Today’s competitive hydraulics market has created a trend of increasing power outputs and at the same time smaller fluid reservoirs. What are the consequences? The operating temperatures of hydraulic fluids used in these systems are significantly higher, leading to greater risks of oxidation and thermal degradation of the additives in the fluid. Varnish, the result of that degradation, can result in unplanned downtime, higher maintenance costs and lower profitability.

Over time, varnish build up can increase the friction inside the valves, especially those with fine tolerances such as servo and proportional types, where this phenomenon can be especially troublesome. Varnish buildup may cause servo valves to stick in an open position. The impact of sticking valves on the hydraulic system can be impaired responsiveness and reduced oil flow, which results in overall loss of efficiency and increase in maintenance costs.

What is Varnish and How Does it Form?
As oil ages, fluid degradation is caused by oxidation, thermal decomposition and the natural process of additive consumption. Additives – performance-enhancing chemicals – are consumed over the life of the fluid. Degradation byproducts increase as the oil ages, eventually forming varnish.

Since varnish is polar, it is attracted to metal surfaces such as servo valves. Varnish starts as a soft, waxy, sticky film. The sticky
nature of this material allows it to attract wear debris, resulting in the formation of a sandpaper-like surface. Eventually, the soft, sticky material transitions to a hard lacquer that can be very difficult to remove.

**How Does Varnish Harm Equipment?**

Oil that has been oxidized generally doesn’t lubricate very well. The result can be reduced oil flow, plugged filters, stuck valves, increased friction and wear, poor heat transfer, and elevated operating temperature. Because varnish acts as an insulator, cooling capacity can be diminished.

On top of that, varnish shortens the lives of equipment components such as valves, filters, pumps, bearings and seals. What’s the bottom line? Hydraulic equipment performance suffers.

For example, in high-performance vane pumps, varnish adhering to the vanes can cause the vane to stick in the rotor slot. The consequences are increased noise, decreased volumetric and mechanical efficiency, increased energy consumption, side plate scuffing, rotary seal damage and possible bearing damage.

**What is the Solution for Varnish?**

Electrostatic filtration systems can remove contaminants, but these systems don’t deal with varnish formation causes, tend to be expensive and can be susceptible to water contamination. Another is the commonly accepted practice for end users to routinely change or clean servo valves in hydraulic equipment to keep their systems running. One new valve can cost $3000 US, and the cost to clean and refurbish a valve can be about $2000 US. And don’t forget to add on the labor costs and the lost production costs of shutting down the equipment.

An ideal solution is using a hydraulic fluid containing Lubrizol® 6776, which prevents formation of the film that becomes varnish. Lubrizol® 6776’s additive chemistry reacts with the precursors of varnish, minimizing the formation of tenacious, hard films on system hardware.

**What Do Tests Show?**

Laboratory testing demonstrates the keep-clean feature of fluids containing Lubrizol® 6776. In industry-accepted tests, fluids containing other additive technologies show...
varnish formation within 500 hours of operation. In the same tests, there was no evidence of varnish formation on system surfaces after 1,000 hours of use with fluids containing Lubrizol® 6776.

Fluid containing Lubrizol® 6776 meets a number of original equipment manufacturers’ specifications:

- Hybrid pump HF-0 has been granted (approval number 289).
- Easily surpasses DIN 51524-2 HLP.
- Provides Cincinnati Machine thermal stability.
- Meets ISO 13357 filterability requirements.

What are the Best Applications for Fluid Containing Lubrizol® 6776?

Fluids containing Lubrizol® 6776 are particularly suited to hydraulic applications where high temperatures – mobile equipment, plastic injection molding machines, glass transfer systems, heavy presses, etc. – can be problematic and compromise the oil’s life. These fluids also are suitable for equipment owners who want to extend the life of their oil and their equipment, including valves, filters and pumps.

Summary

Today’s hydraulic fluids are being subjected to increasingly tough operating conditions. Demands to raise production at the same time as oil volume is decreasing emphasize the need for high-quality hydraulic fluids. New varnish-reducing additive chemistry, Lubrizol® 6776, is the perfect partner for hydraulic fluids used in those harsher operating conditions.