**Myths About Geothermal Heating and Cooling**

IMAGINE A HOME in which the temperature is always comfortable, yet the heating and cooling system is out of sight. That system performs efficiently but doesn’t require extensive maintenance or knowledge on the part of the owners.

The air smells fresh; you can hear the birds chirping and the wind rustling lazily through the trees. The home shares energy with the earth similar to the way the roots of the trees exchange the essentials of life to their leaves and branches. Sounds comfortable, doesn’t it?

Geothermal heating and cooling makes that vision a reality. Geothermal HVAC (heating, ventilating, and air conditioning) brings a building in harmony with the earth beneath, taking advantage of subterranean temperatures to provide heating in the winter and cooling in the summer.

How Geothermal Heating and Cooling Works

Outdoor temperatures fluctuate with the changing seasons but underground temperatures don’t change as dramatically, thanks to the insulating properties of the earth. Four to six feet below ground, temperatures remain relatively constant year-round. A geothermal system, which typically consists of an indoor handling unit and a buried system of pipes, called an earth loop, and/or a pump to reinjection well, capitalizes on these constant temperatures to provide “free” energy.

(Note that geothermal HVAC should not be confused with “[geothermal energy](http://environment.nationalgeographic.com/environment/global-warming/geothermal-profile/),” the process by which electricity is generated directly from the heat inside the earth. That takes place on the scale of utilities and uses different processes, normally by heating water to boiling.)

The pipes that make up an earth loop are usually made of polyethylene and can be buried under the ground horizontally or vertically, depending on the characteristics of the site. If an aquifer is available, engineers may prefer to design an “open loop” system, in which a well is drilled into the underground water. Water is pumped up, run past a heat exchanger, and then the water is returned to the same aquifer, through “reinjection.”

In winter, fluid circulating through the system’s earth loop or well absorbs stored heat from the ground and carries it indoors. The indoor unit compresses the heat to a higher temperature and distributes it throughout the building, as if it were an air conditioner running in reverse. In summer, the geothermal HVAC system pulls heat from the building and carries it through the earth loop/pump to reinjection well, where it deposits the heat into the cooler earth/aquifer.

Unlike ordinary heating and cooling systems, geothermal HVAC systems do not burn fossil fuel to generate heat; they simply transfer heat to and from the earth. Typically, electric power is used only to operate the unit’s fan, compressor, and pump.

A geothermal cooling and heating system has three main components: the heat-pump unit, the liquid heat-exchange medium (open or closed loop), and the air-delivery system (ductwork) and/or the radiant heating (in the floor or elsewhere).

Geothermal heat pumps, as well as all other types of heat pumps, have efficiencies rated according to their coefficient of performance, or COP. It’s a scientific way of determining how much energy the system moves versus how much it uses. Most geothermal heat pump systems have COPs of 3.0 to 5.0. This means for every unit of energy used to power the system, three to five units are supplied as heat.

Geothermal systems require little maintenance. When installed properly, which is critical, the buried loop can last for generations. The unit’s fan, compressor, and pump are housed indoors, protected from the harsh weather conditions, so they tend to last for many years, often decades. Usually, periodic checks and filter changes and annual coil cleaning are the only required maintenance.

Geothermal HVAC Spreads

Geothermal HVAC systems have been used for more than 60 years in the U.S. and beyond.

They work with nature, not against it, and they emit no greenhouse gases. (As mentioned earlier, they use a smaller amount of electricity to run, because they are coupled in with the earth’s average temperature.)

Geothermal HVAC systems are becoming common features of eco-friendly homes as part of the growing green building movement. Green projects accounted for 20 percent of all newly built homes in the U.S. last year. By 2016, a [Wall Street Journal article predicted](http://online.wsj.com/article/SB10001424127887323789704578443173932450096.html) that green housing will grow from $36 billion a year to as much as $114 billion. That’s approaching 30 to 40 percent of the entire housing market.

But a lot of information out there on geothermal heating and cooling is based on outdated information, or outright myths. In our new book [Modern Geothermal HVAC Engineering and Control Applications](http://www.amazon.com/Modern-Geothermal-Engineering-Control-Applications/dp/0071792686)(Egg/Cunniff/Orio -McGraw-Hill 2013), co-authors Greg Cunniff, Carl Orio and I bust many of these myths.

Geothermal HVAC Myths Busted

1. Geothermal HVAC systems are not considered a renewable technology because they use electricity.

Fact: Geothermal HVAC systems use only one unit of electricity to move up to five units of cooling or heating from the earth to a building.

2. Photovoltaic and wind power are more favorable renewable technologies when compared to geothermal HVAC systems.

from：<https://www.nationalgeographic.com/environment/great-energy-challenge/2013/10-myths-about-geothermal-heating-and-cooling/>