



# SVR™ SOLUBLE VARNISH REMOVAL SYSTEM

## INDUSTRY-LEADING SOLUTION FOR REMOVING AND PREVENTING LUBRICANT VARNISH

### Overview

Lubricant varnish is frequently misunderstood as being an oil quality issue. The truth is that all lubricants form dissolved breakdown products, which if allowed to accumulate will eventually form varnish deposits. Varnish forms when a lubricant's capacity to hold dissolved oil breakdown products is exceeded. The key to prevent and remove varnish is to stop the accumulation of these breakdown products and maintain the lubricant's solvency.

EPT's Soluble Varnish Removal (SVR™) system continuously removes and prevents accumulation of dissolved breakdown products during normal turbine operation, so that lubricant varnish cannot accumulate and form – period. Unlike particulate removal based technologies that must wait for varnish to fall out of solution to work, the SVR™ system removes contamination during normal equipment operation when the varnish is dissolved, preventing harmful varnish deposits from ever forming.

## Key Benefits of SVR™ Systems

- Features EPT's industry leading ICB™ filter purification technology for soluble varnish contaminant removal
  - Over 40 million successful operating hours
  - ICB™ filters will not affect turbine oil additives<sup>1</sup>
  - 4-6x more capacity than competing varnish removal systems
  - Unlike competing systems, SVR™ purifies 100% of reservoir volume each day
- Quickly reduces and prevents servo valve sticking
- SVR™ system quickly reduces varnish potential in large gas turbines as measured by the MPC or QSA® tests
- Unlike particulate removal technologies, SVR™ works all the time including operating conditions when varnish is dissolved in the oil
- Eliminates the varnish formation cycle that typically occurs when the oil cools during turbine shut down
- Removes all forms of varnish (solid and dissolved)
- Low cost of ownership over 10 years with defined consumable costs
- ICB™ filter cartridges are changed annually when installed on common sized reservoirs and used in maintenance mode
- Small footprint and straight-forward operation
- Low maintenance: Turn it on and let it run, that's it!
- Guaranteed to work with comprehensive analysis included at no charge until results are documented

## Consumables

One complete set of filters are included with SVR™ system purchase.

P/N 600524V ICB™ filter<sup>†</sup>

P/N 600524T ICB™ filter for lubricants <12 months old

P/N 600699 3 µm β200, micro glass particulate filter<sup>‡</sup>

## Lowest Cost of Operation Over 10 years

80% of all sites clean up with 2 sets of consumables over 3-4 month period, with annual replacement thereafter. See real-life example on next page.

## Best Warranty in Industry

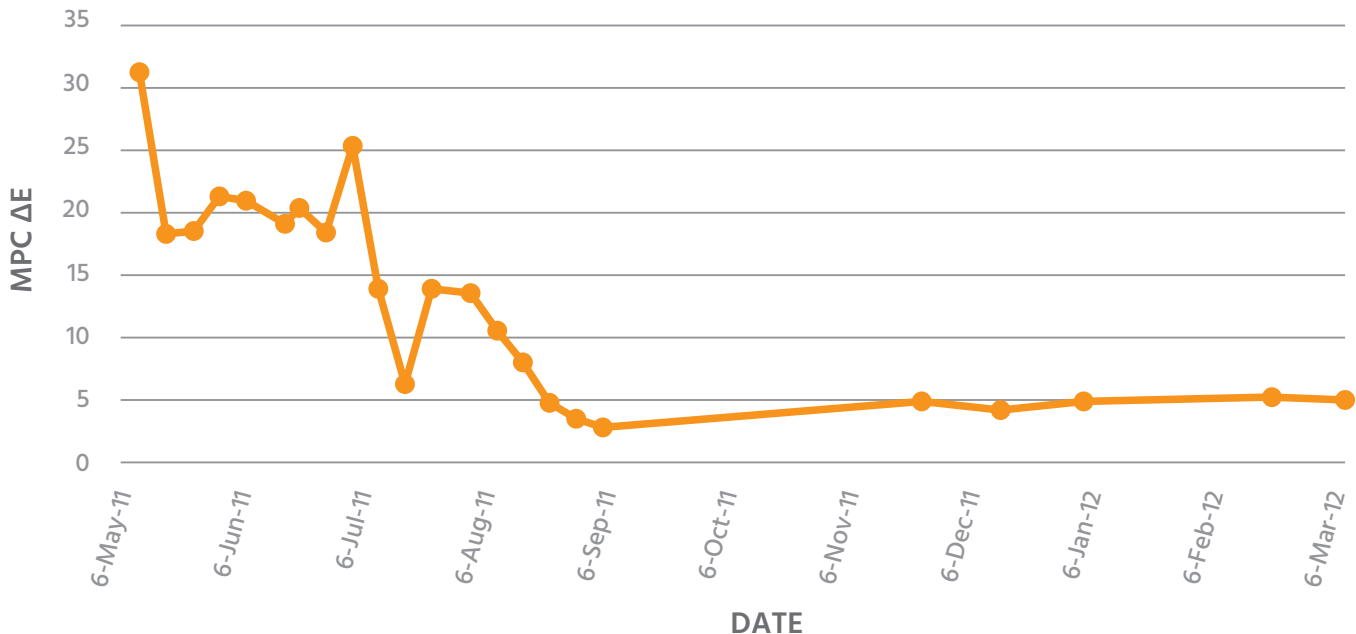
3 years on all parts.

