Fighting Turbine Oil Degradation

By Brian J. Goldstein, Market Development Manager, Dow Performance Fluids

The Calpine Oneta power plant in Broken Arrow, Okla., operates four General Electric 7FA gas turbines. The turbines were not operating efficiently because of problems with varnish and carbon build-up.

The by-products of turbine oil degradation that result from high heat and friction were fouling servo valves, pencil filters, reservoir interiors and piping. The recurrence of varnish and carbon build-up was hindering proper operation of critical hydraulic components.

Gas turbines operate at very high speeds and generate extremely high operating temperatures. When mineral oil-based turbine oils are subjected to the rigors of normal gas-powered turbines, servos stick and filters get plugged. The resulting sludge not only plays havoc in obvious places but collects in areas like turbine piping and heat exchangers. More time is needed for maintenance and lost production from offline turbines adds to costs.

“After unsuccessfully testing several methods and systems that claimed to remove and/or reduce the varnish, Oneta Energy Center (OEC) decided to move toward replacing the lubricant with a product that would better resist or eliminate the varnish or the mechanism causing it to form,” said Mike Pankratz, OEC plant manager.

Selecting the right lubricant and keeping the oil clean are two of the keys to fewer breakdowns and less maintenance or downtime. Localized hot spots in turbine oil can initiate oxidation, causing sludge, varnish and hard carbon deposits to form. ECOSAFE TF-25 Turbine Fluid can shrink the potential for varnish formation in gas turbines used in either base load service or high-stress peaking operations.

Marketed by American Chemical Technologies, ECOSAFE TF-25 is based on synthetic lubricant technology from The Dow Chemical Co. It is a high-viscosity index, polyalkylene glycol-based (PAG) fluid.

PAG-based lubricant oxidation by-products are soluble in the base fluid and will not fall out of bulk solution to cause varnishing or sludge. PAG-based lubricants contribute to long-term actuator and valve cleanliness, reducing the likelihood of sticking and improving starting reliability.

To solve the contamination problems Calpine was experiencing in Broken Arrow, a complete turnkey operation was performed to remove the old lubricant and by-products. A fluid system flush and cleaning was performed on the turbine. All the old varnish and the sludge that had accumulated during normal operations was removed. After cleaning the turbine, ECOSAFE TF-25 replaced the old lubricant.

After one year of operation, Pankratz said that there were no problems noted in analytical testing with regard to acids or oxidation.