

THORDON BEARINGS PROVIDES **NEW LEASE ON LIFE** FOR **FORTUM HYDROPOWER PLANTS**

Fortum's 10MW hydropower plant at Vässinkoski, Sweden, is now successfully operating with Thordon Bearings' polymer SXL turbine guide bearing following the completion of the plant's extensive renovation and recommissioning work.

Thordon's involvement in the project followed the retrofit installation in 2013 of its water-lubricated bearings to the slightly larger Noppikoski plant, also in Sweden. Both refurbishment projects were overseen by ČKD Blansko Holding, the largest turbine manufacturer based in the Czech Republic.

For both plants, ČKD Blansko specified Thordon's SXL polymer bearings, each with a bronze tapered keyset, in addition to SXL axial sealing face rings.

Greg Auger, Thordon Bearings' Hydro & Clean Power Business Unit Manager, said: "When we were first approached by ČKD Blansko to supply the new turbine guide bearing for the 1967-commissioned Noppikoski turbine, we were faced with a particular design challenge: the Francis turbine is connected to the generator by a 45m long shaft supported by seven individual bearing positions. The scope of the project was so extensive, it made sense for ČKD Blansko to replace all of these bearings to achieve the best control of shaft position and vibration."

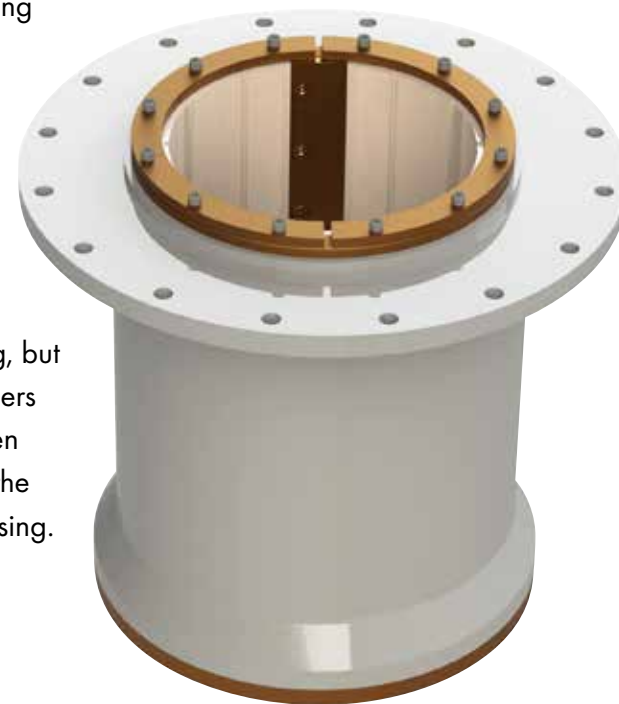
The six intermediate bearings were refurbished by ČKD Blansko, and the seventh water lubricated bearing was replaced with a Thordon SXL guide bearing to support the 420mm (16.53") diameter shaft. Thordon also supplied a longer wearing SXL seal face material for the axial seal assembly that was installed. This was Fortum's first experience with Thordon's water-lubricated guide bearings supplied as part of a major upgrade project.

Based on the success of the retrofit and subsequent five-years of seamless operation, Fortum and ČKD Blansko specified a similar scope of supply for the Vässinkoski plant, which also operates a 1967-commissioned Francis turbine and generator.

"Aside from the obvious environmental advantages, the Thordon solution provides for a longer operating life and, due to the unique tapered keyset design, optimises in-service maintenance since the SXL polymer can be removed without having to split the bearing's metal housing," added Auger.

Commenting on the installation, Jan Piroutek from Eribos, Thordon's distributor for Czech Republic and Slovakia, said: "We worked closely with the OEM on the final design and material selection and supplied the SXL bearing with a bronze tapered keyset along with an SXL axial seal ring."


Working with ČKD Blansko to help design and build all the metal components, the companies were able to use parts of the original bearing casing but replaced the rubber element with the Thordon SXL polymer. During assembly, the bearing was submerged in liquid nitrogen at -196°C (-321°F) to ensure a perfect fit into the housing, but this meant engineers had only about ten minutes to install the bearing in its housing.



"Everything went very smoothly, indeed," said Piroutek. "We anticipate the Noppikoski and Vässinkoski plants will now be operating for another 30-years before their bearings need to be replaced.

"During the commissioning ČKD Blansko technicians confirmed very negligible water leakage through the axial seal – even less than Thordon calculated during the design stage," said Piroutek.

The Vässinkoski and Noppikoski Hydropower Plants, both located on Sweden's Oreälven river, each operate one 10MW vertical Francis unit rated at 333rpm and are connected to the turbine runner by a 45m long shaft.

Following extensive tests, the Vässinkoski plant upgrade was commissioned in March 2018. 



The 1967-commissioned Noppikoski Hydropower Plant operates on the Oreälven river in central Sweden with an installed capacity of 10MW and annual power output of 33GWh.

The plant operates power generation equipment in an atypical arrangement in that the 1620mm diameter Francis runner of the Francis turbine is connected to the generator by a 45m long hollow shaft and the entire rotating assembly is supported by seven individual bearings.

In early, 2013, the plant successfully commissioned an upgraded turbine and generator following an extensive refurbishment by ČKD Blansko Holding. The sister Vässinkoski plant, refurbished in 2018, also features one 10MW Francis turbine, operating with 62m of head at a nominal speed of 333rpm.

In both stations, the generator hall is located below ground level, while the turbine can be found at the bottom end of a deep tubular pit, 4.0m in diameter. Water flows through the units at a rate of 20m³/s via the penstock and into a 6.0m diameter bulb which contains the distributor mechanism and water lubricated turbine guide bearing.

The rotating mass is quite complex as it includes eleven individual shafts coupled together (1 turbine shaft, 4 intermediate shafts, 4 hollow shafts, 1 lower generator and 1 upper generator shaft). Before the refurbishment began ČKD Blansko studied the rotor-dynamic behaviour of the system in order to fully understand the system, including the influence of the Thordon SXL water lubricated turbine guide bearing.

The original radial type shaft seal using carbon segments was upgraded to use an axial-type seal including the Thordon SXL sealing face.