

# GREEN PROJECTS REVISITED

## An ambitious geothermal retrofit

By Simon Blake

**E**ric Lange operates a Toronto-based trucking and logistics company that moves everything from trade show displays to delicate medical equipment around North America. In 2006 he purchased a 30-year-old former auto parts plant in Toronto's west end to use as a warehouse. The 70,000 sq. ft. building's original rooftop units were inefficient and at the end of their lifespan. The first monthly gas bill he received was \$3,800; the next one (for November) was \$5,632, with the likelihood of bills exceeding \$10,000 in the middle of winter.



**Eric Lange was so pleased with the project that he had geothermal installed at his home.**

There are two things one needs to know about Lange. First, he's a businessman and he doesn't like flushing money down the toilet. Secondly, he believes that a comfortable work environment is a productive work environment.

He asked Selectpower, then a division of Guelph Hydro, to do an assessment of the building. As a result, he concluded that geothermal heating and air conditioning might offer a solution. The only problem was finding a location for the borehole

field, until he realized that the 25 by 300 foot driveway needed to be paved anyway.

### The system

GeoSmart Energy of Cambridge, Ont. designed a system that would keep the 60,000 sq. ft. warehouse at 55-60°F, with zoning in the 10,000 sq. ft. office to provide better comfort control. Warehouse heating and cooling is provided by five 70,000 Btu/h forced air heat pumps. There is an 18,000 Btu/h heat pump for the dispatch room, and eight two-stage heat pumps from 24,000 to 72,000 Btu/h supply the office – basically one per zone.

The borehole field consists of horizontal and vertical loops to make up the capacity.

In total, the project cost about \$500,000, compared to about \$200,000 to install new rooftop units.

### Expectations exceeded

So, how well does it work? Were the energy efficiency and payback goals met?

"I'm thrilled with what we've accomplished. I'm thrilled that after five years the payback has been what we thought it would be, if not more," said Lange. Installed in October 2006, savings on the natural gas bill have already covered the cost.

Air conditioning the warehouse wasn't originally part of the plan. "I never at the time thought we would be air conditioning the warehouse... I thought, quite frankly, that we would just turn it off in the summer and save the electricity," said Lange.

"It was only afterwards that I was told that, because of the heat that we've taken out of the ground (over the winter), we had to replenish it (during the summer)."

Lange discovered a key advantage to this. He could advertise his warehouse as "climate controlled," resulting in a significant business advantage. And the extra electricity cost during the summer turned out to be pennies per hour.

There turned out to be considerable savings on maintenance as well. "I'm sure some of your readers won't be happy to hear this, but we don't have a maintenance contract on our building anymore," remarked Lange.

The only maintenance required is to rinse out the stainless steel filters for the heat pumps under tap water, something that is done by employees. Filters for the office units are cleaned four times a year, while those in the warehouse are cleaned monthly, primarily due to contamination from propane-powered forklifts.

### Modifications

Like any large commercial system, a certain amount of fine-tuning was required in the first year of operation.



**The heat pumps in the warehouse provide cooling as well as heating.**



**Extending the ductwork helped with slow recovery when an overhead door was opened.**

Lange found the heat wasn't enough during the coldest days, but that he had an overabundance of DHW, which is also heated with the geothermal system. As a result, the system was re-engineered to devote more of its output to space heating.

One drawback with geothermal is its long recovery time when a large overhead door is left open. Extending ductwork over the doors helped.

Earlier this year Lange decided to add air exchange units in the warehouse. A tenant that moves heavy machinery uses propane-powered forklifts. Carbon monoxide readings at 16 parts per million were well within the maximum allowable level of 250 ppm, but the improved ventilation brought the level down to zero.

"Because this building is so airtight, we weren't getting the air exchange the way we were with a traditional system."

The success of the system has made a believer out of Lange. "I am so happy with it here that when our home heating system needed to be replaced (in 2008), we decided to do the house with geothermal too." +