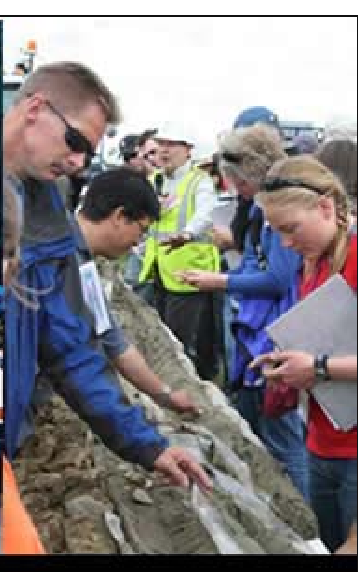

The Buzz
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Geothermal Market Analysis Released

The Canadian GeoExchange Coalition (CGC), Canada's national industry association for geothermal heat pump technology, recently released an extensive statistical report entitled *The State of the Canadian Geothermal Heat Pump Industry 2010 – Industry Survey and Market Analysis.* The document is available on the CGC website at www.geoexchange.ca.

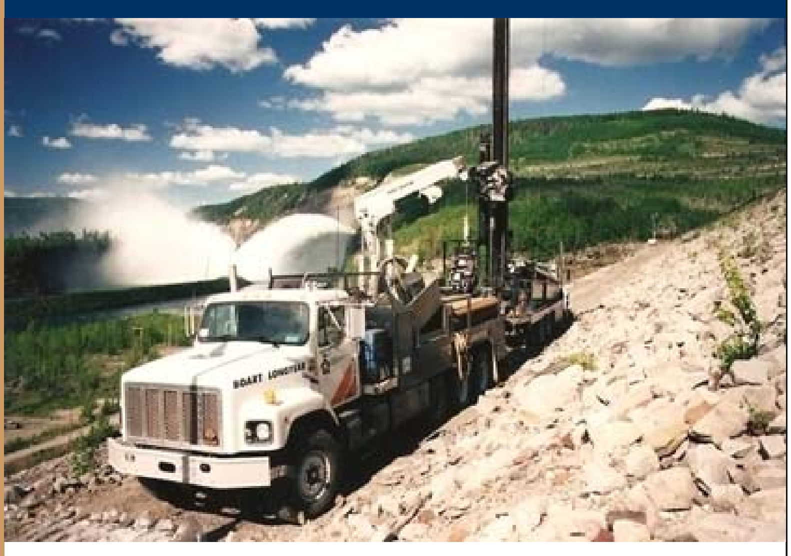
The CGC document is the first to present a comprehensive, credible picture of the Canadian geoexchange industry. After thorough and ongoing research over the past five years, CGC staff found that the vast majority of analysis of, in, or about the industry was based on self-referential reports or even hearsay.

"Policy makers and program developers therefore essentially based their work on unverifiable data and sources. In short, no statistically valid data has ever been published on the Canadian geothermal heat pump industry. As a result, industry stakeholders and government officials lacked the key, strategic information they needed to develop new programs or adapt existing programs," says Denis Tanguay, CGC's president and CEO.

Fortunately, the report shows that the Canadian geoexchange industry has experienced phenomenal growth in the past five years. The market for ground source heat pumps grew by more than 40% in 2005 over 2004 and by more than 60 % annually in 2006, 2007 and 2008.

Despite harsh economic conditions, the CGC estimates the market grew by an additional 5% in 2009. Some analysis and comparison with US markets is also included in the report.

Dam Crisis Sets the Stage for Sonic Drilling



On June 14, 1996, a tourist discovered a sinkhole on the crest of the W.A.C. Bennett dam in northeastern British Columbia, Canada. This 1¼-mile-long dam is a massive structure that holds back 75 billion cubic yards of water in the Williston reservoir. At 600 feet high and 2600 feet wide at the base, it was constructed as a megapower project 45 years ago and it's still one of the largest hydroelectric dams in the world, capable of generating 2,730 megawatts of electricity at peak capacity.

Sinkholes in an earthfill dam signal erosion within the structure and calls of alarm went out immediately as communities downstream prepared for evacuation. Round-the-clock dam monitoring and surveillance were set up and a sinkhole investigation team was assembled. Torrents of water were released to lower the level of the reservoir, representing a loss of generating capacity of more than $1 million per day. Local newspapers and television stations carried the story of possible disaster if the dam was to let go as many feared that the entire downstream valley could be wiped out.

Then, a second sinkhole was discovered on September 8, 1996. Experts from around the world convened at the site to study the cause of the sinkhole formation, to evaluate the extent of the loose zones within the dam's core and to determine the most appropriate remediation options. A comprehensive dam investigation program was put in motion which included non-intrusive geophysical techniques such as electrical resistivity and ground-penetrating radar.

