Tampa Bay Egg Geothermal

SYSTEM UPGRADE, TAMPA BAY, FL

iWorx® by Taco Electronic Solutions
iWorx® Building Management: Case Study in Real World Technology

When a large Tampa Bay mansion was under construction seven years ago, the local paper announced that it was being built for Oprah Winfrey. It was an easy mistake to make, given the home’s trendy location. The street is famous for its many celebrity homes. Stephen King lives just a few doors down.

“All it takes is a rumor for misinformation to catch fire,” said the owner, chuckling. His fortune doesn’t stem from hosting a talk show. Rather, his background is in engineering, and so it was that professional interest which spurred him to pursue the most comprehensive controls systems available for his vacation home.

The home sprawls across 30,000 square feet, most of which are heated and cooled. A 70,000 gallon indoor swimming pool is located near the center of the mansion. Although the roof over the pool is all glass, with a bridge crossing the middle, there’s more to the arrangement than meets the eye.

The pool serves as a giant heat sink and source for the home’s extensive geothermal system. Through load sharing and geothermal technology, the carbon footprint of the gargantuan residence is dramatically reduced. Integrating the entire environmental system is Taco’s iWorx® controls system.

Out With the (not-so) Old

Originally constructed seven years ago, the mansion’s HVAC needs were met by 13 four- and five-ton air-source heat pumps. It wasn’t long before the units had deteriorated noticeably, with oozing rust and decreased operational efficiency.

“It’s not uncommon for air-to-air systems to fail in four or five years around here,” said Jay Egg, president of Egg Geothermal Inc, in Tampa. “The salty air just tears apart outdoor equipment.” The owner of the mansion contacted Egg after talking with neighbors who had their systems replaced. With 16 technicians at the original Tampa location, Egg Geothermal has been doing ground loop installations for the past 20 years. Recently, locations have opened in California and Georgia, managed by Jay’s brothers. The company designs and installs state-of-the-art systems.

“We prefer to stick to commercial and high-end residential projects,” said Egg, “Of the 50 systems we installed last year, only a handful were installed in standard homes.”

“For this large project, the homeowner came to us, not only looking for a more efficient system, but also for a system that wouldn’t deteriorate in the harsh atmosphere,” said Egg. Seven
years into a 10-year warranty on his existing equipment, the homeowner was even willing to sacrifice three years of warranty to replace the aging equipment with new systems.

“Just tear ‘em out and give me the best of what you’ve got,” was pretty much what the owner said, added Egg. The result was a high-efficiency ground-source system with a state-of-the-art controls system.

**Highly recommended**

“iWorx was brought up on several occasions during conversations I had with some other industry professionals, and they told me to give the system a try,” said Egg. “As it turns out, and because of its incredible flexibility – with modules that easily expand, full scalability and wide open protocols – the iWorx control platform was a slam dunk for use at the big home.”

“The owner, being a techie himself, wanted to have full control of the system,” said Egg. “He wanted to have the convenience of controlling the system in the Tampa vacation home while he was away, and he also wanted to see minute-to-minute energy usage and related data.”

The iWorx LCI (Local Control Interface) screen displays kW usage, updated every minute, and saved every 15 minutes.

“It’s rare,” admitted Egg, “that homeowners seek that level of insight or to have full control of such a large, complex system.” Taco’s new iWorx system had the dexterity to control the complex system, while retaining a user friendly method of interface. It’s a web-based building management, monitoring and control system. Designed for the light commercial market and hi-end residential markets.

“What makes iWorx different from other systems,” explains Tom Polansky, technical service engineer at Taco, “is that you don’t need special tools, software or computers to do the installation or commissioning.” Once wired, programs are resident in the controller. By manipulating control parameters for the specific HVAC equipment on the LCI engineering time is eliminated, and installation costs drop significantly.

**BTUs swimming free**

“The homeowner stipulated that he wanted the new system to revolve around a load sharing concept, knowing that his swimming pool could be used,” continued Egg. “After all, he was right – a lot of BTUs can swim in 70,000 gallons of water.”

“In fact, it’s a fully-accessible, 400,000 BTU heat sink, right in the middle of the house,” he added. “The biggest challenge for us would be tying the ClimateMaster geothermal heat pumps together with the swimming pool, and the ground loop. We knew it had the potential of being a controls nightmare.” Following the replacement of air-to-air heat pumps with geothermal gear, the house now has a total of 50 tons of heating and cooling capacity, a load shared by the swimming pool and well field. Each of the 17 heat pumps is on the closed condenser loop. The system is prioritized to take advantage of the heat source, or sink, which seasonally optimizes energy efficiency, regardless of user demand.
System Details at a Glance
There are four pool heat pumps that provide about 400,000 BTUs in heating capacity. They’re designed and prioritized to perform a load-sharing function within the home. Additionally, there’s a 900,000 BTU titanium plate-and-frame heat exchanger that provides passive cooling for many of the geothermal heat pumps. As BTUs are fed into the pool to keep it warm, the end result is that 70°F to 72°F water is used as the first source of cooling for the geo units. Only if additional cooling is needed – typically in extreme summer conditions – are the open loop-supplied, geoxchange fluids circulated and tapped.

“We needed to use a titanium heat exchanger for the load-sharing,” said Egg. “The chlorine in the pool water is brutal punishment for even the best stainless steel units. We spent twice as much on a titanium system, but will never need to worry about it again.”

The geo units are scattered throughout the sprawling floor plan, ranging from 24 to 64 MBH in size. Some are outside; others are tucked away in closets. A VPU2 iWorx module controls the VFD-driven differential circulators for the closed loop portion of the geothermal system. The well loop is powered by a submersible, 150 GPM pump as well as an external pump supplying the heat exchanger with pool water, both operated with VFDs. “In fact, all circulators and pumps at the home are driven by VFD’s,” added Egg.

“The iWorx system controls the VFDs for all heating and cooling functions,” continued Egg. “With the DXU3 iWorx module, the pumps can run at 10 or 20 percent when we only need a fraction of the flow, saving a lot on operating costs.”

Equipped with desuperheaters, eight of the geothermal heat pumps meet all domestic hot water needs within the mansion, though – just to be safe – four 80-gallon electric water heaters serve as backup heat sources. With the iWorx touch screen LCI, the homeowner can control the system on-site. If he’s at home, or at another property, he can alter the control parameters for his Tampa Bay mansion online. It’s rare that a home this size has such a small carbon footprint. Typically, it’s Sasquatch-sized. But, with technology that’s readily available off the shelf, it’s able to fit in a much smaller shoe.

To learn more about the TAMPA BAY, EGG GEOTHERMAL installation and see other iWorx case studies visit www.taco-hvac.com