UCON™ Fluids and Lubricants

Dow TF-25 Logs Over 18,000 Operating Hours On General Electric Turbines

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The Dow Chemical Company (Dow) has offered Dow TF-25, sold exclusively in North America by American Chemical Technologies, Inc. (ACT) as ECOSAFE TF-25, for over three years. During those four years, turbines have performed successfully in the field for over 18,000 hours and 368 starts. One of these turbines has been operating at the Calpine-Oneta power plant located in Broken Arrow, OK since November, 2007. The recommended operating parameters for fluids on these turbines were originally written for mineral oil based lubricants. Dow TF-25 is comprised of unique polyalkalene glycol (PAG) chemistry which has had decades of proven performance in other turbo-machinery applications. PAG chemistry is fundamentally different from mineral oil. Therefore, not all of the recommended lubricant properties specified in GE K 32568F, Lubricating Oil Recommendations for Gas Turbines with Bearing Ambience Above 500 Degrees F., provide a relevant correlation to the performance of this PAG based fluid.

According to the G.E. specification: “the (recommended lubricant properties) are only recommended values. An oil that has been shown to perform successfully in the field may still be used even if all the (recommended lubricant properties) have not been satisfied”.

“The recommended properties for lubricating oil in the G.E. documentation do not have any specifications for PAG based fluids,” said Chuck Carn, strategic marketing manager for Dow Fluids and Lubricants. “However, the G.E. specification allows for the use of fluids that have been shown to perform successfully in the field. Our experience verifies that we have met the performance criteria.”

Why The Change to ECOSAFE?

The turbines in Broken Arrow were not operating efficiently because of severe problems with varnish and carbon build-up. These 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. The resulting sludge not only plays havoc in obvious places but collects in areas not so obvious like turbine piping and heat exchangers.

When mineral oil based turbine oils are subjected to the rigors of normal gas powered turbines, servos stick and filters get plugged. This means more time for maintenance personnel to work on the machinery. Significantly adding to those costs are the lost production of turbines that are off line. So the price Calpine was paying for less than ideal lubrication was quite high. After unsuccessfully testing several methods and systems that claimed to remove and/or reduce the varnish seen, Oneta Energy Center (OEC) decided to move towards replacing the lubricant with a product that would better resist or eliminate the varnish or the mechanism causing it to form.

Lubrication is important for installations like the one in Broken Arrow, OK as gas turbines are built to run at high operating temperatures and require fine tuned hydraulic controls. Selecting the right lubricant and keeping the oil clean are two of the keys to fewer break downs, less maintenance or downtime. Localized hot spots in turbine oil can initiate oxidation, resulting in the formation of sludge, varnish, and hard carbon deposits. ECOSAFE TF-25 is a premium lubricant marketed exclusively in North America by American Chemical Technologies, Inc. and based on advanced synthetic lubricant technology from The Dow Chemical Company, designed to remedy typical problems associated with traditional turbine lubricants.

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. Avoiding varnish formation can help improve starting reliability, help ensure reliable, long term turbine service, and extend equipment operating life with less maintenance and repair expense.

ECOSAFE TF-25 is a high viscosity index, polyalkylene glycol based fluid which provides a low coefficient of friction, exceptional thermal conductivity, and fast air release.

Performance Advantages of PAG Based Lubricants
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. Unplanned maintenance costs due to forced outages can be minimized and intervals between costly scheduled maintenance events are longer.

High Temperature Stability
ECOSAFE TF-25 Turbine Fluid is very stable at high temperatures encountered in gas turbines and is resistant to thermal degradation at temperatures of 120 degrees Centigrade or 250 degrees Fahrenheit. The result is longer fluid life and increased reliability.

Solving Problems At Broken Arrow
To solve the problems of contamination Calpine was experiencing, 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 at Broken Arrow. All the old varnish was removed, so too was the sludge that had accumulated during the normal operation. After thorough cleaning of the turbine, ECOSAFE TF-25 was used to replace the old lubricant. The results were immediately promising. OEC noticed a slight drop in bearing metal temperatures by approximately 2°F - 3°F under similar operating conditions. This reduction in heat is assumed as a result of less friction/energy loss in the bearings.

About Dow

Dow combines the power of science and technology with the "Human Element" to passionately innovate what is essential to human progress. The Company connects chemistry and innovation with the principles of sustainability to help address many of the world's most challenging problems such as the need for clean water, renewable energy generation and conservation, and increasing agricultural productivity. Dow's diversified industry-leading portfolio of specialty chemical, advanced materials, agrosciences and plastics businesses delivers a broad range of technology-based products and solutions to customers in approximately 160 countries and in high growth sectors such as electronics, water, energy, coatings and agriculture. In 2009, Dow had annual sales of $45 billion and employed approximately 52,000 people worldwide. The Company's more than 5,000 products are manufactured at 214 sites in 37 countries across the globe. References to "Dow" or the "Company" mean The Dow Chemical Company and its consolidated subsidiaries unless otherwise expressly noted. More information about Dow can be found at www.dow.com.

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