Intrusive testing with electronic cone penetration was also used to probe the area around the sinkholes. None of these methods were able to provide the engineers with the information that they needed and it was determined that drilling into the core of the dam would be necessary, something that was unprecedented on a working dam. The dangers were obvious -- if a passage opened up, the ensuing water flow would likely be impossible to stop and could quickly breach the dam.

Discussion between the experts arrived at one conclusion – a drilling method was needed that could rapidly provide a continuous core sample and yet did not require the use of compressed air, water or any type of drilling fluid. If drilling fluid was used, the hydraulic pressure created would potentially cause a fracture which could open up a water passage. Meanwhile, a hammer drill had been tried but could not penetrate the dense core of the dam.

In those days, sonic drilling was a relatively new technology that was gaining in popularity. In addition to being extremely fast, sonic drills are capable of doing unique tasks, including providing continuous, large diameter, highly representative core in virtually any overburden formation without the use of any drilling fluid.

In the case of the Bennett dam crisis, Sonic Drilling Ltd., Vancouver, B.C., was chosen as the prime contractor for the drilling investigation. Boart Longyear, Little Falls, Minnesota, was, in turn, contracted to bring up two of its new sonic drill rigs for the job. The rigs used on this project incorporated sonic drill heads that were manufactured by the Sonic Drill Corporation. The drill rigs, themselves, were manufactured by Gus Pech Manufacturing Co., LeMars, Iowa and were literally just out of the factory door with the paint barely dry. Both rigs performed flawlessly for the duration of the project.

One rig operated around the clock for most of the investigation period which begin June 26 and ended November 16, 1996. The second rig was brought in on August 19 and worked 12 hours per day until the project was finished. Although it took only a few days to get the sonic rigs on site, it was a daunting administrative task for Sonic Drilling Ltd. and Boart Longyear to coordinate the deployment and scheduling of the many qualified workers required for this project. Foreign worker permits had to be secured and customs clearances for crews and equipment had to be arranged. The drilling procedure employed was to core 10 to 20 feet at a time into the dam using the sonic drill's core barrel and then return the cores to the surface where they were extruded in a clear poly sleeve.

After the core barrel was removed, an outer casing was vibrated to the same depth to which the core barrel had penetrated and then coring resumed for another 10 to 20 feet. This process was repeated to target depth. The diameter of the cores were 3½ inches.

In some cases, coring was carried out through the dam and then into the underlying bedrock. To complete the hole, PVC casing was lowered inside the steel casing and the hole was grouted as the steel outer casing was vibrated back out of the ground. The grouting operation was extremely slow as only a few feet could be grouted at a time to prevent hydraulic fracturing of the dam or crushing of the casing. The deepest hole was 435 feet. The cores were sent to an on-site lab for analysis.

Based on the results obtained from the investigation, engineers were able to devise a solution. It was determined that the sinkholes were localized and had occurred around two corroded vertical survey benchmark pipes that had been left behind during construction of the dam. In addition, they also discovered that some internal erosion, a process whereby soil particles from one area of the dam migrate to other parts, had occurred. It was decided that a method called compaction grouting — injecting a mixture of cement, sand and silt under controlled pressure into the dam's core — would be used to strengthen the loose material beneath the sinkholes. Fifteen grouting columns were completed and approximately 5000 cubic feet of grout material was injected. Round-the-clock monitoring and surveillance continued but all results indicated that the remediation technique had been successful.

Today, the Bennett dam is operating in a safe manner and still retains its proud place in the history books as one of the world's largest earthfill structures – thanks to a few extra servings of cement and the unique performance of a revolutionary technology called sonic drilling.

Vancouver Aims to be Greenest City in the World

Recently, the City of Vancouver approved a new plan aimed at making it the greenest city in the world by 2020. In addition to making changes that encourage the construction of "greener" buildings that use energy options such as geothermal, the plan also calls for the creation of more green energy jobs.

Vision Vancouver Councillor Andrea Reimer, who helped develop the plan, says jobs in green industries could be key to the city's future growth. "Worldwide, green jobs are outpacing other kinds of economic development three to one," noted Reimer in a CBC interview.

The Greenest City Action Plan is a broad, long-term strategy that was initially launched by Mayor Gregor Robertson in 2009. Specific goals include:

- Reducing the city's ecological footprint
- Reducing vehicle traffic and increasing bike, foot and public transit trips
- Reducing greenhouse gas emissions
- Encouraging local food production
- Reducing waste going into landfills
- Building greener buildings
- Increasing easy access to nature and parks
- Improving air and water quality
- Doubling the number of so-called green jobs in industries like water conservation and clean energy.

All of this is good news for the expanding geothermal industry which has enjoyed a healthy adoption by both Canadian home owners and commercial developers.

As geothermal becomes a mainstream choice, sonic drilling continues to be a logical partner in helping to grow the industry. With its ability to core, case, loop and grout in one operation, sonic drill rigs bring a number of cost-saving advantages to geothermal installations.

www.sonicgeothermal.com **SONIC DRILLING LTD.** www.sonicdrilling.com

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