On-Site Determination of Wear Metal Contaminates and Additives in Machinery with a Portable Analysis Tool

Introduction

The analysis of wear metals and additives in oils is crucial to the functioning and proactive maintenance of manufacturing machinery, power generators and heavy transportation including rail, aircraft, marine and trucking for private and military use. Typical wear metals monitored in engine oils are copper (Cu), iron (Fe), nickel (Ni) and vanadium (V). Lubricant additive elements such as calcium (Ca), zinc (Zn), phosphorus (P) and sulfur (S) are verified prior to use and monitored during use.

Wear Metals

A predictive maintenance program routinely measures metals in the lubricating oils, not only to reduce the expense of dismantling components for visual inspection, but also to indicate and identify worn components prior to failures. The X-5000 Energy Dispersive X-ray Fluorescence (EDXRF) analyzer is a quick and simple tool for monitoring wear metals such as Cu, Fe, Ni and V in oils and lubricants. When analysis determines changes in the levels of these metals, it allows predictive maintenance by identifying small problems before they turn into costly failures.

Additives

Top quality lubricants depend on specially formulated blends of organo-metallic additives to extend lubricant life, protect metal surfaces and increase the range in which a lubricant can be used. The X-5000 EDXRF is a quick and simple tool to measure and monitor additive elements such as Ca and Zn which improve lubrication and S and P which are used for extreme pressure applications. Routine QC of these elements in new lubricants prior to use and the monitoring of changes in their levels during use allows predictive maintenance by identifying small problems before they become costly failures.

Additive Element Detection Limits in Oil

The X-5000 is a portable EDXRF optimized for liquids analysis that provides a quick and simple

Wear Metal Detection Limits in Oil

Element	Typical Souces	Form	X-5000P LOD (ppm)	Upper Warning Level (ppm)
Sulfur	Residual Fuel Oils	Contaminant	12	500-6000
Calcium	Detergents, cement dust, hard water	Additive, contaminant	5	500-5000
Phosphorus	Antiwear additive	Additive	30	600-2000
Zinc	Brass alloys, antiwear additives, galvanizing	Wear metal, additive	1	<2000
Titanium	Gas turbine bearings, turbine blades	Wear metal	12	3
Vanadium	Turbine blades, valves, bunker fuel	Wear metal, contaminant	1	3
Chromium	Piston ring plating, chrome plating, stanless steels	Wear metal	18	30
Iron	Iron and machine parts	Wear metal	1	80-180
Nickel	Stainless steels, plating	Wear metal	1	3
Copper	Cooler cores, brass/bronze alloys, Babbit (antifriction) alloys, brushings, slinger rings, extreme pressure additive	Wear metal	1	25-60
Lead	Journal bearings, Babbitt and bronze alloys	Wear metal	1	10-30

determination of wear metals and additives on site. This predictive maintenance tool provides vital information at that precise moment and location it is needed. There is no need for samples to be sent to an off-site lab or for you to wait for the results to be sent back. And, no additional sample preparation is required; you can simply collect the sample you want to analyze and test it right there.

The analytical performance, closed beam safety, and ease of use of traditional bench top XRF units are all captured in the X-5000. And it delivers true field portability, being packaged into an easy to carry, 22 pound battery operated XRF with integrated PC and industrialized large touch screen. The X-5000 sets the benchmark for performance, power and portability.

Key Features and Benefits

- Portable and lightweight
- Can be used at the work site, inspection line, production area, or on a lab bench
- Sample positioning tray accommodates all sample cups/bottles
- No sample preparation is required
- No daily calibrations are needed
- Starts up immediately, results are displayed in seconds
- Built in correction for different atomic number and molecular weight hydrocarbons
- Closed beam operation for user safety
- Data is stored automatically in tamper-proof format

The X-5000 is your answer for the best analytical performance without compromising field portability or operator safety.

The unique sample tray ensures proper placement of the sample every time for accurate analysis. The sample tray accommodates both bottles and cups of any size.

The X-5000 is engineered to be used anywhere - in the field, at the production line, in an inspection area. It ensures operator safety as a fully interlocked, closed beam system. The closed beam, integrated design unique to the X-5000 is a critical safety advancement as portable XRF analyzers continue to increase in X-ray power and be applied to ever more demanding, in-the-field analytical challenges.

X-5000 EDXRF Specifications

Feature	Specification
Concentration Range	ppm to % levels
Analyzer Weight	10 kg (22 lbs)
Measurement Time	User settable, from seconds to minutes
Operating Environment	-10 to 50°C
Power Requirements	AC or Battery
Tube Voltage	10 - 50 kV
Tube Current	200 µA
User Interface	Built in Touchscreen
Instrument Dimensions	38 x 33 x 28 cm (15 x 13 x 11 in.)
Sample Chamber	29 x 11 x 15 cm (11 x 6 x 5 in.)

labinfo@horiba.com
www.horiba.com/scientific

This document is not contractually binding under any circumstances © 2013 HORIBA Instruments, Inc.

USA: +1 (800) 446-7422 • France: +33 (0)1 64 54 13 00 • Japan: +81 (0)3 38618231

Explore the future   Automotive Test Systems I Process & Environmental I Medical I Semiconductor I Scientific   **HORIBA**