



Commercial Case Study

When a new School District 159 middle school was needed in Matteson, Ill. – located in Cook County among the south Chicago suburbs – topping the district’s list of priorities were long-term energy-saving value and ample learning opportunities that would prepare students for a global career marketplace.

And after design and construction of school facilities featuring a ClimateMaster water-source heat-pump system, the district is confident that for coming decades, Colin L. Powell Middle School will serve as a prime example of 21st-century energy-efficiency foresight in action.

“The school district chose water-source heat pumps because – in addition to the district’s desire for the latest energy-efficient system – there was already a stormwater-detention pond on the site the district had purchased,” said project manager Jerry M. Gillette, P.E. of Globetrotters Engineering Corp. in Chicago. “So we expanded the pond to meet the required water-source flow characteristics.”

In fact, the pond – which is the source of the geothermal system’s water-to-water heat-exchange capability – also lends a certain esthetic appeal to the site. “I hired a consultant to perform the fluid-mechanic studies and

calculations for the required pond characteristics,” Gillette said. “Those calculations are based on water capacity and anticipated ambient temperatures at certain depths year-round.

“Obviously, you have to take both wintertime and summertime conditions into consideration. And we installed a groundwater-well pump in case the level of the pond might fall so low during a potential drought that we’d need to pump more water in to fill the pond – which has to be maintained at a depth of approximately 14 feet (4.2 meters) to accommodate the system’s required flow.”

Overall size of the completed school building is 160,000 square feet (14,864 square meters) – with 82 ClimateMaster water-source heat-pump units installed. Expected annual operating-cost savings using the water-source heat-pump system are estimated at around \$70,000, or about 60 percent compared to a conventional system.

But to truly appreciate the achievement represented by the finished school, we need to examine the project from its earliest beginnings. Several years ago, the student body of School District 159 was expanding to the point that a new middle school became an obvious necessity.



Loop Coils prepared for submersion into the pond.

So the district commissioned KJWW Engineering Co. of Naperville, Ill., to perform an initial feasibility study and come up with a schematic design and recommendations for essential items including the heating-and-cooling system.

“I was involved with KJWW at a very early stage of the project,” said Jay Samuelsson of Imbert Corp., ClimateMaster’s commercial representative in the Chicago area. “And I’ve also interacted very closely with Globetrotters Engineering from the point that Globetrotters became the engineering firm of record and saw the project through to completion.

“Among the things people can often overlook is the importance of funding. Because our ClimateMaster systems require a higher initial investment, we need to be aware of various funding options that are available. Yes, our ClimateMaster products represent substantial anticipated operating-cost savings over the life of the system. But there can also be a lot of initial-cost resistance up front.”

In the case of Powell Middle School, ClimateMaster’s higher initial cost is being largely offset by a grant – awarded for energy-saving technology – from an Illinois clean energy organization.

“To get the grant and secure the funding takes time and persistence, as well as knowing it’s available,” said Samuelsson. “In the past, many people probably wouldn’t go to that level. But now there’s more pressure coming from state and local governments to begin to look more seriously at this kind of technology.” From the point at which Globetrotters picked up the

assignment and Gillette became the project manager, he has bent over backwards to try to assure that the students and teachers have an appropriate learning environment.

The project involves total capacity of 280 tons (985 kW) of water-to-air and 180 tons (633 kW) of water-to-water heat pumps – with outside-air energy-recovery air handlers adding to the efficiency of the overall design. And Gillette is quick to point out that that’s not all – that the overall package really sold the deal.

“One of the biggest points in favor of using this type of system is the fact that we are using a renewable energy source for both heating and cooling.” Gillette said.



ClimateMaster’s enhanced DXM digital controls.

For overall control of the building’s heating and cooling, the school district selected ClimateMaster direct-digital control with DXM boards – tied into a larger building-automation system that controls lighting and all other electrical functions. Gillette also sees the water source as a further key ingredient in the total package.

“Often with heat-pump systems in the Midwest, you have to provide for supplemental heat in the extreme wintertime,” Gillette said. “We don’t think we’ll need that because we’re getting the heat source from the pond. And with the compressor inside the heat pump, we can do things that will extract enough heat so we



Fused header assemblies for the pond loop system.



Construction in progress on the school grounds.



– to monitor weather patterns that affect the pond,” Gillette said. “So I’ve contacted several of the broadcast outlets in Chicago to see if any of them will commit to have Powell Middle School as one of their sites for monitoring and reporting on weather conditions.

“This could be a fantastic chance to introduce young students to the basics of meteorology – and perhaps lead to career possibilities in future years. And it’s all because we have this state-of-the-art energy-saving ClimateMaster water-source heat-pump system in place.”

don’t have to purchase additional heating capacity from the electrical utility, Commonwealth Edison.

“We do have a 780 kW boiler for emergency-heating purposes in case the temperature gets all the way down to -40°F (-40°C). You might sometimes even have to use the boiler when it gets down as low as 20 degrees below zero Fahrenheit (-29°C).

“But as part of our research, we visited a high school in Wisconsin – where it definitely gets colder than it does in the Chicago area – and on that system they have two boilers that they rarely have to fire up. And I don’t think we often will here, either.”

Conservative estimates place the payoff period during which the school district’s operating-cost savings with the ClimateMaster water-source heat-pump system will totally offset the initial-cost premium at no longer than 7 years.

“It’s really a win/win all around,” Gillette said. “The school district is going to benefit. The students and their parents are going to benefit from a more favorable climate in the academic environment. And a 7-year payoff is actually very good for an investment in major cutting-edge equipment such as this.” What’s more, future plans are to submit the school building and its architectural design for Leadership in Energy-Efficient Design (LEED) certification – as administered by the U.S. Green Building Council in Washington. And Gillette also has plans that could directly impact student learning opportunities.

“As part of our control of the heating-and-cooling system, we’ve set up a weather-monitoring system at the school



Colin L. Powell Middle School

Square Footage:

160,000 (14,864 square meters)

Type of System:

Ground-Source Heat Pump

Total Water-to-Air Capacity (HVAC Ton):

280 (985 kW)

Total Capacity Water-to-Water (HVAC Ton):

180 (633 kW)

Owner:

School District 159

Construction Manager:

Louis Jones Enterprises, Inc.

Architect:

Legat Architects

Engineering:

Globetrotters Engineering Corporation

HVAC & Controls Contractor:

Commercial Mechanical, Inc.

Manufacturer:

ClimateMaster, Inc.

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ClimateMaster is the world's largest and most progressive manufacturer of geothermal heat pumps. The company is committed to innovation and dedicated to environmentally clean, economically sound and superbly comfortable home and business environments.

ClimateMaster has been designing and building equipment that enhances the environments we live and work in every day for more than 50 years. In addition to geothermal heat pumps, ClimateMaster offers the most extensive product line of water-source heat pumps for use in a wide variety of applications. ClimateMaster products are proudly built in the U.S.A.



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