Inside a Geothermal Heat Pump

A geothermal heat pump simply enables heat to move naturally and is no more complicated than a refrigerator. The heat pump uses a basic refrigeration cycle to extract heat from the earth and move that heat into a building. In the summer, the refrigeration process can be reversed to provide cooling.

By remembering that heat will naturally move from something warm to something cool and that a heat pump provides the necessary temperature link between the heat in the earth and the need to heat a building—the entire process is very simple.

Important components within a geothermal heat pump are:

- the compressor to change the temperature of the refrigerant
- a heat exchanger linked to the earth loop
- air or water coil to distribute the heat into the building.

A geothermal heat pump will do all the heating and all the cooling of the building within one cabinet. It is an all-electric, clean, reliable, safe and economical system.

Lower Cost Hot Water

In the cooling season, the geothermal system removes heat from the space. Before this energy is moved to the ground loop it can be used to provide domestic hot water. This means low cost water heating in the summer and at substantially lower costs in the winter.

Kinds of Loops

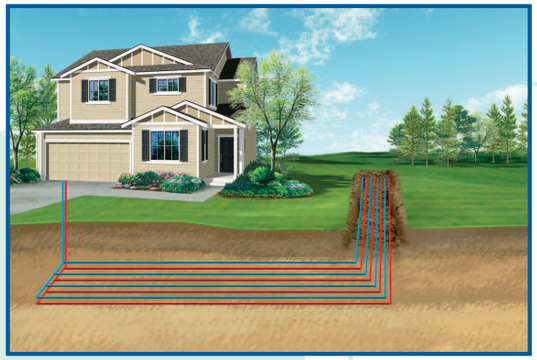
The loops can be installed horizontally or vertically. The method chosen will depend on the available land area and the soil and rock type at the installation site.

Open Loops

An open loop system can be installed where an adequate supply of suitable well water is available and open discharge is feasible. Check for any state and local rules and regulations that may apply.

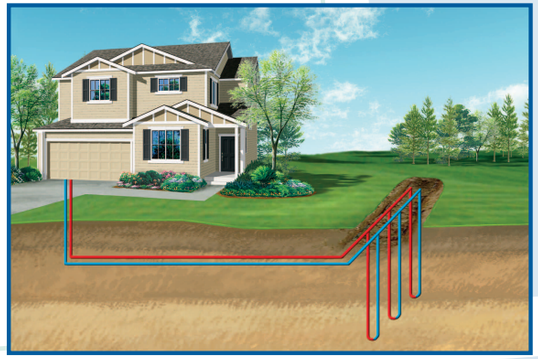
Horizontal Loops

Horizontal installations, when a trencher or backhoe can be used, are less expensive, but take up more land area.



Vertical Loops

Vertical installations, where well drilling equipment is used, are generally more expensive, but are ideal where land is scarce.



Geothermal and Commercial/Industrial Buildings

The Advantages:

- Lower operating costs
- High efficiency
- Less mechanical equipment space
- Reduced floor to floor height requirements
- Lowest life cycle cost
- Minimal maintenance
- Long lasting and reliable

In large commercial buildings, such as school and high-rise offices, the use of multiple geothermal systems allows commercial users to control the climate of each indoor area or zone of a building individually. Each classroom of a school, guest room of a hotel or room of an office building may have its own geothermal unit.

This design means extraordinary savings because the heat removed from the sunny side is transferred to the geothermal unit heating the shady side, reducing the demand on the earth loop.

Resource: WI GeoThermal Association

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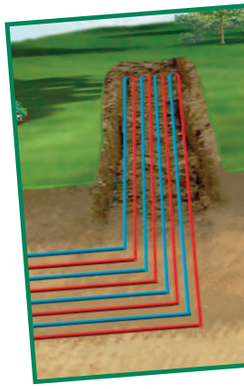
Contact your local electric cooperative for more information about geothermal systems.

Geothermal Heating & Cooling Systems



The Geothermal System

Geothermal systems can be very cost effective, money saving opportunities for homes, schools and businesses.

The most important considerations when choosing a heating and cooling system are comfort and economy. Too often, economy means sacrificing comfort. However, with a geothermal system you can have both. Geothermal systems tap the naturally stored energy of the greatest solar collector in existence, the earth. The systems take advantage of the earth's constant year-round ground temperature to provide heating, cooling and hot water in a variety of applications.

