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Installation photos appearing on page 2 were taken for that article.

Self-Cleaning Filters Permit Avista to Use River Water to Cool Compressors

The Cabinet Gorge Dam was doing some retooling a short time ago and they had to make some important decisions on filtering. The dam is the second largest of eight hydroelectric developments operated by Avista, a major electric and gas utility headquartered in Spokane, Washington.

The dam itself is located on the Clark Fork River in Idaho. Its licensed generating capacity is 263.2 megawatts and it features one vertical Kaplan turbine and three vertical propeller turbines. The challenge faced by the engineering team at Cabinet Gorge was to remove three old compressors and replace them with two more efficient compressors with higher flow rates.

"The three compressors were still performing close to their rated flow rates," said Tracy West, mechanical engineer for Cabinet Gorge. "But there were several reasons to replace them. They were 59 years old and were nearing the end of their service life, parts were difficult to obtain, and the motor inrush currents were high and would likely cause problems in the future." The functions of the compressors were to provide general shop air to the facility, to serve as an energy source for brakes on each unit, and are used to provide air for forcing all of the water out of a unit when it needs to be turned without any load on it.

"The selection of the new compressors went smoothly," said West. "The original selection process was done by my predecessor for a similar installation on another dam. The original compressors were reciprocating units. The decision was made to replace them with two 250 horsepower Kobelco screw compressors.

Cabinet Gorge Dam in northeastern Idaho, first built in 1952.

A FILTERING CHALLENGE

"The only problem encountered was with the cooling of the compressors. The old compressors were aircooled. The new ones needed to be water-cooled. The water supply was not a problem. We would take it directly from the Clark Fork and return it to the river, keeping a constant cooling flow to the compressors and maintaining sustainability. But it was river water and needed to be filtered or it would quickly clog the compressors' tube and shell heat exchanger."

So the power plant's engineering team began researching water filters. They found that most filters and screens require a lot of regular scheduled maintenance for filter cleaning or even replacement , which meant downtime and high parts and labor costs. Next they investigated automatic self-cleaning filters.

AUTOMATIC FILTERS

These filters clean themselves, thereby virtually eliminating maintenance and the need to shut down a system to clean or replace screens. They work by directing the flow to a screen filter. The dirt in the river water is captured by the screen and accumulates on its surface. As the dirt accumulates, the outlet pressure drops. When it reaches a preset differential, a backwash cycle begins and vacuum nozzles suction the contaminants off the screen and send them to a drain, all without interrupting the main flow.

There was one problem the Cabinet Gorge team had. It seemed that all of the automatic filters they were finding were made of carbon steel and they thought that they wouldn't last long in a water environment because the water changes direction many times within a filter making it more erosive and eventually removing any coating protecting the carbon steel. Then they found a line of self-cleaning filters that were made completely of stainless steel. "The problem with carbon steel filters is that they can degenerate fairly quickly in a challenging envi- ronment," said Dan Flanick, manager for Tekleen, the maker of the line of stainless steel self-cleaning filters.

"That is particularly true in a hydroelectric plant where they operate 24/7. Of course they are coated, but that can wear away over time. Stainless can take a lot more punishment." The Cabinet Gorge engineers opted for the Tekleen filters. "We recommended our LPF4-LP model with a 100 micron screen," said Flanick. "It's a horizontal system and actually uses two screens. The first is a coarse 3/8-inch screen that removes large particulates that could damage the second finer 100-micron screen. After the coarse screen, the water passes through the fine screen. The dirt and plant particulates accumulate and begin to cause a pressure drop. In our system we have preset

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Self-Cleaning Filters Permit Avista to Use River Water to Cool Compressors, continued

the activation pressure to 7 pounds per square inch. When it hits that pressure, a differential pressure switch triggers our filter controller to open 1 or 2-inch flushing valves and activates high-velocity suction nozzles that vacuum all of the accumulated particulate matter from the screen and flush it out of the system using only a few gallons of water and taking just 10 seconds with no interruption of the main flow." "The second installation, which I oversaw, went smoothly," said West. "Dan Flanick came by personally to inspect the installation, which was done by our crews and to conduct a training class. Since we brought both filters up, we have had no issues and no maintenance. And the compressors are running great and we're returning the water to the river."

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