Geothermal household installation in use

Sometime in the first century AD, the Romans conquered Aquae Sulis, a small town in what was then known as the province of Britannia.

Rather than plunder resources, however, the Romans set about using them wisely. One such resource was the hot springs to feed public baths and underfloor heating. Back then, the result was a beautiful form of bathing on a chilly winter's day. Nowadays, the result is tourist drawcard in the English county of Somerset known all over the world as a place called Bath.

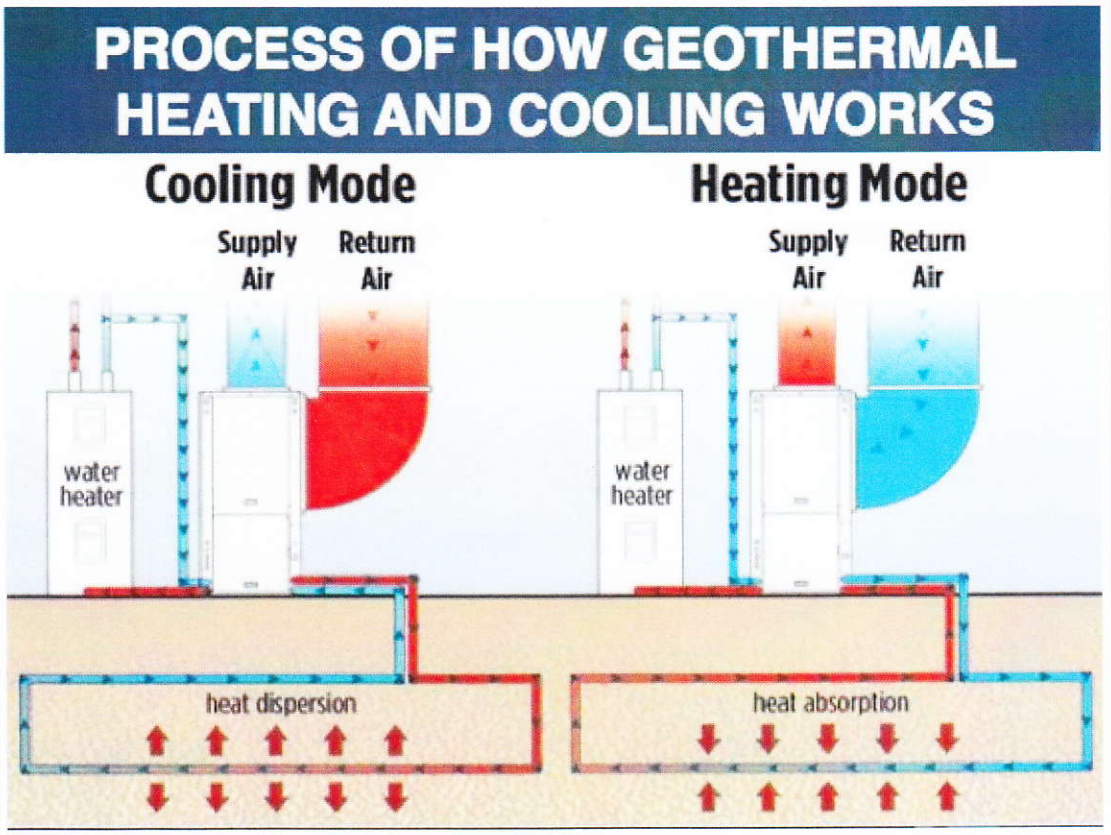
Sitting in a lovely warm bath on a cold winter's day back then, few Roman citizens would have contemplated the idea that the same concept used to heat their baths – a concept now called geothermal energy – would be widely used around the world and would be considered a serious part of a solution to stop the whole world from getting too hot.

Today, however, such is the reality. In 2005, according to a GeoHeat Quarterly Bulletin published by Origin Institute of **Technology**, a total of 73 countries around the world produced a total of 273 petajoules (PJ) of energy using geothermal techniques.

With the renewed push to achieve carbon emissions reduction in Australia, some engineers believe geothermal technology should be used more widely here. One is Troy Thompson, Geothermal Advisor, South East Asia, New Zealand and Australia at HÜTTE Bohrtechnik GmbH, a German supplier of drilling rigs and accessories for the civil and geothermal industries.

"As an Australian living in Germany, I have witnessed first-hand the cost savings" Thompson says.

"I would encourage all designers and builders to seriously look at this technology".



Process of how geothermal heating and cooling works

How does it work?

Essentially speaking, geothermal heating involves the use of geothermal energy – energy generated and stored in the earth – for heating and cooling purposes.

Outside of regions close to tectonic boundaries, which often contain ground or groundwater with temperatures that exceed the target heating application, this involves extracting heat contained beneath the surface (Thompson says that in Australia, temperatures range between 10 to 24 degrees Celsius at depths of between 50-400 meters). This is commonly done via heat pumps.

A diagram of how it works is shown below. In summer, when temperatures within the home or building exceed those in the ground, cooling is achieved by pumping heat from the building to a transfer mechanism and then subsequently through narrow pipes into the ground, where it dissipates into the earth. The reverse process is used is used to heat the building in winter, where the warmer air from the ground pumped upward into the building.

What are the advantages?

Thompson believes geothermal energy has a number of advantages. Apart from being a durable and having a long life span, geothermal is a renewable and plentiful resource, he says. Also, unlike some renewable sources, such as wind technology, geothermal heating can be installed in limited space areas with minimal disruption to either home or building occupants or the surrounding environment.

But perhaps the most significant advantages are **energy efficiency** and cost. Thompson estimates that geothermal use could reduce energy consumption in Australian households by 75-80% (more still if the geothermal pump is powered using solar energy), reducing annual

household electricity bills from $2,920 to $730. In the United States, the Environmental Protection Authority estimated in 2008 that geothermal energy saved the average householder 30-70 percent in heating costs and 20-50% in cooling costs.

Downsides and Risks

Since it involves drilling into the ground, however, geothermal heating is not without risks, especially in cases where the geology of the area is not well understood. The city of Staufen im Breisgau in Germany is a case in point. Following exploratory geothermal drilling in 2007 to heat the town hall, the city centre initially sank a few millimeters and then began to rise. The cause was put down to a geothermal process called anhydrite swelling – whereby high-pressure groundwater came into contact with an anhydrite (anhydrous calcium sulphate) which then began to expand.

Then, there was the case in Basel, Switzerland, where drilling 4.8 kilometers into the earth set off a magnitude 3.4 earthquake.

It should be noted, however, that in contrast to the situation at Basel, the type of geothermal energy Thompson is talking about involves using heat much closer to the surface and therefore involves drilling of up to a few hundred meters at most. This is known as 'shallow' geothermal energy, and involves less disruption to underground geology than the deep drilling used in Basel.

Also, in spite of such incidents, proponents of geothermal point out that the technology is well established and has been used across a large number of countries throughout many years.

Images courtesy HÜTTE Bohrtechnik GmbH

By Andrew Heaton