

Customer Testimonial



Monolec® Turbine Oil (6461)

Nuclear Generating Station – United States

General Electric Steam Turbine & Auxiliary Equipment

- Reduced foam level in return oil tank of steam turbine by two-thirds
- Improved demulsibility from 5-37-38 in 30 minutes to 40-40-0 in 10 minutes
- Decreased oil temperature and discharge air temperature in auxiliary equipment

Customer Profile

This nuclear generating station located in northeastern United States has been a customer of Lubrication Engineers, Inc. since 2007.

Application

The station's major equipment includes its main unit – a General Electric steam turbine – as well as outboard heater drain pumps, auxiliary vacuum pumps, condenser vacuum pumps and other auxiliary equipment. Station personnel began investigating alternatives to the turbine oil used in its steam turbine and auxiliary equipment due to concerns over oil performance.

Challenge

Personnel were concerned with discoloration of the station's oil, which appeared black when examined in a 1-liter sample bottle. They were also concerned with increasing levels of foam in the steam turbine oil reservoir and in the reservoirs and sight glasses of auxiliary equipment. The foam level in the turbine return oil tank exceeded 12 inches.

In-depth oil analysis also indicated the station's used turbine oil demonstrated the following:

- Poor foaming tendency
- Poor demulsibility (water separability) at 5-37-38 (ml of oil-water-emulsion) in 30 minutes
- High varnish potential of 62.2 ΔE
- Increased acid number of 0.10
- ISO Cleanliness Code of 22/20/16 (particle contamination)

The turbine oil in use was a traditional formula using Group I base oil, a formulation which the manufacturer announced would no longer be available. The supplier recommended conversion of all equipment to its new Group II product



Unit 1 Steam Turbine Generator

formulation. However, station personnel were reluctant to do this based on reports from other stations that had converted to Group II turbine oils and then experienced problems in the same areas where they were already seeing weak performance.

Because of these concerns, station personnel discussed doing a complete changeout of the turbine oil reservoir during a future major outage.

LE Solution

Lubrication consultants Harish Doshi and John Hayes recommended LE Monolec® Turbine Oil (6461) as a replacement for the existing oil. Monolec 6461, an ISO 32 viscosity grade oil, is a mainline turbine oil designed and formulated with a high-performance Group I base oil. Monolec 6461's unique formulation includes several proprietary performance-enhancing additives that combine to deliver improved oxidation resistance, demulsibility performance, foam characteristics, volatility and wear protection.

Following an exhaustive product evaluation, ASTM compatibility compliance and approval by the station's corporate parent, the nuclear generating station planned to introduce Monolec 6461 into the GE steam turbine as make-up oil and to immediately begin using it in auxiliary equipment that required an ISO 32 turbine oil.

As personnel finalized plans for the changeout of the oil in the steam turbine, they were able to observe the performance of Monolec 6461 in the auxiliary equipment. The results they observed were immediate and impressive.



Results – Auxiliary Equipment

Using Monolec 6461 in auxiliary equipment, they observed a noticeable reduction in the foam visible in reservoirs and sight glasses, as well as the following results specific to each piece of equipment:

Outboard Heater Drain Pumps

- Oil temperature dropped by 10°F (5.6°C), forcing a reset of the equipment’s low-temperature alarm.
- This temperature reduction will provide long-term operational benefits.

Auxiliary Vacuum Pumps

- Oil temperature dropped by 3°F (1.7°C).
- Discharge air temperature decreased by 10°F (5.6°C).

Main (Condenser) Vacuum Pumps

- Oil temperature dropped by 5°F (2.8°C)
- Discharge air temperature decreased by 10°F (5.6°C).

Results – Steam Turbine (main unit)

The positive results observed in the auxiliary equipment listed above – along with additional equipment – gave them confidence to begin adding Monolec 6461 to the reservoir of the steam turbine.

GE Steam Turbine

Beginning in 2010, the station began adding Monolec 6461 to its steam turbine as make-up oil. With less than 10% by system volume of Monolec 6461 added, the following results were documented:

- Foam level in return oil tank was reduced by two-thirds.
- Demulsibility (water separability) improved from a very poor 5-37-38 in 30 minutes to an excellent 40-40-0 in 10 minutes.

This promising early performance of Monolec 6461 as make-up oil in the steam turbine allowed the station to postpone the complete changeout of the reservoir to Monolec 6461 until late 2012.



Thank you to Harish Doshi and John Hayes, LE lubrication consultants, (pictured) for providing the information used in this report.



Outboard Heater Drain Pump



Auxiliary Vacuum Pump



Main Vacuum Pump

Unit 1 – Steam Turbine Return Oil Tank



Above: Before Monolec, foam is near top.



Right: After Monolec, foam level drops by two-thirds.

Monolec® is a registered trademark of Lubrication Engineers, Inc.

Based on actual user experience. Individual results may vary. Not intended to supersede manufacturer specifications.