

GEO OUTLOOK

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A New *Angle* on Horizontal Drilling

By Dara McCoy

If the ground source heat pump (GSHP) industry was polled to name the top challenges of installing a geothermal system in a residential application, the cost and physical restraints of installing a loop in a residential lot would easily crack the top five. When Oregon-based housing developer Steve Turner, owner of SR Turner Construction, decided he wanted to couple a radiant heating and cooling system to a ground loop for a residential development, he had no idea he was about to tackle those two issues head on.

Turner bought the residential lot in an existing neighborhood from an owner who had partitioned his lot. The lot gave Turner 6,000 square feet to work with, and the two-story home Turner constructed consumed 2,800



The 922 Ditch Witch horizontal-directional drill can make getting into tight residential areas, where landscaping and existing homes can be obstacles, a much easier task. (Photo courtesy of Ditch Witch.)



When a fence or other constraints challenge drilling for GSHP loops the Ditch Witch 922, a machine the size of a small garden tractor, could provide an answer. (Photo courtesy of Ditch Witch.)

square feet. It didn't leave much room for a geothermal bore field, which meant Turner would have to find a way to get a loop installed in limited space with tight access in the already developed neighborhood.

Eventually, Turner contacted Sean Hogan, sales representative of Ditch Witch Northwest. "I've been working on this for about five years trying to get the contractors who are building these systems to look at our technology for drilling these wells," said Hogan, who was so determined to build a GSHP market for Ditch Witch directional drilling machines in his area, he donated the use of Ditch Witch equipment and his expertise in drilling wells for Turner's home. "It allows them to use horizontal-drill technology instead of a vertical drill to put wells where they typically can't be placed like underneath a residence."

Hogan didn't misspeak. Using the 922 Ditch Witch horizontal-directional drill, Hogan drilled six boreholes at 200 feet deep underneath the home. The drilling machine, the size of a "small garden tractor," is typi-

cally used to drill horizontally and then surface at one end, Hogan said.

For Turner's home, Hogan drove his drilling machine into the backyard, without tearing down fences or obliterating the yard, and drilled the six boreholes at a 45-degree angle underneath the home. Hogan said the challenge was drilling a "dead-end" hole as opposed to going down five or six feet, surfacing at an exit end and pulling pipe into the ground as might be done on a horizontal installation.

"I developed an anchor that we would place on the end of the pipe," Hogan said. "We pushed the ground loops down to the ground. Then, we would pull the pipe in the ground, while we retracted our drill pipe." Hogan's anchor, "nothing more than a pointed piece of steel," was installed to the end of the drill pipe and the geothermal loop. When it reached the end of the borehole the steel point would anchor the loop preventing it from being pulled out of the hole with the retracting drill pipe, he said. Though the process took some refin-

ing, Hogan said he feels he developed a good system for this type of installation. “This is just an idea that I’ve wanted to try,” he said. “We had to come up with a system, and we have to develop tools to do it.”

The benefits of the “semi-vertical” bore field in this project were significant. The ideal land mass needed for a horizontal bore field was not available. A conventional vertical drilling rig would have been impossible to get into the yard and more costly. “Our equipment is less expensive,” Hogan said. “We can put wells in for the least amount of money with a horizontal drill versus a vertical drill.”

Conrad Brown, consulting engineer on the project from PAE Consulting Engineers Inc. noticed another potential cost saver in the amount of grout that was needed for the project. “They use a very small amount of grout slurry as they drill,” he said. “They don’t have to grout the hole afterwards. When they pull out of that hole, none of the earth actually gets physically brought out of the bore. It’s just liquefied in the hole and once the moisture goes out, it solidifies again.” The process was significantly cleaner, too. Brown said only three or four gallons of slurry came out of each hole, which was contained on a small trailer towed behind a pickup truck. “That’s the extent of the mess,” Brown said. “It’s a big difference from a vertical system.”

Turner realized there would be installation savings, as well as the energy savings his customer desired. “Had we done it vertical, I would say we would’ve spent \$20,000 on the holes, and we spent about \$5,000 on this option,” he said. “It was significantly cheaper.”

When Trying Something New Pays Off

Their involvement in this somewhat experimental project paid dividends for Brown and Hogan as well. Brown’s employer, PAE Consulting Engineers, plans to use the same directional drilling process in a commercial net-zero building in Seattle, he said. For Hogan, his five years of promoting Ditch Witch for GSHP installations is paying dividends. “Since I’ve done this project, there’s a new company, Oregon Geothermal, that is now doing this on a regular basis,” Hogan said. “It

was a heating and cooling company that decided to start putting in these ground loops this way, and they’ve been successful so far.” In fact, without Hogan’s semi-vertical drilling process, one of Oregon Geothermal’s clients, who owned a house located on a cliff near the Willamette River in Portland, Ore., wouldn’t have been able to have GSHP heating and cooling.

In 22 years of building homes in the Pacific Northwest, this was the first GSHP home Turner had ever developed, but it left lasting impressions by cutting estimated energy expenses in half for the four-bedroom home. “If all the U.S. market were to switch over to this type of system, we could cut our energy dependence as far as residential heating and cooling in half,” he said. “This is a great solution.” Turner plans to install the same type radiant and GSHP system in the next new home he builds for himself. “If you can get half of your energy in your backyard, that’s a good thing.”

Hogan has started hearing some feedback about his drilling method in Oregon but says word of mouth is sometimes a slow process. “People aren’t aware of the technology so they’re not using it,” he said. “Once people see this being done, when you can go into somebody’s yard and not even disrupt their shrubs or lawn too much, I think it will be the way of the future.”

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