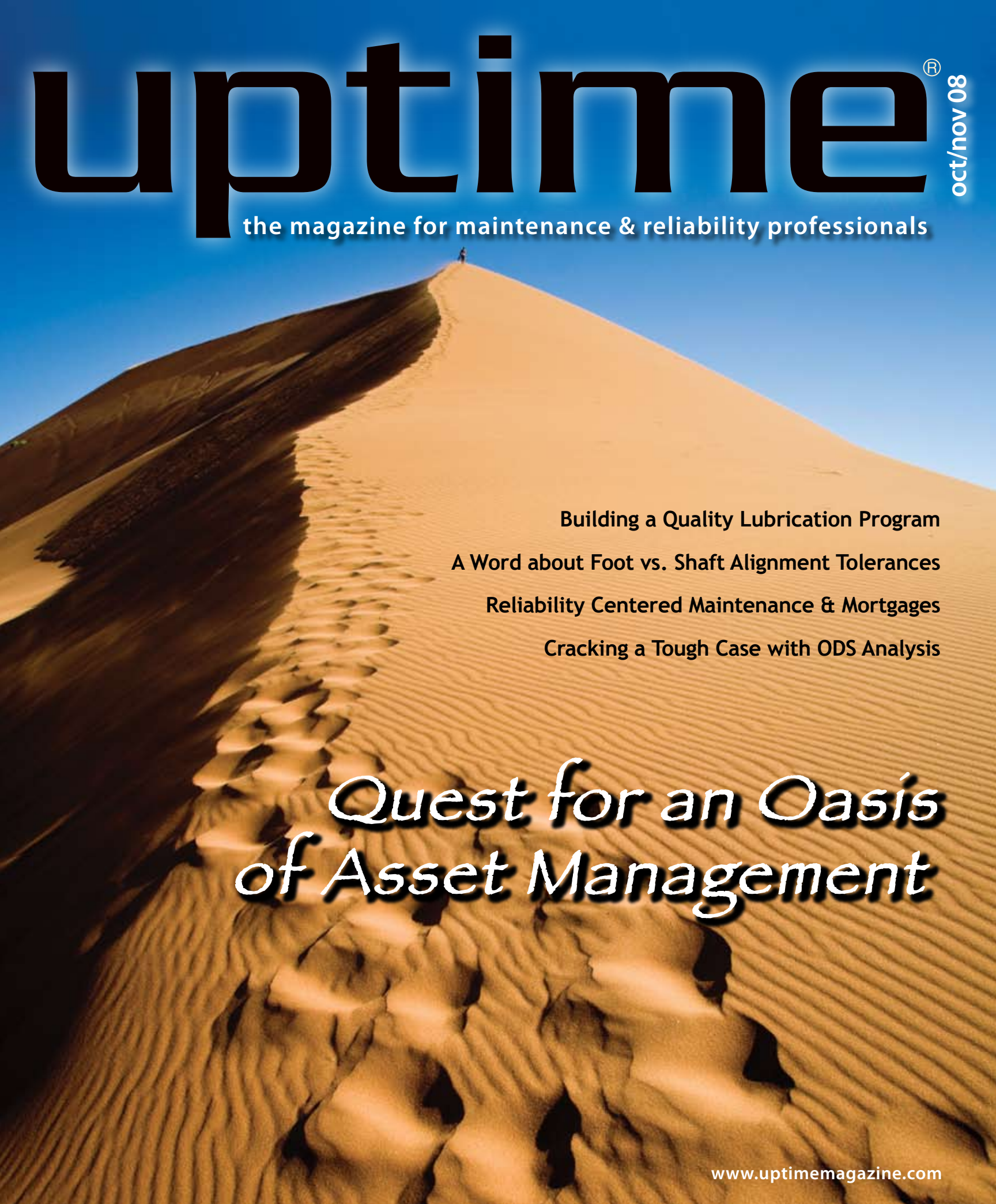

Building a Quality Lubrication Program

A Word about Foot vs. Shaft Alignment Tolerances

Reliability Centered Maintenance & Mortgages

Cracking a Tough Case with ODS Analysis

Quest for an Oasis of Asset Management

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What has your oil analysis been missing? It's a good question to ponder. And while your thinking, read about the next step your lubrication program can take to protect your machinery...

Filter Debris Analysis

It is an absolute given that keeping a machine's lubricant as clean as possible is a major component in increasing that machine's useful life. And to that end, filter technology has gotten good...really good. In fact, filter technology is so good that it actually prevents many wear issues, but it also eliminates evidence of many impending problems.

Of course, the filter is designed to collect debris, including wear debris created when a problem arises in your machine. So, if you are conducting your oil samples and sending them to the lab, the tests are being conducted on filtered oil. The filter is the best place to look for wear issues. That's where Filter Debris Analysis comes in.

We tracked down Alison Toms, Technical Director for GasTOPS, Inc, noted author and Chief Chemist for over 300 military labs worldwide, and Mike Barrett, VP of Marketing for Insight Services, with 15 years experience in crafting oil analysis programs for industrial companies.

Here is what Alison and Mike had to say....

A FilterCHECK™ instrument used to conduct Filter Debris Analyisi.

First, why don't you briefly explain to us what Filter Debris Analysis actually is?

Filter debris analysis (FDA) is a technique that analyzes debris captured in a machine's oil filter. Our automated method cleans the filters, collects wear debris for x-ray fluorescence (XRF) analysis, and counts and sizes the filter debris particles, with high repeatability and reproducibility. This method:

- Identifies and quantifies the elemental and metallurgical constituents of the wear particles;
- Identifies the specific components that are wearing; and
- Provides improved diagnostic and prognostic information about impending failures in of fluid-wetted components.

