
Understanding Varnish Control

Decon®-Type Additives vs. Varnish Solvent Oils vs. Varnish Filtration

Varnish is a leading cause of sticking valves, reduced reliability, and unplanned downtime in turbines and hydraulic systems. Customers are often presented with three very different mitigation options: **chemical additives (such as Decon®-type products)**, **varnish solvent or cleaning oils**, and **varnish filtration systems (such as resin adsorption)**. While all three can play a role in varnish management, they work by **fundamentally different mechanisms**, have different risk profiles, and are best applied at different stages of a varnish problem. This paper explains the differences in plain language so operators can select the **right tool for the right situation**.

What Is Varnish (In Simple Terms)?

Varnish is formed from **oxidation by-products of oil and additives**. These by-products are **polar, resin-like molecules** that are initially dissolved in the oil. When the oil can no longer keep them dissolved, they fall out of solution and:

- Plate onto hot metal surfaces
- Restrict servo valves and controls
- Form sticky or lacquer-like deposits

Understanding that varnish is primarily a **chemical contamination problem**, not a dirt problem, is key to understanding why different solutions behave differently.

Option 1: Varnish Additives (Decon®-Type Products)

What they are: Varnish additives are **concentrated chemistry packages** added directly to the in-service oil. They are not replacement oils and do not require draining the system.

How they work:

- Introduce **controlled polarity** into the oil
- Re-dissolve and mobilize varnish precursors
- Keep deposits suspended so they can be removed by filtration

What they do well:

- Allow cleaning **while the system remains in operation**
- Free sticking valves and controls
- Reduce surface deposits without changing viscosity grade

Limitations:

- They do **not permanently remove varnish** on their own

-
- Mobilized varnish must be captured by downstream filtration
 - They do not correct the underlying oxidation mechanism

Best used when:

- Equipment cannot be shut down
- Early to moderate varnish symptoms exist
- Used **in combination with enhanced filtration**

Option 2: Varnish Solvent or Cleaning Oils

What they are: Varnish solvent oils are **specialy formulated lubricants** with high natural solvency, often using polar base stocks such as esters or alkylated naphthalenes. They replace the existing oil during a cleaning phase.

How they work:

- Use **base oil polarity** to chemically dissolve varnish
- Soften and remove deposits from metal surfaces
- Clean the system more aggressively than additives

What they do well:

- Effective at removing established varnish
- Can deeply clean internal surfaces
- Useful during planned outages or recommissioning

Limitations:

- Typically require a drain-and-fill event
- Can release varnish faster than filtration can handle if unmanaged
- Not intended for long-term service in all applications

Best used when:

- Significant varnish is already present
- An outage is available
- Followed by oil replacement and proactive varnish control

Option 3: Varnish Filtration (Resin / Adsorption Systems)

What they are: Varnish filtration systems use **specialized adsorption media**, commonly resin-based, designed to remove **dissolved polar contaminants** from oil.

How they work:

- Attract and bind polar varnish molecules at a chemical level
- Remove what particle filters cannot see
- Reduce varnish precursors *before* they plate out

What they do well:

- Permanently remove dissolved varnish from the oil
- Prevent future deposit formation
- Operate continuously with minimal system disruption

Limitations:

- Do not remove hardened deposits already on surfaces
- Media must be monitored and replaced
- Cleaning rate depends on oil condition and system volume

Best used when:

- MPC values are elevated
- Recurrent varnish problems exist
- As a **long-term prevention strategy**

How These Approaches Work Best Together

No single tool solves varnish alone. The most reliable programs combine methods:

- **Additives** mobilize and loosen varnish
- **Solvent oils** remove heavy deposits during outages
- **Resin filtration** permanently removes varnish from the oil

Used together in the right sequence, these technologies address both **existing deposits and future formation**.

Key Takeaways

- **Decon-type products are additives**, not solvent oils
- **Solvent oils clean by base-oil chemistry**, but often require oil changes
- **Varnish filtration removes dissolved varnish permanently**
- Successful varnish control is about **chemical cleanliness**, not just particle counts

Understanding the role of each option allows operators to select a solution that matches their equipment condition, operational constraints, and reliability goals.



Sources

- ASTM International. **ASTM D7843** – *Standard Test Method for Measurement of Lubricant Generated Insoluble Color Bodies in In-Service Turbine Oils using Membrane Patch*
- Combined Cycle Journal. *Lube-Oil Maintenance: Lubricant varnishing and mitigation strategies*
- Pall Corporation. *Pall Sentry™ Varnish Remova*
- Fluitec. **DECON™ Deposit Remover & Oil System**
- ProActive Reliability (EPT Clean Oil). *MPC Varnish Potential Testing (ASTM D7843)*