



# Special Tests





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## Varnish Potential by MPC Testing

### *Identifying Varnish and Sludge Potential in Oil*

MPC (Membrane Patch Colorimetry) tracks the amount of insolubles present in the lubricating oil. In this way catastrophic failures can be avoided.

MPC is the only ASTM method (*certified ASTM D7843 test: Standard Test Method for Measurement of Lubricant Generated Insoluble Color Bodies in In-Service Turbine Oils using Membrane Patch Colorimetry*) to determine Varnish Potential. By separating oil degradation products their color is measured. It is an important part of turbine and compressor lubricant management. In this type of industry the oil may be in use for many years before it is completely changed. If not properly monitored risk is there of harmful sludge and varnish.

With MPC, a direct correlation is made between the color and intensity of the insoluble contaminants and oil degradation. The test is designed to identify soft contaminants directly associated with oil degradation. This test is considered to be highly sensitive and reliable for detecting subtle changes in insoluble levels

A varnish potential analysis (VPA) combines multiple testing technologies to measure a lubricating oil's propensity to create varnish deposits. Following tests are combined:

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- **Membrane Patch Colorimetry (MPC):**  
A highly sensitive test and reliable for detecting subtle changes in insoluble levels.
- **Remaining Useful Life Evaluation Routine (RULER®):**  
The RULER test uses linear sweep voltammetry to measure hindered phenolic and aromatic amine antioxidant content.
- **Karl Fischer Method:**  
Increased water concentrations indicate coolant leaks, process leaks around the seals and possible condensation.
- **IR Spectroscopy:**  
FTIR covers the monitoring of base stock degradation, oxidation and additive depletion in machine lubricants, hydraulic fluids and other fluid types.
- **Ultra Centrifuge Test:**  
an excellent indicator of varnish potential.



- **Acid Number:**  
A rapidly rising acid number indicates antioxidant depletion.
- **Particle Count:**  
Particulate contamination is tested using two methods, optical (soft/varnish particles) and pore blockage (hard particles).

It provides a high level of confidence when extended oil drains on critical equipment are established. It is up to the operator to conduct the tests routinely, by exception or utilized in conjunction with a regular testing package.

Standard: ASTM D7843



## RULER (Remaining Useful Life Evaluation Routine)

Measuring the amount of remaining anti-oxidants

With (LSV) Linear Sweep Voltammetry, oil analysis has a tool to accurately determine the level of anti-oxidants in used oils. The Ruler uses LSV to provide the exact amounts of aminic and phenolic anti-oxidants present in the oil. Testing and monitoring antioxidant additives (oxidation inhibitors) level is important for controlling the degradation of turbine oils and industrial oils and their remaining useful life (RUL). Excessive temperatures, water and/or cleanliness levels of the fluid have a direct relationship to the reduction of antioxidants. By measuring the depletion and available reactivity of these antioxidant compounds while conducting other routine performance tests, the service life of used lubricants can be effectively monitored.

Suitable for compressors, hydraulic systems, bearing lube systems, gas and steam turbines circulating systems.

During their life time the antioxidants are continually reduced, the remaining life time of oil can be estimated. Accelerated rate of oxidation and degradation of oil occurs if all antioxidants are used. The performance and functionality of the oil will be affected. Eventually also leading to varnishing on certain systems

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Standard: ASTM D7590

## Analytical Ferrography (A-Fer)

Morphological analysis of equipment's wear mode

The Analytical Ferrography technique is in use since 1970. It provides Microscopic Examination and Analysis of Debris (particles) found in lubricating oils. These particles consist of metallic and non-metallic matter.

- The metallic particle is a wear condition that separates different size and shapes of metallic dust from components like all type of bearings, gears or couplings (if lubricated in path).
- Non-metallic particle consists of dirt, sand or corroded metallic particles.

Analytical Ferrography reveals both the wear mode(s) present as well as the alloy compositions of the wear particles present. A clear picture is given of the component(s) that are wearing in the system. Often Analytical Ferrography identifies catastrophic wear modes, when typical ppm wear metal does not show any sign of the wear condition.

Analytical Ferrography can pinpoint specific component failure modes, thereby allowing maintenance to take action to avert a catastrophic equipment failure.

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### Summary

- 1) Provides detailed morphological analysis of wear mode present in equipment; determines the number, size and shape of wear particles
- 2) Goes beyond typical part per million (ppm) wear analysis
- 3) Can categorize alloy types of wear particles
- 4) Provides necessary info to make accurate and decisive maintenance decisions.
- 5) Testing for a.o. General Industry, Power stations, Chemical Plants, Railroad Industry, Food procesors etc.
- 6) Products monitored with Ferrography testing are: steam turbines, heat transfer/treatment systems, engines, pumps, compressors, gas/steam turbines, grease lubricated bearings etc.

Standard: ASTM D7690



**Wear  
Particle  
Analysis**



## PVOT

*Rotating Pressure Vessel Oxidation Test*

**Oxidation stability testing of steam turbine oils (RPVOT) per ASTM D2272.**

The Rotating Pressure Vessel Oxidation Test (RPVOT), formerly known as RBOT, evaluates the remaining oxidation test life of in-service turbine and other oils; a good indicator of oxidative potential.

### **Objective:**

To determine lubricant's resistance to oxidation and sludge formation using accelerated test conditions, involving: high pressure, high temperature, oxygen, the presence of water and active metal catalysts.

Where the RPVOT is performed, the results should be considered in concert with other tests, such as **varnish potential** (QSA and/or MPC) and direct measurement of phenolic and amine-based oxidation inhibitors (**RULER** instrument), to truly gauge the remaining life and health of the lubricant.

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### **Application**

- Compressor oils
- Large reservoir oils
- Turbine oils
- Hydraulic oils

Standard: ASTM D2272

Along with the partnership with Polaris Laboratories, Enluse launched the start of our own private label “**FanPro™**” – Fluid Analysis Program. Fluid analysis with Polaris provides a solutions based approach to maintenance, backed by ISO 17025 A2LA accreditation (highest level of quality attainable by a testing lab). This independent cooperation gives you an independent advice.



References:  
Polaris Laboratories