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ALS Tribology Varnish Potential Test Package Improved with Added Testing

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Varnish is deposited on mechanical surfaces when a high-molecular-weight substance forms due to oil degradation and becomes insoluble; this substance is otherwise known as soft contaminants. Unlike hard contaminants (dirt, metals, and metallic oxides) that cause abrasive wear in components, soft contaminants in lubricating oil coat working surfaces where they harden and become varnish. Varnish is generally the result of thermal degradation or “thermal stressing” of the oil due to exposure to very high temperatures combined with the absence of oxygen. Localized hot spots caused by adiabatic compression (micro-dieseling) of air entrained in the oil can create temperatures of >1800º F. Electrostatic discharge (ESD) may create temperatures that can exceed 18,000º F. Varnish buildup can be a “silent killer” for hydraulic systems and turbines, causing system malfunctions and even shutdowns. Varnish is known to be particularly fond of servo valves. In excess, it will cause sticking and prohibit proper movement. It may also impede proper cooling of the lubricant and the lubricant’s ability to remove heat by coating heat exchangers and other cool internal surfaces. Varnish may also cause filter clogging, affecting proper system filtration of other harmful contaminants and also affecting system pressures. Varnish will also trap hard contaminants, creating an abrasive surface contributing to system wear.

Next-generation turbine and hydraulic oils have greater oxidation resistance, so they are in service longer. However, they have less solvency capabilities; therefore, degradation material is less likely to stay solubilized in the oil. These next-generation oils also use organic polymer anti-foaming additives and, with older highly active systems, may actually increase entrained air in the oil and the possibility of micro-dieseling occurrences. With typical routine oil analysis, varnish precursors will go undetected. A system may potentially have a serious varnish problem, and routine oil analysis reports will indicate “NORMAL,” giving end users only part of the overall condition of their lubricants. There is no direct measurement or specific test for varnish precursors in hydraulic and turbine lubricants, but ALS Staveley's comprehensive test package can predict the lubricant’s potential to create varnish buildup. Evaluation of the test data will rate the varnish potential of a lubricant as LOW, MODERATE, ELEVATED, and HIGH.

RULER® (Remaining Useful Life Evaluation Routine) – ASTM D6971/6810 Test Added to ALS Staveley's Varnish Potential Test Package

The RULER® instrument quantitatively analyzes the relative concentrations of antioxidants (phenols and amines) utilizing voltametric techniques. The RULER® has become an industry standard test used in comprehensive turbine oil, hydraulic oil, and varnish potential test packages to determine

useful life remaining. The RULER® test reports % phenolic, and % amine antioxidant additive levels. In order for the RULER® to quantify the antioxidants remaining in lubricating oil, it must have a reference of the new oil. See a sample of our new Varnish Potential Test Report.

Please note: Samples must experience a 72-hour waiting period at room temperature after receipt by the lab in order to allow the fluid to auto-oxidize. The auto-oxidation will allow varnish precursors to transition from a soluble condition to more of an insoluble condition. This allows us to better detect soft contaminants and provides better results to the customer.

Test Package: VARPOT

Description: VARNISH POTENTIAL

Required Sample Size: 500 ml minimum

IMPORTANT: A representative new/unused oil sample must be submitted with the system sample to use as a reference for the RULER® test. For best results, the new oil sample should be from the same lot as the in-service oil being submitted.

Return to homepage.