INNOVATIVE SOLUTIONS IN GEOTHERMAL SYSTEMS

CASE STUDY: INNOVATION IN GEOTHERMAL HEATING AND COOLING

Challenge

American Water's subsidiary in New York is piloting a geothermal innovation to heat and cool larger buildings. We have taken a creative approach to traditional geothermal technology and developed a new renewable energy application that will lower energy costs and reduce a building's carbon footprint.

This geothermal system departs from traditional geothermal—which has been in existence since the 1950s—by eliminating the need to drill over a hundred deep geothermal boreholes thereby significantly reducing initial construction costs.

Solution

We have constructed a modified geothermal system that has achieved more than 50 percent savings in energy consumption. We are providing heating and cooling for a 40,000 square foot school without utilizing fossil fuel in the winter months. The American Water geothermal system at the William L. Buck Elementary School in Valley Stream, N.Y. uses the thermal properties of the water as it passes through a heat exchanger.

The heat exchanger works like radiator with two compartments and two separate, closed loops. In one loop, ground water travels through the heat exchanger. The other loop, the geothermal loop, is comprised of 90 percent water and 10 percent glycol. These two loops pass through the stainless steel, food-grade heat exchanger in sequence to heat or cool the building.

In winter, the temperature is transferred from the water loop to the geothermal loop, and then flows into the classrooms. In each classroom, there's a unit that compresses the glycol mix and furnishes heat. In the summertime, the geothermal loop passes the temperature from the building through the heat exchanger and into the water loop.

The American Water Geothermal System allowed the school to save more than 50 percent in energy consumption.

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Benefits

Temperatures in each classroom can be individually controlled and with the American Water geothermal system in operation, administrators, teachers and students have a much more comfortable learning environment. For the first time ever, the William L. Buck Elementary School can be cooled in summer. Once unable to have community events or classes during the summer months due to lack of air conditioning, this school has been fully utilized with the geothermal installation.

Construction of the geothermal system began in September 2014 with crews working at night to avoid disruption to student learning. By February 2015, duct work was complete, the heating and cooling geothermal console units had been installed in each classroom, and the system was put into service.

The American Water Geothermal System allowed the school to save more than 50 percent in energy consumption. This translates into 41,000 BTU /square foot/year in addition to adding air conditioning.

TOP: Classroom Geothermal Units; MIDDLE: Heat exchanger Geothermal; BOTTOM: Glycol Loop Pump

Collaboration

The pilot's success depended on the collaboration of multiple partners. The ongoing support of New Hampshire Senator Jeanne Shaheen and New York Congresswoman Kathleen Rice allowed the project to move forward. Jack DiEnna's Geothermal National and International Initiative (GEO NII) helped conceive the project. Image Engineering Group, a leading design firm for geothermal projects, completed the design work and Bancker Construction Corp, a civil contractor based in New York, performed construction.

The innovative thinking that went into this pilot demonstrates that American Water's sustainability achievements are only limited by our own creativity. And—most importantly—the school saves on its energy costs and can use those savings for other scholastic purposes, and can now utilize the building space all year round for educational and community priorities.

This research and development pilot could transform traditional geothermal systems and introduce a new application in renewable energy for communities seeking to create cost effective approaches to sustainability. American Water is exploring with other facilities how to leverage this innovative approach, a demonstrated solution to lower energy costs and reduce carbon emissions.

CONTACT

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