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New system will boost power output of dams

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The Columbian

BONNEVILLE DAM — The Army Corps of Engineers last week unveiled a new control system that will squeeze more megawatts from Columbia River dams and generate millions of dollars in added power sales.

The system is a computerized turbine-blade controller that will increase daily generator power production by about 1.5 megawatts, or enough from each of Bonneville Dam's 10 generators to supply electricity for 1,000 homes.

That is expected to generate $2 million annually in added power sales from one Bonneville powerhouse alone. The dam has two powerhouses.

"Because of this increased efficiency, we'll get more power from each generator with the same amount of water," said Pat Keough, division chief of the Corps' Portland District.

The dam's so-called Kaplan turbines, with adjustable blades, operate less efficiently when the proper angle is not maintained between turbine blades and the adjustable gate openings feeding water to the turbines.

The new system, basically a computer panel added to existing controls, will continuously monitor blade angles. It has been tested successfully on one of the main turbines at Bonneville Dam's second powerhouse since 1987.

The Portland District expects approval from its higher headquarters for installation of the system on Kaplan turbines at all Corps projects on the Columbia/Snake river system. Bonneville Power Administration has urged quick installation, Corps officials said.

The cost: $5,000 per unit, including parts and labor, "which is inexpensive considering the potential savings," Keough said.

Installation is under way on the remaining seven turbines at Bonneville's second powerhouse.

This version of the computer system was developed by Portland District mechanical engineer Tom Thorsen, working with the Hydroelectric Design Center of the Corps' North Pacific Division.

The key to the new system is programming turbine blades to vary angles based on water flow and conditions, Thorsen said.

Because of reduced pressure on turbine blades, the system also will increase the survival rate of small fish that pass through turbines, he said.

Bonneville gets computer plan for generators

BONNEVILLE DAM — A computerized system that markedly improves the operating efficiency of hydroelectric generators is being installed at Bonneville Dam's second powerhouse, the Corps of Engineers said.

The computer system adjusts turbine blades according to the amount of water entering the turbine gates. It has been tested on one of the turbines at Bonneville's second powerhouse since 1987. It is being installed, at a cost of about $5,000 per unit, on the other seven units in the powerhouse.

Plans call for the system to be installed at all of the Corps of Engineers-operated dams on the Columbia/Snake River system.

The device increases daily generator power production by about 1.5 megawatts, enough to supply electricity for 1,000 households. It was developed by Tom Thorsen, a mechanical engineeer in the corps' Portland District, workihg with the Hydroelectric Design Center of the corps' North Pacific Division.

Because of this increased efficiency, we'll get more power from each generator with the same amount of water," said Pat Keough, chief of Portland District operations. The result, he said, is increased power revenues, decreased maintenance costs and longer equipment life.

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Portland District

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CORPS ANNOUNCES INNOVATION TO SAVE MILLIONS IN POWER PRODUCTION

Bonneville Dam, Ore.--The U.S. Army Corps of Engineers has developed a system that will save about $2 million annually at one powerhouse alone. The system is a computerized turbine blade controller which will increase daily generator power production by about 1.5 megawatts or enough to supply electricity for 1,000 homes.

"Because of this increased efficiency, we'll get more power from each generator with the same amount of water," said Pat Keough, Corps Portland District Operations Division chief. "This will mean not only increased power revenues to the region, but decreased maintenance costs and longer equipment life.

"The system was installed and has been under test on one of the main turbines at Bonneville Dam second powerhouse since 1987. It's an application of modern computer technology," according to Keough.

Kaplan turbines, turbines with adjustable blades, operate less efficiently when the proper relationship is not determined and maintained between turbine blade angles and the adjustable gate openings where the water enters the area surrounding those blades.

"This new system automatically repositions the turbine blades and gates when conditions change so the turbine continually operates at maximum efficiency.

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"We, in the Corps, are excited and proud to be able to make this announcement, especially at a time when the Bonneville Power Administration (BPA) has announced that electrical supply nearly equals demand," Keough said.

"Engineers have long recognized the need for such a system, and many of them have been working on it," Keough continued. "Engineers from other Corps offices participated in the development."

The District expects approval from its higher headquarters for installation of the system on Kaplan turbines at all Corps projects in the Columbia/Snake River system. BPA expressed a keen interest and urged quick installation. Installation is underway on the remaining seven units at the Bonneville Dam second powerhouse. Keough said "installation cost is about $5,000 per unit, including parts and labor, which is inexpensive considering the potential savings. We know, for example, that we have improved efficiency on the test generator at Bonneville Dam second powerhouse by about 2 percent. If we multiply that savings by all the generators in the second powerhouse using a wholesale rate of 5 cents per kilowatt hour, this would produce an annual $2 million in revenue," Keough said.

This version of the innovative computer system was developed by Portland District mechanical engineer Tom Thorsen working in conjunction with the Hydroelectric Design Center of the Corps' North Pacific Division. Thorsen explains the system in this way.

"First, we must determine the most efficient turbine blade angles at a given powerhouse under varying conditions. We do this by using what we call an 'index' test, which involves operating a unit under

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different water levels, using different gate and turbine blade positions, and measuring the results. The maximum efficiency points are those which generate the most electric power using the least amount of water. The data from the index tests are entered into the computer, which then can be set to continually monitor the blade position and amount of water and to continually make corrections to maintain maximum efficiency."

Thorsen said also, "the device provides a convenient digital display of the inputs, the blade position error, and an alarm system to warn powerhouse operators of power or input signal losses. This new system provides a complete and uninterrupted picture of how well it is doing its job. That is another major improvement over existing systems."

"Another advantage of this system will be increases in survivability of any juvenile fish that pass directly through the turbines and not through the fish bypass systems at our projects," said Keough. "We are finding that by increasing the efficiency angles of the blades and gates, pressures are reduced above and below the blades that may cause harm to the fish."

"We in the Corps continually strive to sharpen our abilities by exploring new and better ways to do our job. This is just one example of innovative, responsive engineering service to the nation," Keough concluded.

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