THORDON SXL GUIDE BEARING ELIMINATES RISK AT THE STAR LAKE GENERATING STATION

Reliability was an important factor in the Star Lake Hydro Partnership's decision to replace the Star Lake Generating Station's turbine guide bearing. The 18-MW facility — owned by a partnership of Abitibi-Consolidated Inc. (51 percent) and Enel North America, Inc. (49 percent) — runs about 98 percent of the time, shutting down for scheduled maintenance for only six to seven days a year.

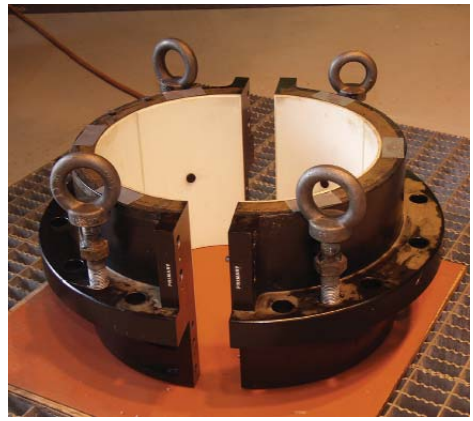
As manager of the Star Lake Generating Station in southwestern Newfoundland, Canada, Robert Conlon wanted to replace a water-lubricated, hydrostatic turbine guide bearing in a vertical Francis unit that required a complex high pressure filtered water supply. This filtration system was very costly to maintain and a previous hydrostatic bearing failure during initial startup had required the replacement of both the turbine shaft and the bearing, which meant a month-long and costly outage.

"The second water-lubricated, metal turbine guide bearing has performed fine for four years," says Conlon. "However, we were concerned of the consequences if this bearing failed at full load. The result could be an unexpected failure destroying the bearing, damaging the shaft and possibly damaging the generator."

Those fears were eliminated, however, when the hydrostatic metal bearing was replaced with a water-lubricated, Thordon SXL turbine guide bearing operating in hydrodynamic conditions.

For water lubricated metal bearings such as the one at Star Lake, the fluid film must be consistent between the shaft and the bearing. If abrasives are present in the lubricating water, the fluid film may be disrupted and the bearing will fail. The water supplied to water lubricated metal bearings has to be extremely clean (contaminants removed to 25-30 microns).

Thordon SXL bearings allow a larger diametrical clearance between the shaft and the bearing surface and require more water than the metal bearing. The water flow requirements to the SXL bearing surface for cooling purposes are 0.15 litres/minute per mm (1 U.S. gallon/minute per inch) of shaft diameter at standard clearances. However, the water filtering requirements are not as stringent for SXL bearings, because wear life is not seriously effected with water contaminants up to 150 to 200 microns.



Thordon SXL Main Guide Bearing ready for installation at Star Lake

Thordon SXL is an elastomeric polymer bearing material with a 25-year history of long-life performance in water lubricated main shaft guide bearings. "It was certainly the right choice for us," says Conlon. "Even if the Thordon SXL bearing were to fail, it would not fail suddenly and unexpectedly. The most that would happen is that the Thordon material would wear a little bit."

Before making the commitment to purchase the Thordon SXL bearing, the Star Lake Hydro Partnership researched the product extensively. This included checking references in North America and Europe. "Satisfied with the experience of others," says Conlon, "the order was eventually placed for two bearings (one plus a spare) in July 2003".

Rapid installation reduces downtime

Normally, the turbine shaft has to be dismantled to install a solid journal bearing. Disassembly and re-assembly is an arduous process. In addition, the whole unit has to be realigned as a part of the process.

Working with Thordon's engineers, however, the decision was made to design and fabricate the bearing in two halves. "We simply took the two halves and bolted them together around the shaft," says Conlon. "Once the Thordon bearing was in place, it was positioned with a constant annulus around the shaft." Before removing the old bearing, the turbine runner had been wedged in position so that the turbine shaft was centered on the old bearing. As a result, no time-consuming realignment was necessary.

The Thordon bearing was so simple to install, in fact, that the outage lasted just six days, which Conlon observed, "was a large saving in time and money."

Confident that the Thordon SXL bearing will not fail unexpectedly, the Star Lake Hydro Partnership is comfortable that they have made a major improvement in Station reliability. The Thordon SXL bearing is performing as anticipated.