CASE STUDY

Historic Winona Schools Build a Sustainable Future with Darcy Solutions

Winona Area Public Schools Use Groundwater-Enabled Geothermal to Heat & Cool Facilities

BACKGROUND

In 2021, the Winona School Board and administration knew they needed to address the cooling and air quality in their Washington and Jefferson Elementary Schools. The schools, both built in the 1930s, had substandard ventilation and no air conditioning, resulting in poor air quality for staff and students. This was especially evident during the Covid pandemic when the school experienced high absenteeism due to illness. In addition, the lack of air conditioning made the schools very uncomfortable for staff and students in the late spring and early fall, and the facilities were virtually unusable for activities in the summer.

JEFFERSON ELEMENTARY SCHOOL

5 WELL SYSTEM

4,320 MBH HEATING DEMAND

200 TONS COOLING DEMAND

WASHINGTON-KOSCIUSKO ELEMENTARY SCHOOL

4 WELL SYSTEM

4,080 MBH HEATING DEMAND

310 TONS COOLING DEMAND

PROJECT OBJECTIVES & PROCESS

The school board's Finance Committee, made up of three board members, the superintendent, and finance director, were tasked with identifying and reviewing various options and making a final proposal to the rest of the board. The solution needed to address the long-term cooling and air quality needs for the two elementary schools. It also needed to be financially feasible and fit into the current schools' existing footprint. There was a strong desire for the solution to be environmentally sustainable based on community interests. Lastly, the board wanted to preserve the history of the area by keeping and repurposing the existing buildings which still house original interior designs.

APPROACH & SOLUTION

Architects and Engineers to come up with viable options based on the objectives. After an exhaustive research and review period, the board ultimately chose the Darcy Solutions geothermal option due to its high efficiency, smaller footprint, and long-term sustainability. The land in Winona was well suited to leverage geothermal energy based on hydrologic productivity. The district's Alternative Learning Center was already using the technology, so they had some experience with these systems.

School Board Member Nancy Denzer said that the geothermal option was attractive due to its high efficiency cooling capacity and environmental sustainability. It also effectively solved the air quality issue. "Addressing air quality and the health and safety of our staff and students was a big priority for us, and we believed a geothermal solution would meet those needs."

The school board sent the project out for bid and settled on Darcy Solutions as the geothermal technology provider. Darcy engineers quickly went to work, partnering with Wold and Kraus Andersen throughout the planning period to develop a solution that would fit their needs.

According to Mike Lavoie, Director of Systems Engineering at Darcy, the geothermal option operates more efficiently and decarbonizes the HVAC system by its electrification with the benefit of addressing climate change. It also has a smaller footprint and longer shelf life.

"An average boiler system lasts around 25 years, but a heat exchange well can last up to 75 years," said Lavoie. "Our system also takes up less space and is less visible than other traditional HVAC solutions."

The geothermal option also has a much better "coefficient of performance," or the ratio of energy-out compared to energy-in.. The best boilers have a max of about 1:1, while geothermal might deliver up to four units of energy for every one unit of electricity used. Annually, Darcy geothermal enabled HVAC systems are more than 400 percent efficient.

"This was a big shift for the veteran staff, but I couldn't be more pleased with their ability to accept and embrace the change. They were proud to be a part of this project and the new system ultimately freed up their time to focus on other things."

— Nancy Denzer, School Board Member

RESULTS & BENEFITS

Because the school was in operation during the installation and remodel, the project needed to be broken into two parts and completed during summer months. Darcy managed the design and installation of a building-side closed geothermal loop using a water-to-water heat pump and a groundside closed geothermal loop and open aquifer system.

Justin Haller, Maintenance Supervisor, was skeptical at first. He has a background in HVAC but wasn't as familiar with geothermal solutions before joining the project. Geothermal is not a common system in the United States and often requires education for professionals who commonly use other technologies.

"I came in after the decision was made and helped get the project over the finish line," said Haller. "Once complete, the systems worked great and did exactly what they were designed to do. There haven't been any significant challenges and ongoing maintenance has gone smoothly."

Denzer said the school board also had some initial concerns that the maintenance staff would be able to understand and address any issues.

According to Superintendent Brad Berzinski, air quality improved, the learning environment became more comfortable, and energy costs began to go down. They are now trying to take advantage of some financial incentives, including Federal tax credits and rebates from Xcel Energy.

Berzinski, Haller, and Denzer all said they would recommend this solution to others, due to its efficiency, volume capacity, sustainability, smaller footprint, and health and safety outcomes.

"We will get 30 percent of our costs reimbursed for using Prevailing Wage and Apprenticeship requirements on the project. This has been a real positive for our school district, staff, and students. We are very happy with the decision and the results."

— Brad Berzinski, School Superintendent

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