

# GEO OUTLOOK

GeoExchange: Energy Smart • Financially Sound • Environmentally Friendly

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## Warren **Warms** to the Idea of **GeoExchange**

By Marie Kadavy

In 1957, Warren, a small community just up the road from Winnipeg, Manitoba, built an ice arena to meet its winter sport needs. Fifty years later, citizens of Warren

began skating under a new roof. The South Interlake Credit Union Arena, which replaced the 1957 facility, serves the surrounding area with nine months of ice.



Photo courtesy of Frontier Refrigeration.

*A hockey player tests the ice maintained by Ice Kube units.*

Despite the negative temperatures of the Canadian winter, the arena also keeps its visitors warm. The arena's 50-year-old predecessor didn't even offer its hockey players, skaters or spectators heating, but, with a geothermal system and community support, the arena keeps visitors comfortable and bills affordable.

## From Ice Cubes to Ice Kubes

For this small community of just 750, operating costs had to be low to maintain the arena. "There are hockey rinks up and down the highway that are going to be shut here shortly because the little communities can't afford to run them," Chuck Lefley, a member of the South Interlake Recreation Board, said. "That, I think, was the driving force in why we did this because it would be fine to save money when we built it, but then, if we can't afford to keep the doors open, it didn't do us much good." A geothermal system was chosen so that people could actually use the facility, Jim Lindsay, president of the South Interlake Recreation Board, said. "If we had to pay \$60,000 a year in energy costs, it would be very difficult to run."

Tower Engineering, a firm certified by the Leadership in Energy and Environmental Design (LEED) program, served as the mechanical and electrical design engineers as well as construction managers for the project. Greg Jorgensen, a professional engineer at Tower Engineering, recommended a geothermal system for the building. "They are energy efficient, compact and easy to operate," Jorgensen said. "Ice arenas, cold-storage warehouses and packing plants are ideal for heat pump applications because they require heating and cooling at the same time."

The South Interlake Recreation Board had discussed the option of a geothermal system with Frontier Refrigeration, an installation contractor, and, while fundraising for the new arena, the board watched the progress and success of Frontier's geothermal projects for five or 10 years. For the arena in Warren, Frontier suggested an Ice Kube System. The systems are well-suited for ice rinks because they are specifically designed for very low-temperature applications. The arena's three 25-ton low-temperature, water-to-water units and one 5-ton water-to-water unit manage

to produce ice, provide domestic hot water, heat and air condition the building all for much less than a conventional system. "It's way more energy efficient," Derrek Wertepny, the installer of the system, said.

*Photo courtesy of Frontier Refrigeration.*



*The three 25-ton heat pumps keeps visitors warm.*

The facility uses a combination of open- and closed-loop applications. The closed-loop portion of the system chills the rink surface to make ice and also recycles waste heat to warm the building. The open-loop portion acts as a supplementary heat system. Using 150-foot supply and return wells vertically installed on opposite sides of the arena, the open-loop system adds or subtracts heat to the building loop based on demand. Early in the season, when the building has no use for heat, the open loop rejects heat. On days of extreme cold, when the extraction and rejection heat don't adequately heat the facility, the open loop supplies heat.

Ice is made on the rink's concrete slab lined with 66,000 feet of 1-inch high density polyethylene (HDPE) pipe. Under the 6-inch concrete slab, the thermal buffer offers an additional 12 to 18 inches of dry, compacted

material that can be refrigerated. The thermal storage beneath the ice supplements refrigeration when flooding, lights or people increase the load, Walter Lehmann, president of Ice Kube Systems, said.

A total of 75 pounds of environmentally-friendly refrigerant R404 is used in the ice-making process, while the 5-ton water-to-water unit, which produces the building's domestic hot water, operates on approximately six pounds of the refrigerant. The units use Fluorescent Geothermal Solution, a heat transfer solution specifically designed for low-temperature geothermal applications, which includes fluorescent dye to help differentiate between condensation and actual leaks.

The 30,000-square-foot arena, complete with seating area, dressing rooms and canteen, includes all in-floor heating via 3/4-inch high-density geopipe. Even when doors open to temperatures of minus 20°F, the arena manages to stay warm. "We were a little afraid we weren't going to be able to keep the lobby area comfortable," Jim Lindsay said. "But it just seems when those doors shut, the heat coming up from the floor recovers quickly, and it stays really comfortable in there."

Lefley said the difference is obvious. "In our old building, it was an ice cube," he said. "It was just the coldest. If it was 20 below outside, you could be sure it was 25 below in the arena. There wasn't a stitch of insulation. We've gone from that to a very comfortable, modern building that is warm." Controls in the new arena, designed and installed by Larry Kyrzyk of Frontier, allow for varied temperatures in the different areas of the facility. The lobby and dressing rooms are kept at a warm 70°F while the bleacher area is maintained at about 45°F. The ice slab is kept at 19°F to 21°F.

