ADVENTURES IN HEAT PUMPS

These homeowners – and their mechanical contractor – were willing to take a chance on new heat pump technology.

DAN FOLEY, long-time mechanical contractor and owner of Foley Mechanical in Lorton, Va., recently installed his first Daikin Altherma air-to-water heat pump in a newly constructed, 5,500-sq.ft., three-level home overlooking the Potomac River. The heat pump is connected to a radiant floor heating system in the basement and garage, two fan coil units, and a domestic hot water tank. Two flat plate solar collectors are also tied in.

The Daikin Altherma features inverter compressor technology

The homeowners, Lorraine and Judd Horbaly, own a cabinet manufacturing business. They established a new company, Riverview Builders LLC, to serve as general contractors while building their new home, which is where they plan to retire. They knew from the beginning that they wanted to build a LEED Gold house, so they literally spent years researching energy-efficient technologies prior to construction. That research led them to the Daikin Altherma.

"We originally wanted a geothermal system, but after I spoke with David Knight, a mechanical contracting energy consultant with Monterey Energy Group in California, we changed directions," Lorraine explains. "David has installed dozens of Altherma heat pumps on the West Coast. After talking with him, we got excited about the technology and began to seek a mechanical contractor in our area who would be interested in working with this new technology and installing it in our home."

Although the Altherma is new in the United States, it has been around in Europe since the mid-2000s, where financial incentives (similar to the U.S. tax credits) in some areas have

The homeowners built with LEED Gold in mind.

Crew members Slavko Nisevic (lead installer, left) and Juan Polanco (installation helper) were trained on the new technology.

encouraged homeowners to install the technology. The Horbaly home ended up being one of the first on the East Coast to employ this technology.

Lorraine was referred to Dan Foley by Jeff Riley, HVAC sales and product manager for the Thos. Somerville Co., a distribution company headquartered in Upper Marlboro, Md., who has worked with Foley for many years.

"I got a call from Lorraine one day last summer and she was going on about the Daikin Altherma and how she had learned about it from David Knight out in California," Riley says. "I actually had to stop her and tell her that I had never even heard of the Altherma — and we're a Daikin distributor! That's how cutting edge she was in her research."

Riley quickly got up-to-speed on the new technology and Thos. Somerville Co. eventually became one of a handful of distributors in the United States to begin distributing the Altherma units over the past year. At the time of this writing, Daikin was preparing for a nationwide rollout.

"This is a remarkable technology," Riley says. "Once AHRI gets a handle on how to confirm its efficiency, and if tax credits become available, it should really start grabbing hold."

After talking with Foley upon Riley's recommendation, Lorraine hired Foley to review proposals. But the jobsite was almost two hours away from Foley's office. "After awhile, it just made sense for us to do the job ourselves," he says. So Foley and one of his employees took a two-day training course on the system and then it was off to the field to embark upon the learning curve.

HOW IT WORKS

The Altherma extracts heat as energy from the outside air. Energy is transferred through refrigerant piping to a Hydrobox, which heats the water (or cools it during summer) and then circulates it through low-temperature radiators, floor radiant heat or fan coil units. Inverter compressor technology adjusts the speed of the compressor to suit the heating or cooling demand. Therefore, the system rarely operates at full capacity, and consumes only the energy actually needed.

Lorraine's research indicated that the Altherma, because of its inverter technology, will be able to get 66 to 80% of its energy from the outside air. "So for every one kilowatt of electricity consumed, it generates three to five kilowatts of heat or air conditioning — that's a good return on investment."

"The house has a super-high-performing envelope," Foley says. "There

Refrigerant piping connects the outdoor unit to the indoor Hydrobox (far left).

Two flat-plate solar panels will produce 70% to 75% of the energy required for domestic hot water.

is hardly any heat loss. If this were a traditional stick-built house, it would have required 10 to 12 tons of cooling. Because of the insulation, we were able to specify a 5-ton Altherma."

The unit is tied into an 80-gallon, stainless steel Altherma water tank. Foley could have specified another brand, but says the tank is of high quality. Although the heat pump could supply much of the energy required to heat the water, Foley suggested two Viessmann flat-plate solar panels for the job as well.

"We hesitated to install a solar thermal system for heating hot water because the Altherma does a pretty good job of producing domestic hot water," Lorraine says. "However, our goal is to reduce fossil fuel energy consumption as much as we can, so we agreed. We have good southern exposure on our roof where Dan installed the panels and, with the 30% tax credit, it was affordable."

The solar panels should produce 70% to 75% of the energy required for domestic hot water, with the heat pump providing the remaining energy. There are three zones of radiant floor heating in the full finished basement (which has an office, media room, full bath and in-law suite), with a fourth in the garage; the garage zone is isolated with a heat exchanger and propylene glycol to eliminate the risk of freezing. The tubing is 1/2-in. Uponor HePEX.

The first floor is one zone split into three areas using EWC dampers. The first of two First Co. fan coils feeds the heating and cooling to those three areas. The second fan coil, in the attic, heats and cools the second floor, which is split into two zones. The fan coils include 5-in. Honeywell media filters. Foley also installed a 200-cfm RenewAire Energy Recovery Ventilator.

THE RIGHT FIT

What made the Altherma a good fit for this job? "It met the needs of the client," Foley says. "It fit with her budget and will meet her energy-efficiency goals."

At the time of this writing, Foley was planning his second Altherma project for the personal residence of David Peabody, AIA, LEED, a Passive House Certified Consultant and principal of Peabody Architects, a residential green architectural firm.

In addition to the innovative mechanical system, the Horbaly house features many other energy- saving technologies, such as:

- Insulated Concrete Forms (ICFs) for the foundation and lower level
- Structural Insulated Panels (SIPs) for the upper walls and roofs
- Energy Star-rated windows and doors
- A rainwater catchment system for landscaping

They also hope to install a wind turbine in the future.

"We've estimated that our cost to heat and cool the house will be approximately $700 per year," says Lorraine, who was hoping that she and Judd would be able to move into the house within about six weeks from the time of this writing.

"We expect a return on our investment in the home's envelope and HVAC technologies in less than 10 years," she adds. "In the meantime, we will live in a supremely comfortable, well built, quality home with the knowledge that we are contributing every day to a healthier planet."

Lorraine Horbaly has written extensively about all of the green aspects of this house. You can access her articles at **www.tinyurl.com/28qokfd**. The Horbalys welcome inquiries about the technologies they've used in their home. To contact Lorraine, email her at lorraine@walmerenterprises.com. ♻

Lisa Murton Beets is a Cleveland-based freelance writer and frequent contributor to Green Mechanical Contractor and Radiant Living magazines.