

Re-greening RETRO

Geothermal — focal point of this home's retrofit

By John Vastyan | *Common Ground*

For most folks, this home's simple comfort system was more than ideal. An LP-fired boiler sent its heat into a radiant floor system and, when it was warm, open windows did the job just fine. Sadly, the downside of the simpler approach to heating the home was simply too expensive.

For Bill Gover, a retired plant engineer and his wife Barb, the appeal of tapping geothermal energy from below ground and severing ties with a propane supplier was too enticing to ignore.

Like many people who built in 2003 as the Govers did, the concern for energy efficiency was alive, but not worrisome. The 3,000-square foot, three-bedroom home also has a heated garage and workshop.

"During the winter of 2012, before we installed the geothermal system, we were filling the 500-gallon LP tank one, two, or even three times a month in one case," Gover said. "That was the final straw. We knew we needed to do something."

For a few years, Gover had toyed with the idea of solar thermal to assist the boiler. "I really had to fight with that option as a viable investment," he said. "But I worked with a friend who had a great experience with geothermal, so that tugged me toward geo as the solution we chose to invest in."

Bill's research into geothermal systems took him to a broad range of online resources, including Racine Wis.-based Modine Manufacturing Co.'s website. There Gover found a local contractor with experience installing Modine's systems.

The Govers soon learned from Tony Brown, president of Brown Plumbing & Heating that

a single geo system — in this case, a five-ton water-to-water unit — could provide warmth for the radiant heat system while also meeting the Gover's indoor comfort needs during the mild summer months. Brown also recommended a 50-gallon indirect water heater with an electric element as back-up heat to meet the Gover's domestic water needs.

Brown's geothermal recipe — using a water-to-water system to do the heavy lifting year-round — works especially in parts of the country where winters can be serious business and where summer months tend to be on the milder side. In addition, the recipe is also well-suited for homes in rural areas where propane is expensive and natural gas isn't available.

"We used a five-ton hydronic coil set on top of a York air handler as a source of back-up heat, and also for summer cooling," Brown said. "This way, the water-to-water geothermal system provides year-round comfort."

Brown said there was no real need for traditional air conditioning until recently: "Summers are getting warmer now, and more humid. But when winter rolls in, and especially with the way weather patterns have changed in the past few years — with erratic, unpredictable patterns — it's a game-changer," Brown said. "We install equipment that will do the job reliably, and do it well. After all, I've got to hang my reputation on it."

Geothermal — a specialty

Brown said one of the core specialties of his firm is geothermal heating and cooling — mostly residential work, though with a mixed bag of light commercial systems as well. "We work with reputable drillers and excavators



who take their geoexchange work seriously. Beyond the important decision about the equipment that's installed, the quality of the geoexchange is the most important facet of the system, and the biggest investment."

Brown and his HVAC project manager, Josh Zak, are hydronic guys at heart. "We love the comfort that hydronics uniquely provides," Zak said. Before the geothermal retrofit, Brown and Zak installed the boiler-driven hydronic system for the Govers. And though — after nine years of duty, the boiler was removed — the rest of the system remained in place, ready to serve a newer, better purpose after the retrofit.

"The Gover's hydronic system has several zones with fluids that are circulated by Taco 007 circs, managed by two Taco zone controls," Zak said. "A larger 0011 circulator serves the new air handler because there's greater head loss through the copper coil."

So, when they made preparations to replace the old boiler with the new, Modine water-to-water geothermal system, it was clear they'd have the opportunity to make the retrofit a two-fer: using hot water for winter heat and cooled water to combat the warmth and humidity of summer.

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“Of course, the circs for the multi-zone radiant heat system see duty only six months of the year, but the larger Taco circ sees year-round duty because the air handler’s set up for supplemental heat, and also summer cooling,” Zak said. The geothermal/hydronic system also consists of a 50-gallon buffer tank and a GeoFlow pump station.

According to Brown there’s also a five kilowatt heating element for back-up heat and a 10kw heater as an electric-only option.

Zak affirmed that the mechanical room work was rather simple; noting the switch from the fossil fuel boiler to the geo system was less than a day’s work.

Watch out for that tree...

Even with a wooded lot, the Govers chose to dig a horizontal exchange field – favoring that over deep, vertical geoechange wells because of the lower cost. The excavators initially wanted to remove more trees to accommodate the 50-by-90-foot bed, dug to a depth of between 10- and 12 feet, but the Govers held their ground: only four trees would be sacrificed. About 5,000 lineal feet of geothermal tubing, in slinky coils, were installed in five separate trenches.

A few months later, however, green leaves faded and fell, a clue to the coming of winter. Light snow was already on the ground when the full effect of the polar vortex hit. The unexpectedly long duration of the weather condition drove natural gas, LP and fuel oil prices higher.

“Worst of all was the leap in price for LP gas,” Gover said. The cost for fuel doubled, and then soon tripled. Limits were placed on deliveries because of a declared shortage. Some dealers said deliveries would

be delayed and they could provide only 200 gallons a month until the emergency lifted because of a run on fuel nationwide.

The Govers heaved a sigh of relief when they saw the coincidence of their newly-won energy independence, free from the giant spike in the cost of LP gas and limited availability. “We certainly couldn’t afford LP prices like those, and the limit of fuel we could purchase – if we could get it – would have been another concern.”

Gover estimates annual savings to be as much as \$1,300. He explained, though they have tracked utility and energy expenses carefully, last winter’s severity – and greatly fluctuating costs for electric service and LP gas – has made it a challenge to accurately predict future savings. Also, they’re very happy with the return from their geothermal system.



Left: Josh Zak, geothermal project manager for Brown Plumbing & Heating, checks the system operation. Modine photo.

Above: Bill and Barb Gover talk over their new geothermal system with Josh Zak. Modine photo.

So while others were struggling with the reality of dwindling energy reserves and sky high prices in the face of an uncommonly brutal winter, the Govers luxuriated in the radiant warmth that came from energy harvested in their back yard.

Brown explained the Gover’s geo-field will also improve in performance in the years to come. “The improvements will be gradual; maybe even unnoticeable to them,” Brown said. “But it’s proven that a trenched, or bed, geoechange field – as it fully collapses, improving contact with the pipe – will improve overall system efficiency.” **RJ**

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