Untapped opportunities

Ground water contractors already have the skills and knowledge for geothermal drilling

By Chris Skalkos

With modified drilling methods and equipment, the average well-drilling technician has all the knowledge required to drill bore holes for geothermal systems.

Ground water drilling technicians today are doing more than just drilling wells. Most already install pumps and many have ventured into water treatment systems. By utilizing existing skills and equipment, installing geothermal ground source heat pumps is yet another value-added service ground water contractors should consider when looking at alternative revenue opportunities.

Geothermal heating and cooling systems use ground water to transport thermal energy that is stored in the earth to buildings. In the heating mode, energy is recovered from the ground by extracting ground water from a well or fluid that circulates through one of a series of vertical bores and directing it through a pipe system acting as a heat exchanger.

The heat is upgraded through the evaporation and condensation cycle of a heat pump and is delivered to the building by ducted air. In the cooling mode, the heat pump extracts heat from the interior of the building to provide hot water while excess heat is rejected through the heat exchanger and sent back under ground.

With the rising costs of fossil fuels, along with the federal and provincial government efforts to promote renewable energy systems, many homeowners and commercial builders are adopting this technology. Some ground water professionals have taken an interest in this field by diversifying their drilling operations to take advantage of the profit opportunities, since geothermal systems require the need for bore holes and water-producing wells.

The technology has been widely used in Europe for years and is becoming a popular alternative in North America. There are opportunities for well-drilling companies since one geothermal method called the "open loop" system requires the use of two wells, one that can provide water at the required volume per minute and another rejection well or return well that dumps the water back into the aquifer. A vertical "closed loop system" also provides opportunities for well-drilling technicians since it requires a number of bore holes to be drilled at about 125 to 150 feet of bore per ton of heat pump capacity.

There are opportunities for well drillers to construct the wells, drill the bore holes and maybe even follow through with the installation. The average water well company would need to modify its drilling operations to take advantage of this niche market.

The average rate per foot for drilling geothermal bore holes is much less than the average rate for drilling water wells so it doesn't make sense to tie up a million-dollar rig on a geothermal site when it could be making more money elsewhere. However, geothermal drilling can be cost effective with less expensive equipment such as smaller vertical drilling machines and hollow stem auger units. There is smaller equipment available, but of course this is geographically dependent, since drilling through overburden is different from drilling into rock.

Geothermal drilling for bore hole fields is all about production, drilling as many holes as possible in a short amount of time whereas water-well drilling requires the careful construction of a reliable hole to get good quality water.

With modified drilling methods and specialized equipment, the average well-drilling technician is already equipped to drill the holes for these geothermal systems and there is also an opportunity for ground water pump technicians since the technology for heat pumps is similar to water-well pumps.

Despite the lower price rate per foot, geothermal drilling can profit by using less expensive equipment that can enable drillers to increase volume. Water-well contractors can make this a specialized niche market by creating a separate division within their ground water drilling operation using smaller, less expensive rigs and focusing on volume.

The main difference is in the approach. Ground water contractors take pride in their work and don't want to drill cheap

holes, but the heating contractors want production within a tight time frame.

Adding a separate geothermal bore hole division can be a viable business, independent of well-drilling operations. A number of well-drilling companies who have already jumped into this industry have progressed to installing the piping for the systems as well.

Why should water-well contractors even consider it? It is one of the very few related industries that complement what water-well companies do.

Geothermal ground source heat pumps will become more prevalent in the future as Canadians move away from conventional fossil fuels for more environmentally safe and cost-efficient energy sources.

It takes a worldwide crisis, such as the fuel shortage in the 1970s or the global warming crisis of the 1980s to make a change in the industry and the industry is seeing another one now with the current shift towards green building systems.

Ground water professionals have the skills and knowledge to enter this field while maintaining the integrity of ground water. The new future for ground water, apart from just supplying water, will be for supplying energy.

Ground water is emerging as one of Canada's most important untapped sources of renewable energy. Provincial governments are already offering incentives and rebates for installing clean-energy systems and provincial utility companies will accelerate the development and commercialization of renewable energy technologies.

Ground water researchers will need to investigate aquifer thermal energy storage technologies that can be utilized for commercial-scale district heating and cooling systems. Ground water consultants will need to locate and map high-capacity aquifers that are suitable for these projects.

The future is bright for this industry. Water-well contractors will have more opportunities to expand their operations to include geothermal drilling and installation of geothermal systems if they choose to do so. The renewed focus on ground water energy will provide new opportunities to revitalize the ground water industry in Canada and create new profit opportunities for ground water contractors. ■

Energy storage of aquifers

Aquifer thermal energy storage (ATES) technology involves the temporary storage of heat and cold in aquifers. Waste heat collected during the cooling of buildings in the summer is re-injected into an aquifer and stored until the winter. The heated ground water is then recovered and utilized to heat the same building in winter. Once the heat has been extracted, the cold water is re-injected into another part of the aquifer and stored for cooling the following summer. Depending on the needs of the facility, shorter storage periods (such as daily) can also be designed.

ATES systems contain a minimum of one supply well and one injection well, separated to form a cold store and a hot store. For larger applications, such as high-rise buildings or subdivisions, the number, design and spacing of wells increases to form well fields, but the concept remains essentially unchanged.

ATES and conventional ground water energy systems not only provide a reliable, clean renewable source of energy, but they simultaneously provide significant environmental advantages over fossil-fuel-based sources. Some of these benefits include substantial savings in energy consumption; preserves non-renewable fossil fuels for other beneficial uses; reduction of fuel production and pollution at refineries; reduction of carbon dioxide, nitrogen oxide and sulphur compound emissions, gases that contribute to global warming; and elimination of the need for cooling towers and their associated chemicals.

The large energy storage capacity of aquifers makes ground water heat pump systems ideally suited to the supply of base-load demand for heating and cooling of buildings. ATES systems, in contrast, are suited to heating and cooling during periods of peak electrical demand. The reduction in electrical usage during this period can translate into substantial cost savings. ■