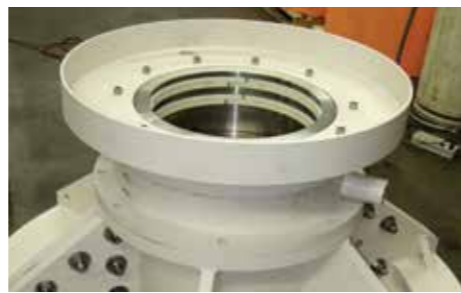


The COME BACK of Water Lubricated Turbine Guide Bearings

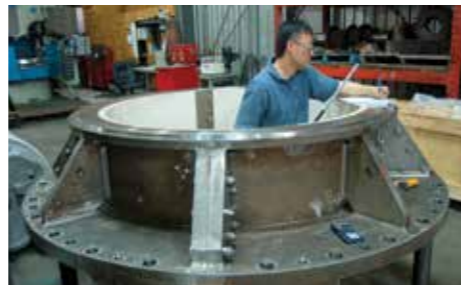
Hydro-electric turbines operating in remote areas all over the world are producing enormous amounts of clean energy. Nonetheless, a large number of these generating stations have the potential of posing an environmental threat to local ecosystems. Oil and grease have long been considered as one of the primary methods of lubricating the lower turbine guide bearing. As environmental regulations become more stringent, any accidental or operational loss of oil or grease to the environment is not acceptable and can have grave repercussions. This can be a serious issue in remote areas where detection, monitoring and spill clean-up can be very difficult due to the poor accessibility or un-manned operation of the power station.

To eliminate any risk of oil leakage, Thordon Bearings can prepare custom designed solutions of water lubricated lower turbine guide bearings. Solutions can range from a simple bearing supply to a complete bearing, supplied with the support housing and integrated shaft seal housing package. Working with hydroelectric turbine equipment manufacturers and power station operators around the world, Thordon Bearings is not just providing bearings to fit an application, but developing bearing solutions to resolve and overcome bearing application challenges. Listed below are some examples of hydropower plants around the world using Thordon water lubricated turbine guide bearings.



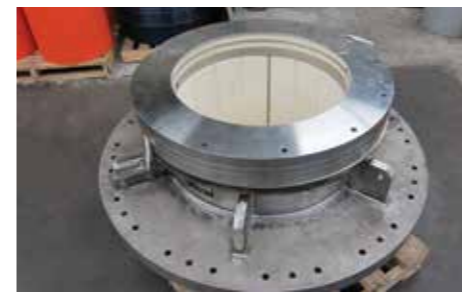
Spaulding I & Spaulding II

Working perfectly since 2012, the conversion of 2 turbine guide bearings on vertical Francis turbines at the Spaulding power stations located in the US Pacific northwest from oil/white metal bearings to Thordon's water lubricated SXL bearings has been a great success. In this application the bronze tapered keyset is covered with SXL flaps, which eliminates a large groove in the front of the key that could direct cooling and lubrication water away from the running face of the bearing during certain operating conditions.



Saratov

In 2014, Thordon was selected to supply the turbine guide bearings for 21 large vertical Kaplan turbines, each with an output of 60 megawatts for a large power station in Russia. With 1350 mm shaft diameters, these are among the largest water lubricated turbine guide bearings that Thordon has manufactured for the hydro industry so far. Thordon SXL elastomer was specified for the water lubricated bearing system. The turbine guide bearing housing was split into 4 segments to allow it to be more easily maneuvered in the location where it was to be assembled. This bearing system also featured 2 tapered keysets to facilitate easy future bearing replacements.



Raanaasfoss Power Plant

Originally built in 1922, the Raanaasfoss Power Plant in Norway began a project in 2012 to maximize performance and to render it more environmentally friendly. This project included six vertical propeller turbines, each with a maximum output of 15.5 megawatts. Thordon supplied the SXL turbine guide bearing for the first unit in December 2012 and the final unit was up and running in spring 2016. Thordon was tasked with providing a design solution for the complete bearing and seal assembly that used water as the lubricant instead of oil. As one of the concerns for the project was environmental impact, Thordon's water-lubricated bearings were the right fit for both the technical requirements and environmental mindset.

The design focused on providing a fully hydrodynamic bearing design with adequate support to carry the expected loading while integrating Thordon's unique tapered keyset feature for fitting the polymer bearing directly into the fabricated stainless steel bearing housing, without the use of adhesives or additional mechanical fastening. The reduction in the complexity and total number of components in the assembly resulted in substantial cost savings. The use of the Thordon tapered keyset greatly reduces downtime during bearing inspection or replacement as it facilitates easy removal of the polymer bearing shells without removing the shaft or bearing housing.



Centrale di Fabbriche

Owned by a large utility in Italy, the Centrale di Fabbriche power station was originally built in 1955. Discussions began in 2014, and were primarily focused on improving access to the shaft seal and eliminating risk of water entering the existing oil lubricated Babbitt bearing assembly on this vertical Kaplan turbine. In the original design of this 15 megawatt unit, any problems encountered with the shaft seal were very difficult and time consuming to resolve as complete disassembly of the oil lubricated turbine guide bearing would be required. A water lubricated bearing would be the solution to this problem with complete elimination of the existing oil bearing and shaft seal, being replaced by a new Thordon SXL bearing and shaft seal mounted above the bearing assembly. In early 2016, a new stainless steel bearing housing was fitted, with Thordon's SXL bearing and tapered keyset supporting the 400mm diameter shaft. The original carbon graphite shaft seal was also replaced with a new radial type seal that utilized Thordon's SXL elastomeric seal segments for improved seal wear life.



Ruskin Power Station

The Ruskin powerhouse was built in 1930 located in British Columbia, Canada. The original vertical Francis turbines were designed using water lubricated stave type wooden turbine guide bearings. Thordon SXL staves had been used to upgrade the original wooden bearings and keep the units running for the past 10 years. When the decision was made in 2013 to completely replace the ageing turbines, it was a logical solution to continue using Thordon to provide a modern approach to the original water lubricated design. Three new 35MW vertical Francis units were installed to replace the original turbines, starting in 2014 and Thordon supplied the complete water lubricated SXL bearings in stainless steel housings, together with the radial type shaft seals and water filtration systems to supply the water for cooling & lubrication of the bearings.

About
THORDON
THORDON BEARINGS INC.

Thordon SXL has a proven track record and has been used in Hydro, Marine and Industrial applications for over 35 years. Thordon SXL offers a low coefficient of friction, superior adhesive wear performance and good resistance to wear resulting from third particle abrasion. SXL offers minimal to no maintenance requirements and eliminates the pollution risk associated with oil-lubricated bearing alternatives.

Thordon turbine guide bearing designs allow easy installation and replacement without removing the split steel bearing housings or shaft. Thordon has over 35 years' experience supplying water lubricated turbine guide bearings, for rehabilitation and new projects.

For more information check out our video at: thordonbearings.com/hydro-power/new-hydro-video