

Turning Geothermal Energy

**Innovative Use of Technology
Leads to Higher Efficiencies
with Less Maintenance**

into POWER

Geothermal energy is considered a clean, green, renewable source of power. The challenge is how to economically capture the heat from the earth and turn it into electricity. One company has found a way to improve the margins by adopting innovative technology to help achieve higher efficiencies, reduce maintenance costs and improve the reliability of 30, 100 HP condenser fans at its geothermal power plant in the Oregon desert.



U.S. Geothermal began commercial operation of the Neal Hot Springs 22 MW facility in November 2012. With 30, 100 HP condenser fans, this is the company's newest and largest plant.

U.S. Geothermal Inc. is a leading renewable energy company focused on the development, production and sale of electricity from geothermal energy. The Boise-based company began commercial operation of its newest and largest plant, the Neal Hot Springs 22 MW facility near Vale, Oregon, in November 2012.

Most of the thermal energy that enters the plant has to be removed as waste heat in the cooling system, in this case through an air-cooled heat exchanger. Thermodynamic laws dictate that the cooler the heat source the less energy can be converted to electricity. Therefore, it also means that the heat rejection equipment, as a percentage of overall plant construction, becomes more expensive for geothermal power plants like Neal Hot Springs because the geothermal resource is cooler than the geothermal industry average and is much cooler than the combustion temperature in a coal- or gas-fired power plant.

For example, a 22 MW geothermal plant requires the same size cooling tower as a 50 MW natural gas steam plant. U.S. Geothermal VP of Project Development Kevin Kitz says this is why reducing operation and

maintenance costs of the heat rejection system are critical to the economic success of low-temperature geothermal plants like Neal Hot Springs. When

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of project development,
U.S. Geothermal

Kitz learned about Baldor’s direct drive cooling tower motor, which replaces the traditional and maintenance-prone gearbox configuration typically used in cooling towers, he believed he found the right product.

“I was very interested in using this motor from the minute that I first

heard about it,” says Kitz. “The advantages were crystal clear to me. It’s a very efficient motor that uses a variable frequency drive (VFD) to reduce parasitic losses to improve profit margins. It also has very low maintenance costs, and a five-year warranty that says Baldor puts its money where its mouth is on reliability.”

The motor is unique because it combines the technologies of Baldor’s laminated finned frame RPM AC motor with a high-performance permanent magnet (PM) rotor design, creating a high torque, direct drive motor specifically designed for cooling tower applications.

The laminated finned frame construction provides a highly efficient,

power-dense package that replaces the right angle gearbox and jack shaft installation found in conventional cooling towers. The fan couples directly to the motor shaft and is controlled by Baldor’s VS1 cooling tower drive for optimal variable speed performance.

Not only was U.S. Geothermal the first company in the geothermal industry to adopt Baldor’s cooling tower motor

solution for air-cooled condensers, it was also the first in any industry to apply the 5800 size motor in such a large scale project. The air-cooled condensers at Neal Hot Springs are also innovative for the large diameter induced draft fans on the horizontal air heat exchanger bundles. Kitz says the big fans offer a huge advantage in terms of performance, and the Baldor motors supplement those advantages.



U.S. Geothermal was the first company in the geothermal industry to adopt Baldor’s cooling tower motor solution for air-cooled condensers. Kevin Kitz, the company’s VP of project development, says the advantages of using the Baldor solution are crystal clear, calling it a very efficient motor with very low maintenance costs.

“In other industries, the heat rejection system is the tail of the dog,” says Kitz. “But in geothermal power plants, heat rejection IS the dog. It represents as much as one third of the total cost of the installed power plant equipment. Consequently, even small improvements go a long way, and we feel we have achieved a big improvement.”

Ian Spanswick, product director with TAS Energy, was the power plant project developer for Neal Hot Springs, and responsible for the technology of the power plant. He says TAS recognized the potential of using the cooling tower motor while brainstorming with the U.S. Geothermal team, and it was through

the team’s interest that TAS really started exploring it as an option. It was a novel idea to use cooling tower motors with air-cooled condensers. Spanswick says while his company strives to find new and better ways of doing things, progress like this wouldn’t have been possible unless the customer was also pushing to do more.



Baldor’s cooling tower motor is a high torque, direct drive motor specifically designed for cooling tower applications. The laminated finned frame construction provides a highly efficient, power-dense package that replaces the right angle gearbox and jack shaft installation found in conventional cooling towers. The fan couples directly to the motor shaft and is controlled by Baldor’s VS1 cooling tower drive.



Designed specifically for the cooling tower industry, Baldor’s VS1 cooling tower drives provide optimal variable speed performance for reduced energy consumption.

“We were able to work hand-in-hand with U.S. Geothermal to improve the project,” says Spanswick. “Working like this with a receptive and creative customer is a working relationship that is very unique. I’ve rarely come across it, and I think that’s what made this successful and helped to move the industry forward.”

Kitz says it’s typical of his company to investigate and closely scrutinize new technology – seeking engineered solutions that will help them improve processes and control costs. And he believes that the key benefits of adopting the new cooling tower motor technology remain clear.

“Efficiency, low cost of ownership and promised reliability drove our decision to use Baldor motors in these dry cooling, air-cooled condensers,” says Kitz. “This motor was the right product at the right time.”

Realizing the benefits that can be achieved with this unique solution, U.S. Geothermal also installed large-diameter fans and Baldor cooling tower motors at its San Emidio plant in Nevada. The advantages of this arrangement have also been noticed and adopted at other domestic geothermal power projects.



U.S. Geothermal also installed large-diameter fans and Baldor cooling tower motors at its San Emidio 9 net MW binary cycle power plant, located 100 miles northeast of Reno, Nevada.