THORSEALS AND HPSXL SOLVE WICKET GATE LEAKAGE PROBLEM

As any beaver will tell you, stemming the unrelenting force of river water is a complex engineering feat. So it's not surprising that the first dam to span the massive Columbia River in Washington State, U.S.A. - the *Rock Island Dam Hydroelectric Project* - would run into its share of leakage problems.

Operated by the Chelan County Public Utility District (PUD), the project has a history that dates back seventy-five years. Today, the dam consists of two powerhouses. The second, constructed during the late 1970s, features eight horizontal bulb turbines, each with 24 wicket gates. Collectively, these turbines produce 1.8 million megawatt hours of power annually.

Rock Island Dam Hydroelectric Facility located on the Columbia River, Washington, USA

Leakage began to occur in the wicket gates soon after the second powerhouse was put into commercial operation due to the original poor seal design. "This resulted in costly maintenance problems over the years," says PUD Project Engineer Ken Anderson. "Water ingression occurred directly into areas where electronic devices, sensors, and electrical equipment were located." A makeshift system of tarps was used to divert the water. Raincoats became a necessity.

When Anderson joined the project in 1999, solving this excessive leakage problem became his primary concern. He began the process by consulting Tom Breiwick of *Pacific Marine Equipment* of Seattle, a longtime Thordon distributor.

"Ultimately," says Breiwick, "we were awarded two consecutive contracts to build 24 new wicket gate housing assemblies with upgraded bearings and seals." These new units would serve as interchangeable spares, facilitating the upgrading of all the existing units over time.

Back in 1988, Thordon SXL Thor-Tape had been installed to address some original bearing problems. "This time around," says Breiwick, "we collaborated with Ken, and the application engineering specialists at Thordon, and it was decided that we needed a bearing that could be interference fit into the housing." This would tighten the dimension on the bearing bores, resulting in less play and damage to the seals.

The answer was HPSXL. This is the hardest and stiffest grade of Thordon, featuring the lowest coefficient of friction for less wear and elastomeric qualities for strong performance under edge loading conditions.

The seals selected for the job were Thorseals. These are Thordon's high performance line of tough, abrasive resistant hydraulic cylinder seals providing positive sealing over a wide range of operating pressures. "Due to all the previous sealing problems, I came up with a new double seal design to replace the single seal system," says Anderson. In the new design, the space between the first and second seal was plumbed so that, if leakage did occur, the water could be drained and the volume tracked and evaluated. "Thordon designed and manufactured the second seal for us within a very short timeframe," says Anderson, "which I thought was extraordinary."

After the successful installation of the initial 24 wicket gate housings, *Pacific Marine Equipment* was eventually awarded the contract to overhaul all 192 existing units. They are managing the project, including production and assembly, while Thordon is providing the bearing and sealing elements, design and technical support. Five turbine units have been overhauled to date. The remaining three are due to be completed by May 2004.

The ultimate question is, of course, has the leakage stopped? "We were dealing with an infiltration rate of 20 gallons per minute on some units," says Anderson. "Today there's virtually no leakage at all from the new units we have installed. So, yes, finally the problem has been solved."

Thordon HPSXL wicket gate bearings with Thorseals