<sup>1</sup> Lubricants less than 12 months old should use EPT- 600524T series filters for additional protection.

<sup>†</sup> Recommend stock level of 2 each. 2 filters used during operation.

<sup>‡</sup> Recommend stock level of 4 each. 1 filter used during operation.

## MPC $\Delta E$ Reduction Using SVR™ System



## SVR™ System Gas Turbine Application Case Study

The above example demonstrates typical SVR™ system performance in a varnish-contaminated turbine lubricant reservoir.

- Lubricant solvency is quickly improved after SVR™ system installation due to removal of dissolved breakdown products.
  - This initial period of operation is known as the restoration phase where previously deposited varnish is re-dissolved by the lubricant because of its improved solvency characteristics.
  - Varnish testing is recommended bi-weekly during the restoration phase as monthly testing will not show the initial dramatic VPN decrease or subsequent deposition removal shown by MPC value increases/decreases.
- The length of the restoration phase is based on the amount of varnish and contamination that has accumulated in the lubricant reservoir.
  - 3 – 4 months is common in most systems, longer for heavily varnished systems.
  - ICB™ filters may need to be replaced 1x in normal restoration phase situations, or 2x in situations with heavier contamination levels.
- Observe varying MPC value increases/decreases.
  - Increases are expected in situations where varnish deposits are present; the increase is showing the impact of deposited varnish being dissolved back into the lubricant.
- The second MPC value decrease is a positive indication that suggests the restoration phase is coming to an end.
  - In the example above, there is a third increase/decrease showing that additional varnish deposits were still being dissolved and then removed.
- 4 months after SVR™ installation, the restoration phase is complete, and the lubricant enters the “stability phase” where MPC values are extremely low and stable (>7 months in this example).
  - Varnish precursors are removed as they are produced during the stability phase, eliminating the normal accumulation cycle and the potential for varnish formation.
  - Operating in the stability phase should be the goal of all turbine operators as it optimizes lubricant/additive performance, and reduces the associated risk of lubricant related turbine failures.

## SVR™ System Specifications

SVR SYSTEM SIZE	SVR 150	SVR 300	SVR 600	SVR 1200	SVR 2400
Dimensions LxWxH (cm/in.)	120 x 79 x 102/ 47 x 31 x 40	120 x 79 x 148/ 47 x 31 x 58	122 x 66 x 102/ 48 x 26 x 40	122 x 66 x 148/ 48 x 26 x 58	178 x 76 x 148/ 70 x 30 x 58
Weight (kg/lb)	159/350	181/400	201/550	273/600	454/1000
Connections: Inlet/Outlet FNPT (in.)	1.0/1.0	1.0/1.0	1.5/1.0	1.5/1.0	2.0/1.5
Electrical Options	120 VAC 1P, 230/ 380/ 475/ 575/ VAC 3P 50/60 Hz. Standard unit is general purpose. Class 1 Div. 1 and Div. 2 options are available.				
Current	12.8 Amps				
Oil Temperature	38-70°C/100-158°F. Heater and cooler options are available.				
Certifications	ASME Certified Vessels @ 150 psi / UL, CUL, CSA				

## SVR™ System Sizing for Turbine and Compressor Lubricant Maintenance

For normal turbine or compressor oil maintenance, the desirable flow rate is to exchange the fluid reservoir volume 1 – 2x per day. For recovery projects, higher exchange rates are desired.

SVR SYSTEM SIZE	SVR 150	SVR 300	SVR 600	SVR 1200	SVR 2400
Reservoir Volume (L/gal) For larger volumes contact factory.	1600/420	3200/845	6400/1690	20000/5280	40000/10560
Flow Rate (LPM/GPM)	2/0.5	4/1	8/2	16/4	32/8
Reservoir Exchange Rate per 24 hr	1.8x	1.8x	1.8x	1.44x	1.44x
Estimated Acid Reduction Capacity Per Set of Filters	2	2	2	2	2

**Note:** Using the above sizing, 80% of sites are typically restored with 2 sets of filters with a replacement interval of 6 weeks. The clean-up or restoration period is typically 3 – 4 months. Heavily contaminated sites normally require 3 sets of filters with a replacement interval of 1 month. After lubricant restoration is complete, the normal fluid maintenance mode requires that filters are replaced annually. All installations include detailed monthly analysis until clean-up period is complete. See SVR™ Case Studies for additional information.

## Additional Resources

- 20 Case Studies: Turbine Lubricant Varnish Removal using SVR™ Systems
- Combined Cycle Journal: Lubricant Varnishing and Mitigation Strategies
- Modern Power Systems: Turbine Lubricant Maintenance for Varnish Free Operation
- White Paper: MPC Varnish Potential Testing (ASTM 7843)
- ICB™ filters for SVR™ systems, ICB™ 600524

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