"With the in-floor heat, we get good recovery on the heat," Lindsay said. "The floors are always dry, and, when guys get in the shower area, the cement isn't cold," Lindsay said. "We get a lot of compliments on that."

Heat pipes also run through the approximately 500 seats in the viewing area, keeping spectators comfortable. In addition to keeping fans warm, two dehumidifiers prevent moisture from collecting on the board glass, allowing fans to see the action. In the summer, the dehumidifiers act as air conditioners to cool the building during community events.

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The rink is open seven days a week from Sept. 1 through May 31, offering approximately 500 visitors per week ice for winter sports, but Lindsay hopes the building will be utilized year round. In the summer, the arena transforms into an events center, housing the local high school graduation, community socials, a music festival and a weekend farmers' market.

### A Green Beacon in the Canadian Cold

“For a typical building like that, we would be in the \$60,000 range for annual energy costs,” Lindsay said. The expected annual energy savings for the \$2.8 million arena are between \$30,000 and \$40,000. “We believe our energy savings is 50 percent of what we used to use,” Lefley said. “We counted everything, our lights, our ice plant and heating our water in the old facility, and that was over \$5,000 a month. We are now at about \$2,200 a month, and we heat our building on top of it.” Lefley called the energy savings a bright light. “The savings just caught our eye,” he said. And, the arena’s energy efficiency caught the eye of Natural Resources Canada.

Natural Resources Canada awarded the South Interlake Credit Union Arena the maximum amount of \$60,000 through its Commercial Building Incentive Program (CBIP). “The intent of CBIP is to fund better design,” Michel Lamanque, a Natural Resources Canada representative, said. To qualify for the CBIP grant, the arena had to be 25 percent more efficient than a comparable facility built to the Model National Energy Code for Buildings. “We far exceeded every standard that they needed to give us this grant,” Lefley said. In fact, the arena was 61.6 percent more efficient. “They decided to do the whole nine yards,” Lamanque said.

In addition to the energy efficiency of the geothermal system, the building boasts efficient lighting fix-



Photo courtesy of Frontier Refrigeration.

*Concessions, dressing rooms and bleachers complete the arena.*

tures and bulbs, including occupancy sensors in the dressing rooms, heat recovery ventilators, compressors with an average energy efficiency rating of 10.7 and the ability to store compressed heat. “What makes this project interesting is not everyone has the capacity to store heat,” Lamanque said.

The geothermal system and green features not only save money but also reduce greenhouse gas emissions. The arena cuts greenhouse gas emissions by 375 tons each year, the equivalent of taking 68 cars off the road, according to the U.S. Environmental Protection Agency Web site.

LEED Accredited Professional Jeff Penner, of Stantec Architecture and Road Architecture Inc., served as project architect and, with support from Ted LeBlond, Tower Engineering, LDA and HTFC, designed the building with a sustainable approach according to LEED guidelines. The future of the project could hold further development of the arena per the architecture firms’ Master Plan for the recreation center, including a six-sheet curling club, visitor and gathering atrium, community hall and festival grounds with a lake view.

## Overcoming the Extra Capital Cost

Construction of the new facility and installation of the geothermal system left the arena with a million dollar debt. Rising above the upfront cost and patiently waiting for payback is always a challenge. Luckily, the facility received \$575,000 in grants and incentives. In addition to the CBIP grant, Manitoba Hydro awarded the arena a \$15,000 Power Smart grant for installing automatic lighting systems and efficient fixtures and bulbs. It also received an infrastructure grant from both the provincial and federal government for a total of \$500,000.

A sooner than expected payback will help, too. It is estimated the geothermal system installation cost \$250,000 more than a conventional system. "I think when we looked into putting this in they thought there would be a 20-year payback," Lefley said. "We believe it's going to be a lot

sooner. With us saving \$2,000 a month, that doesn't seem to take very long." The expected payback time has been cut in half to about 10 years.

After years of planning and fundraising, the expertise of Ice Kube Systems, Frontier Refrigeration and Tower Engineering and the support of a little community passionate about ice sports brought an efficient, af-

fordable solution to Warren and the residents of Woodlands and Rosser municipalities.

"You would think a brand-new system and everything there would be some glitches, but we've been very fortunate," Lefley said. "These people put it together immaculately. We've been pretty much trouble-free."



A 5-ton heat pump provides domestic hot water for arena operations.

Photo courtesy of Frontier Refrigeration.

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