Please explain the difference in what you will pick up through Oil Analysis vs. Filter Debris Analysis.

When machinery components wear abnormally, debris is shed into the lube oil system. The filter removes as much as 95% of the wear debris from the oil. Industry realized that the cleaner the oil system, the less chance of damage caused by abrasive wear. Over the past decade there has been a move to increasingly fine filtration, making conventional monitoring techniques such as atomic emission spectroscopy and ferrography less effective at providing reliable indication of machinery component wear. Filters capture the history of component wear for the life of the filter and for the capture efficiency of the filter. Because of this, filter debris analysis provides advanced notice of impending wear problems. In the military, the warnings with FDA are 5 to 10 times earlier than with traditional oil analysis.

The x-ray fluorescence (XRF) technique used to evaluate the filter debris can analyze particles of any size, from 1 micron to 1000+ microns. So the size limitations of the different atomic emission techniques - ICP (up to 5 microns), rotrode (up to 10 microns) and rotrode filter spectroscopy (up to 40 microns) – are not an issue with XRF.

Another factor to consider is that debris from a fault is released in

bursts, not continuously. Consequently, if the oil sample is taken between bursts, there will not be an indication of a wear problem. Filter debris analysis solves this dilemma since all the debris is captured in the filter.

Tell us a little about the history of Filter Debris Analysis, how and why it was developed.

Filter debris analysis has been in use since the mid 1980's. When the Canadian Forces' Sea King helicopter was plagued with main gearbox debris problems in the early 1990's, the Canadian Defense Research Establishment Atlantic (DREA) embarked on a research project to determine if the debris from the filters could be used to reliably evaluate the condition of helicopter gearboxes. The project was so successful that FDA became an integral part of the maintenance program to determine Sea King gearbox health. However, it was a manual, cumbersome process.

In the late 1990's the Sea King senior aircraft maintenance officer tasked their health monitoring specialist contractor, GasTOPS Ltd. (Ottawa, ON), to work with DREA to develop the FDA program into an automated tool for mechanics at the flight line. The outcome of the project was the development and production of the FilterCHECK™ instrument. The instrument was simple to operate and in 15 minutes, could efficiently clean a filter, quantitatively count and size the ferrous and non-ferrous debris via the in-line particle debris monitor and prepare a patch of the debris for XRF analysis.

In 1999, the US military's Joint Oil Analysis Program Technical Support Center (JOAP-TSC) (Pensacola, FL) initiated an application project to develop and include energy dispersive x-ray fluorescence (EDXRF) capability in the FilterCHECK™. This project resulted in a new version of FilterCHECK™ that cleans the filter, counts and sizes the ferrous and nonferrous particles, prepares a thin film patch of wear debris, determines the metallic composition and mass of the debris. Data analysis and component profiling enables the damaged internal components to be pinpointed and determines the systems serviceability.

In 2007, Insight Services, working with GASTOPS, developed an automated systematic process to wash and analyze industrial size filters in a similar fashion employed by the military. The FDA instrument, designed to accommodate larger filters found in industry, is a self-contained unit that employs an automated method for filter washing to extract representative debris from the filter with high repeatability and reproducibility. Insight Services is marketing Filter Debris Analysis to its industrial customer base from of its lab in Cleveland, OH.

Although this technology has been around for a while, it is very new to industrial applications. Is industry embracing this testing procedure as quickly as you would expect?

There is still the need to get the word out to industrial customers. As with any new technology in the maintenance technology area, there is some skepticism to the benefits received. The military has been more willing to embrace this new technology because they were driven to find an immediate solution to operational and safety related issues. Also, with their large fleets of identical components, it is easier to analyze fleet statistics, and to document that traditional techniques are not providing the necessary advanced warning of impending failures.

Are there certain industries that could benefit more than others by utilizing Filter Debris Analysis?

FDA is best suited for any critical equipment in a plant maintaining large sump capacities. Some examples would include gas and steam turbines found in the power industry, large compressors found throughout chemical plants, and gas processors and hydraulic systems in steel mills and paper mills. In reality, any filter from a critical piece of rotating equipment is a candidate for an annual filter debris analysis.

Although originally designed for aircraft filters, the FilterCHECK™ technology has been adapted to perform Filter Debris Analysis on the majority of industrial filter sizes.

What are the top three reasons a company should consider using Filter Debris Analysis?

- Early warning of machinery failures with associated financial savings through maintenance reduction and avoiding operational upsets.
- To identify specific component damage
- To provide enhanced results that oil analysis can no longer deliver

What is the time frame a company can expect for a return on their investment in utilizing Filter Debris Analysis?

Well, an early warning on one gas turbine failure, resulting in avoiding catastrophic failure, reducing maintenance costs and avoiding operational upsets, can more than pay for FDA for the entire fleet of equipment.

Please give us a success story or two from companies that are using FDA.

Jeff, I included an FDA report we did on a Centrifuge in a brewery. The oil analysis report was rather benign and they suspected they were having machine problems so they sent in the filter. The report demonstrates the analysis of that filter. The bearing on this centrifuge failed right after they sent the filter. The tremendous amounts of copper signify bearing wear and their size precluded detection on the ICP of the oil analysis report.

How can interested people get more information about Filter Debris Analysis?

Contact Insight Services, 216-251-2510, or on the web at www.testoil.com

Contact GasTOPS Inc. at 850-478-8512 and www.gastopsusa.com Our website contains filter debris success stories and articles.

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