

Self-lubricating bearings improve performance, reduce environmental impact at hydro project

When Hydro Quebec contracted Alstom Hydro Canada to build the turbines for its Peribonka generating station, it was seeking solutions to both operational and environmental issues. One of four dams on the Peribonka River in Quebec province, the \$1.4 billion, 385MW facility consists of a primary earthen dam that spans two valleys, two main dikes and three Francis turbines.



It became fully operational in March 2008.

Hydro Quebec, which operates a total 56 hydropower facilities, were looking for a long life and maintenance free plain bearings that are compliant with Canadian Environmental Assessment Act. Consistent with its corporate motto, “Our choice is clear: Clean and Green”, the company is dedicated to “environment-friendly turbine design with lubrication-free technology to reduce water pollution.”

Powertech Labs in British Columbia tested a variety of bearing materials to U.S. Army Corps of Engineers requirements for service in the wicket gates of hydro turbines. Based on the results of these tests, which simulated conditions in actual turbines, Alstom specified GGB (formerly Glacier Garlock Bearings) self-lubricating, filament-wound HPM™ cylindrical plain bearings for the wicket gates controlling the flow of water into the tur-

bines. The company also specified GGB HPF™ thrust bearings for the operating ring assemblies in the plant’s three Francis turbines. Both materials were developed specifically for hydropower applications.

GGB supplied bearings for three units, plus one spare set. Performance of the bearings to date has been good, according to Bernard Delisle, Alstom Hydro’s chief engineer for the project. Delisle indicated he specified the GGB bearings based on their material properties, as well as GGB’s engineering and technical support.

High-strength, self-lubricated bearings

Both HPF and HPM combine the self-lubricating properties of PTFE with the high strength and stability of an oriented glass-fiber-filled epoxy resin backing. HPF consists of a proprietary filled PTFE liner bonded to a fiberglass-reinforced composite backing, and is available in both flat and cylindrical forms. HPM consists of a bearing liner composed of PTFE and high-strength fiber winding encapsulated in an epoxy resin enhanced with self-lubricating fillers.

The maintenance-free materials provide high load capacities, low wear rate and low friction, long service life, excellent corrosion resistance, and virtually zero water absorption for dimensional stability. And because they do not need to be greased, the HPF and HPM materials do not release polluting lubricants into the river.

“When we selected the self-lubricating bearings, we looked at a lot of things to obtain a global evaluation,” explained Alstom Hydro’s Delisle. “For example, what were the machining tolerances? If they were too large, we would be required to machine the wicket gates, which would add costs. We also looked at delivery, price, and the tests from Powertech Labs.

Frank Trivieri, GGB sales manager for Canada, added “Both HPF and HPM tested very well at Powertech Labs. The HPM bearings actually exhibited lower friction values than Alstom had designed for, resulting in less force to operate the wicket gates and a higher safety margin.”

With regard to GGB’s engineering and support services, Delisle said, “They have a lot of technical experience. I always ask myself, ‘How do I feel about asking technical questions of a supplier?’ I feel comfortable with GGB.” The challenge was to machine the turbine and wicket gate bearings to such high tolerances that they would last longer than expected, despite the higher loads.

“There is a great deal of engineering that goes into the turbines and bearings,” said GGB’s Trivieri. “We had to develop special tools to precision machine the Bearings to high tolerances for long wear life. The cost of shutting down a turbine to replace a bearing could run into millions of dollars, so they want the Bearings to last 30 years.”

With 76,000 employees, a presence in 70 countries and annual sales of nearly 17 billion, Alstom Hydro is a world leader in integrated power plant, power production services and air quality control systems. The company supplies approximately 25 percent of global hydropower from an installed base of over 400 GW of turbines and generators all over the world.