



Pall Corporation

**Pall Solutions for
Varnish Control in
Turbine Lubrication &
Control Systems**

PREVENTION

Varnish-forming materials are generated when the lubricating fluid is subjected to:

➤ **Oxidation**

The presence of air, water, and particulate contamination in conjunction with high temperature can promote oxidation of the fluid and the resulting formation of precursors to varnish.

➤ **Thermal degradation**

High fluid flow rates and shorter reservoir residence time promote air entrainment responsible for micro-dieseling and the resulting high temperature degradation of the fluid.

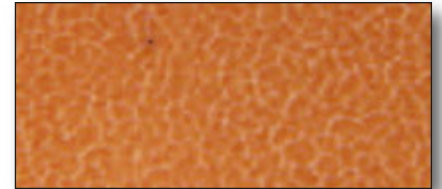
Electrostatic discharge from filters also causes high temperature degradation of the fluid.

Expensive Consequences

Systems contaminated with varnish are prone to costly downtime and maintenance:

- Cost of replacement of control valves and other critical components
- Lost production due to unscheduled downtime
- Expensive fluid replacement and flushing procedures in extreme cases
- Poor cooling of the fluid due to contaminated heat exchangers

The consequences of varnish formation place a high burden on the profitability, availability, and reliability of power-producing turbines.



Photomicrograph of varnish forming material at 100x magnification



Filter housing internals coated with varnish



Heavily contaminated servo valve due to varnish deposit



Ultipor SRT GT lube element

Pall SRT media: removing one key precursor of varnish

SRT media (stress resistant technology) combines Pall's state-of-the-art filtration technology with an anti-static feature to make for optimum protection of the turbine lubrication system.

- Ultipor® SRT filter elements are rated at $\beta_{1000} \geq 1000$, providing optimum protection against component wear. Pall's filtration media technology has been a standard for gas and steam turbines for years.
- Ultipor SRT filter elements are designed to effectively mitigate electrostatic discharge.
- Ultipor SRT filters are available for most power turbine designs, and are used by major turbine OEMs to mitigate filter-induced static discharge when high flow-rates and stringent oil cleanliness are specified.

The only viable long-term solution is a combination of preventive and corrective actions, all part of the Pall Total Fluid Management experience.

SOLUTION

Pall Corporation has combined world-renowned filtration media science with excellence in system design to create a unique, robust solution for your varnish problems.

Pall VRF system

The Varnish Removal Filter (VRF) skid is proven to effectively remove varnish-forming material found in power turbine lubrication and control systems. Designed as a self-contained unit, it operates continuously in kidney-loop mode to process the turbine lubrication fluid reservoir.

The VRF skid incorporates an inlet strainer, a hydraulic pump, Pall VRF-PGG varnish removal modules, a Pall high-efficiency Ultipleat® SRT polishing filter, and an optional lubrication fluid cooler. This system flow rate is 11 gpm (42 lpm), large enough to efficiently treat most turbine lubrication systems in a matter of weeks.



Pall VRF Varnish skid

Advantages of Pall VRF

➤ **Proven Efficiency**

Field experience has shown varnish levels reduced from critical to well-below normal levels

➤ **Speed**

Pall VRF system has one of the fastest clean-up times in the industry

➤ **Reliability**

Proprietary adsorption technology packaged in a simple, proven system design results in a remarkably robust and reliable system

➤ **Fast Payback**

Typical payback of the Pall VRF can be obtained in weeks (when accounting for replacement valve costs, unavailability of equipment, and lost production)



Varnish contained in fluid samples before and after treatment with Pall VRF system

Eliminating varnish in your combustion turbine will result in

- No varnish-related outages, leading to increased availability of your system
- Significant reduction in replacement parts costs
- Reliable and seamless start-up
- Lower energy consumption, and hence, a greener solution

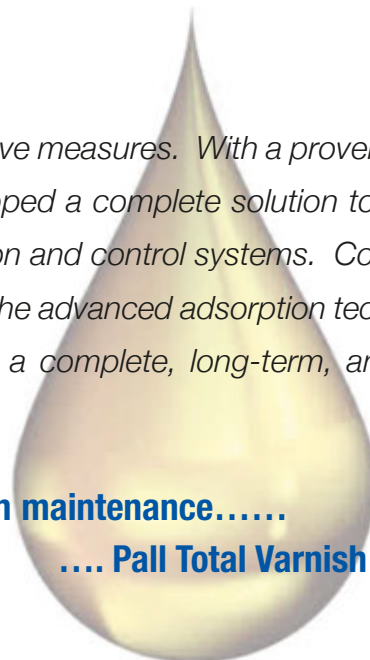
Pall VRF varnish removal filters will take care of all the varnish-related problems in your turbines.

Pall Solutions for Varnish Control in Combustion Turbine Systems

Efficient control of varnish requires preventive as well as corrective measures. With a proven history in steam and gas turbine filtration, Pall Corporation has developed a complete solution to varnish removal and prevention of varnish formation in turbine lubrication and control systems. Combining the preventive power of antistatic SRT filtration technology with the advanced adsorption technology of the new Pall VRF varnish removal system, Pall introduces a complete, long-term, and cost-effective solution to your varnish problems.....

Take charge, protect your equipment, save on maintenance.....

.... Pall Total Varnish Control



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