

Green drilling

Energy-saving geothermal drilling
gets cleaner with Atlas Copco
portable air compressor »



*(from left) Don Pedifer, Peter Reitsma, Andrew Gordon,
Nigel Blakey, Stanley Reitsma, Lawren Guldemond*



» In a new era of energy consumption when everyone is looking for ways to depend less on fossil fuels and more on alternative “greener” options, companies such as GeoSource Energy Inc. are leading the way to the future. GeoSource is an industry leader in the business of Geothermal Drilling which is essentially the process of installing geothermal loops to facilitate natural heating and cooling. The loop fields they are installing make it possible for large industrial or corporate structures to achieve a net-zero energy footprint.

Helping to reduce the energy needed for the drilling work, GeoSource is using Atlas Copco’s XRVS 1000 CD6 portable air compressor with FuelXpert™ technology, a much more fuel efficient option as compared to other existing products currently available in the marketplace.

In business since 2004, GeoSource is owned by three brothers: George, Peter and Stan Reitsma and is based on Ontario, Canada. Stan comments that, “Consumers are looking for energy-friendly homes and structures. It’s a grassroots drive to live greener. We are seeing a larger percentage of these types of projects.”

The project showcased is for what Stan called a progressive builder, Davies Smith Developments. There will be two parking levels below the living structure with utilities in the basement. The loop field required 76 holes to 170 meters deep. A manifold will bring the loops together and direct the fluid through the geothermal appliances.

Geothermal heating and cooling works simply by passing liquid through pipes. Those drilled pipes (the loopfield) move heat from a building and discharge it into the ground during the summer months. In the winter months the geothermal system draws heat from the earth and delivers it to the building. The geothermal system will pay for itself in five years based on current energy rates. Drilled loops as described in this particular contract are typically more efficient than horizontal installations.

With the company’s two drills and one compressor, drilling was scheduled to take four weeks.

“This will be a good looking building when it’s complete,” said Stan. He said that partly because it won’t have rooftop air units. Instead plans call for a rooftop pool and rooftop gardens - a private park for condo residents.

The utilities for this building are provided for in a 30-year contract. This gives the owners a fixed cost for energy that won’t spike with fluctuations in energy rates.



Stanley Reitsma stands next to the Atlas Copco XRVS 1000 CD6 compressor that is providing air to two drill rigs.

First on-site

GeoSource is pretty much the first contractor on-site at a building project. The company’s specialty is drilling on a future building site before excavation begins on the basement. It’s an advantage to work the site alone, with no interference from other contractors and on undisturbed ground.

Although they have tried other compressors with their drill, the company has found success with the Atlas Copco XRVS 1000 CD6 compressor, mostly because of its fuel savings and reliability.

Here the unit was running at 52.8 lph at 80



percent engine capacity. Stan equated this to about 30 to 40 cents per drilled foot for fuel. “Efficiency of equipment can be the difference between making profit or not,” he said.

They have found that the XRVS rotary screw compressor, capable of delivering 1,000 cfm at 25 bar (365 psi), uses a third to half of the fuel of their past compressor. It averages about 50 liters per hour, compared to the former unit’s 125 liters per hour. The XRVS’s Caterpillar C13 Tier III diesel engine and Atlas Copco FuelXpert™ provide efficient air. The FuelXpert™ system electronically regulates engine speed and the air inlet valve to optimize fuel consumption.

To drill shale or limestone, PDC bits are used with the compressor operating at about 100 psi. The compressor sends air through a manifold that splits the air between the two drills. If the dual rotary rig is drilling overburden, GeoSource uses an Atlas Copco Total Depth 3.5-inch hammer with a 4-inch bit, which requires air at 300 psi. In this scenario the XRVS compressor will supply 1,000 cfm of free air delivery at 300 to 325 psi to the manifold valve. The manifold is set up to deliver up to 600 cfm to the dual rotary rig and 400 cfm to the single rotary rig drilling with a PDC bit in the shale below the casing.

Stan likes how the electronic pressure control doesn’t freeze up on the XRVS. It also runs much quieter than their old compressor. This is important in the residential areas where they most often work.

Drilling conditions

GeoSource uses a dual rotary rig to advance 133 mm threaded steel casing through overburden up to 100 meters depth. The casing is retrieved after the loops are in place. They use a 100 mm PDC drill bit and 73 mm drill pipe for most bedrock drilling where there is a prevalence of shale and limestone. Typical depths of geothermal boreholes are 150 m to 180 m but GeoSource has drilled deeper, into the 195-meter range, but Stan said it’s necessary to upsize the geothermal pipe if they are going deeper than 195 meters. Depth has increased over the last 10 years from the 100 m range and boreholes up to 300 meters have been discussed.

Laying out the pattern

When the basement is excavated, the holes for the pipe are drilled at an angle to be exactly in the right location. “Vertical is easy. Having to figure the azimuth so the holes are at the exact location two stories below surface takes some expertise.”

Stan is a former engineering professor at the University of Windsor, Ontario, Canada whose education includes a geology undergraduate degree and civil engineering graduate degree, so figuring drilling patterns for geothermal wells would be right up his alley. Multiple rows of holes must ultimately line up at the proper depth, each well away from another.

Drilling a series of angled holes so close

(top left photo) The remote control for drilling operations allows operator Andrew Gordon to stand away from the wet area. Once the surface is excavated the holes will line up for easy connection.

(top middle photo) Stanley Reitsma and Peter Reitsma. The mobile grout truck behind them offers a convenient and efficient setup. It’s also a great billboard.

(top right photo) Lawren Guldmond

together in the basement of a building that isn’t built yet takes some detailed planning. “Our system sets us apart,” said Stan. It is a system GeoSource pioneered, which forecasts the angle of the holes so they don’t cross, or more importantly, don’t draw the ground energy from other holes. They also place a plug at the depth of the future basement to ensure the geothermal loop will remain free of debris during excavation of the parking garage.

GeoSource is just the first of a team of specialists to work on this carbon-free housing project. But with their expertise and experience the site is on its way to a successfully green foundation. ☉