



LETTER

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Test Reports on the Internet: Get your User ID and Password Now

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Varnish : A Stealthy, Lethal and very Costly Enemy

Have you ever heard about varnish? Not as famous as wear and corrosion, the two major failure problems of machines and lubricated systems, varnish is considered worse and may occur without knowing the cause.

Historically, the only way to detect this threat has been physical inspection which causes unplanned downtime and costly repairs. Fortunately, a number of tests allow for detecting varnish formation tendencies and it is important to perform them on a regular basis in order to avoid unintended production interruptions.

What is varnish?

Varnish is a thin, oil-insoluble layer of oil-degradation residues and by-products that develops over time on the internal surfaces of lubricated equipment. That situation can even occur on well-maintained machines with clean lubricants.

There are many types of contaminants that will not dissolve in oil in lubricating system oils. These contaminants are classified in two categories :

- Hard contaminants, such as dirt and wear debris.
- Soft contaminants composed of oil degradation by-products.

The mechanisms of oil oxidation and chemical and thermal degradation are leading contributors to the formation of soft contaminants, sludge and varnish; but there are still many unknown or misunderstood causes.

For hydraulic systems, the main consequences are excessive wear of pumps, increased bearing friction and servo-valves sticking. Varnish acts as an insulator, reduces the cooling effect of heat exchangers, deteriorates the oil's resistance to flow and blocks up filters. The presence of acidic constituents will also accelerate deterioration.

The limitations of current lubricant analysis methods

Varnish cannot be detected by the standard commercial oil tests due to the limitations of these techniques: the by-products responsible for the formation of varnish are non-metallic, therefore they can't be identified directly or measured by spectrometric analysis. Particle counting is not applicable because the varnish particles are smaller than 3 microns, which makes this method ineffective. Water and acid tests are lubricant degradation acceleration catalysts but they are not varnish identification tests.

How do we measure varnish?

There is however one test allowing to measure the oil's varnish potential: Quantitative Spectrophotometric Analysis (**QSA**), based on the extraction of insoluble contaminants, followed by a spectral analysis and material separation (see photo of membrane here under).



The **QSA** test allows to differentiate the soft contaminants, (the latter being responsible for the formation of varnish) from the hard and larger contaminants (not being related to oil degradation).

The varnish formation potential is estimated in **CIE_dE**, on a scale of 1 ~ 100, that would indicate a lubricant's tendency to form varnish. A CIE_dE result higher than 40 indicates a high level of varnish.

NORMAL	CAUTION	MARGINAL	CRITICAL
< 15	15 ~ 30	30 ~ 40	> 40

CIE_dE Results - 1 ~ 100:

For additional information on the varnish test, contact us at
info@tribologik.com or call us at **(514) 383-6330** or at **1-877-461-8378**.

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info@tribologik.com