

Rocky Reach Dam - Wenatchee, WA

Flygt Submersible Pumping Technology to Provide Safe Fish Passage

Scope

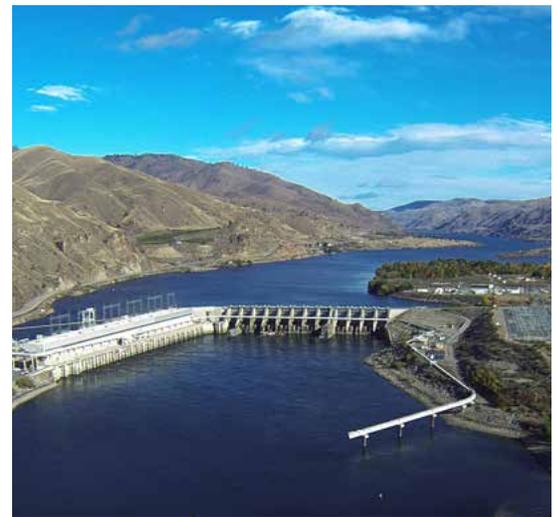
Wenatchee is stereotypically small-town America, with white picket fences and lush apple orchards. Many visitors to the picturesque agricultural community in central Washington also pay a visit to the town's biggest tourist attraction - Rocky Reach Dam, with its colorful flowerbeds, visitor's center and historical and technical museum. The dam, operated by the Chelan County Public Utility District (PUD), is one of nine hydroelectric dams along the 1,200 miles of the Columbia River in Washington. This river is the most significant environmental force in the Pacific Northwest, providing recreation, fishing and irrigation. Because of the steep drop from its origin to its mouth, it also is one of the greatest sources of hydroelectric power in the world.

The Columbia River basin produces historically some of the world's largest runs of salmon. The Pacific trout and salmon species reproduce in fresh water, but spend most of their growth cycle in ocean.

To help salmon and trout return from the ocean to their native streams to spawn, the dams have long operated fish "ladders" - gradually stepped-up watercourses that help the fish get around the massive vertical dams. But once hatched, the young fish have to get back downstream as well. Each spring and summer, juvenile salmon and steelhead attempt to navigate through an obstacle course of hydroelectric dams in their downstream migration. Mortality in the early life stages is normally high due to factors including natural predation and human induced changes in habitat. By the time dams were built, the salmon population was severely depleted. To reverse the declining fish populations, a federal mandate now requires the power plants to shut down the power production during the peak migratory season or develop "fish friendly" solutions.

Solution

To protect fish without losing valuable power, the operator at Rocky Reach Dam constructed a bypass powered by 29 pumps. A surface collector to guide fish around a hydro project was developed and tested by Chelan County PUD engineers and biologists. The system is based on sonar studies showing that fish generally travel in the upper



Rocky Reach Dam

Customer: Chelan County Public Utility District (PUD)

Challenge: Redirecting juvenile fish with out losing valuable power

Products: High Capacity Submersible Pumps



Pacific salmon migration upstream

60 feet (18.3 metres) of the river. The surface collector system appeals to the natural instinct of juvenile fish to stay in that zone and follow the water flow - which in this case is created by powerful pumps from Xylem's Flygt team. The water directs the fish into a bypass pipe, which moves them safely around the dam.

Flygt has designed a record-breaking and industry-leading custom pump for this unique application. This design results in the most efficient creation of the fish attraction flow required.

"The powerful flow from 29 pumps operating together helps guide the fish into a safe bypass channel, thus avoiding the hydroelectric turbines," says Stefan Abelin, director of engineering at Flygt US.

Flygt's supply and maintenance for the Rocky Reach fish bypass system:

- 29 PP7900 pumps, each rated at 120 HP and a flow of 7 cubic meters per second at 0.6 meter head (250 cubic feet/second at 2 feet of head).
- 10 racks of flap gates to prevent reverse flow.
- Electric controls, remote supervision, control buildings, transformers.
- Pump testing, installation and an extended pump and control maintenance agreement.

The Chelan County PUD bypass system is impressive. The key is guiding the fish into the fish collector, and that's the job of 29 ultra-low head, high-capacity submersible pumps designed by Xylem's Flygt team especially for the Rocky Reach Dam.

The reasons we selected Flygt pumps for our fish collector were that they had a proven design, technical expertise and financial strength.

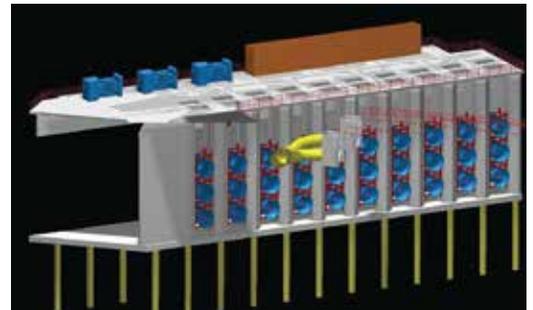
"Flygt was the pump producer we judged would be the most likely to succeed for this project," says Brett Bickford, PUDs senior civil engineer and manager of the fish bypass project.

Results

Construction of the entire fish bypass system was expected to cost \$89 million. "This is a lot of money, but a very good investment because we save fish and water," says Bickford. "If we did not invest, Rocky Reach could have to spill 60 to 70 percent of its average daily flow in the spring and summer." At a power price of \$45 per megawatt hour, this is approximately \$750 million in lost power revenue over the next 15 years, which is the financial life of the new bypass.



Flygt PK7900 pumps are prepared to be installed in stacks of 3 per each rack



Pumps' layout at Rocky Reach - 3D rendering



The flow directs the fish into safety through the 9 feet diameter x 4,600 feet long bypass pipe

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