

## Varnish Potential in Turbine and Hydraulic Systems

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Varnish development in turbine and hydraulic circulating systems has become a more prevalent issue over the years. Much of this can be attributed to different oil formulations with new base stocks, lubricant oil mixing, smaller reservoirs and higher operating pressures. Varnish is generally the result of thermal degradation of oil due to exposure to high temperatures without the presence of oxygen. Temperatures can be in the range of >400°F due to hot spots, micro-dieseling and compression. Varnish buildup on turbine and hydraulic system components can lead to poor operation, unexpected downtime, increased maintenance cost and possible failure of safety systems.

Varnish is a high molecular weight substance that is insoluble in oils, also known as “soft contaminants”. These “soft contaminants” are sticky and like to deposit on metal surfaces. One of the surfaces that attract varnish in turbines equipped with hydraulics is in servo valves. This may result in the valves sticking and cause the turbine to trip or shutdown. Because they are sticky, varnish deposits also like to attract solid contaminants, such as dirt and metal debris in the oil, resulting in abrasive wear. Gas and steam turbine varnish deposits, in particular, have become more of a problem since the widespread introduction of Group II, III basestocks. This is very prevalent in peak systems.

Routine oil analysis testing will not detect the presence of varnish or varnish precursors, but here is the good news...

Staveley’s comprehensive test package can predict a lubricant’s potential to create varnish buildup. Analysis evaluation will rate the varnish potential of a lubricant in service. In order to monitor those systems prone to varnish and deposits, Staveley Services has bundled together a group of tests that take a look at areas where degradation precursors and byproducts will be apparent and measurable. These tests enable us to anticipate the lubricant’s **Varnish Potential**

1. Millipore Filter Patch Visual Examination
2. Filter Patch Weight
3. ISO Particle Count
4. Color
5. Blotter
6. Ultra Centrifuge



Filter Patch

This test package looks at multiple parameters, not just a single aspect of the lubricant for a more comprehensive evaluation. When combined, the assessment of these test results determines the **Varnish Potential Rating**:

**Low – Moderate – Elevated - High**

If we establish that your system has varnish, or the potential for varnish, you can then take steps to clean up the reservoir. Use of Electrostatic Filtration has proven effective in eliminating these degradation byproducts and purifying the turbine oil for extended service life.



Ultra Centrifuge

For more information about varnish testing please contact us at [info@staveleyna.com](mailto:info@staveleyna.com).