Benefits

Comfort – Geothermal systems produce an abundance of warm and cooled air and deliver it gently into the space. There are no blasts of hot or cold air that are associated with other types of systems. Since these air temperature fluctuations are substantially reduced, Geothermal systems provide superior room comfort control.

***A Geothermal system can result in up to:**

- 70 percent lower heating costs
- 30 percent lower cooling costs
- Two-year to seven-year payback
- Lower operating and maintenance costs

*According to the Geothermal Heat Pump Consortium

Economical – How about lower energy bills? Heat from the ground is free and the only electricity needed is for moving that heat between your home and the ground.

Environmentally Safe – Geothermal systems are recognized by the Environmental Protection Agency (EPA) as the most environmentally friendly heating and cooling technology available. It is a system you can feel good about using. CO_2 emissions are significantly reduced. A geothermal heat pump has very few moving parts to maintain, and is located indoors, where it is protected from weather extremes, vandalism and abuse.

Clean – No flames, no flue, no odors – just safe, reliable operation.

Low Maintenance – Geothermal systems require little maintenance. Homeowners only need to change air filters. Businesses could eliminate expensive maintenance contracts or on-staff operators.

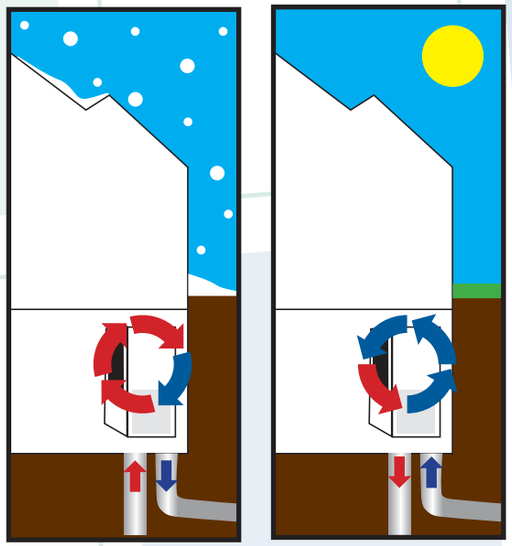
Efficient – Geothermal systems are more than four times as efficient as the most efficient fossil fuel furnace. Instead of burning a combustible fuel to make heat, they simply move heat that already exists.

How a Geothermal System Works

The process is simple. It is based on the basic concept that heat will naturally move from something warm to something cool. A geothermal heat pump provides a means for this natural heat transfer to occur so the earth's heat can be moved into the heat pump and used to heat the building.

Geothermal can provide for 100 percent of your heating and cooling needs.

Geothermal technology moves heat rather than creates heat.



Winter Summer

The heat source for a geothermal heat pump in our region is found at a depth of six to eight feet below the surface. At that depth, the ground temperature is a consistent 50 degrees. The earth's heat is extracted by means of a ground loop heat exchanger consisting of polyethylene pipes containing a water solution. The water solution inside the pipes captures heat from the ground and with a circulating pump moves the water into the heat pump. Within the heat pump, a heat exchanger removes the heat from the water solution, concentrates the heat and then distributes the heat to a forced air or hydronic system in the building.

For cooling, the process is just reversed. Excess heat from the building is removed by the heat pump and transferred into the earth loop heat exchanger.

About 65 percent of a geothermal heat pump's heating capacity is actually free heat that was removed from the ground and transferred into the heat pump. It is little wonder why these systems are so economical—they are using free heat from the ground.

Check with your electric cooperative heating specialists or tax advisor to learn of current incentives or rebates. Incentives on geothermal systems are typically higher than on conventional heating systems.

Do these Systems Work in Our Region?

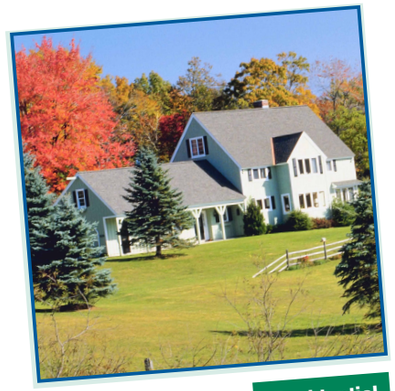
Yes. Since a geothermal system simply moves the earth's naturally stored heat into the building, the outside air temperature in the winter or summer does not affect the performance of a geothermal heat pump.

The earth underground is at a constant temperature. This provides all the needed energy to heat your home or building. There are thousands of geothermal systems operating in homes, businesses and schools throughout the Midwest.

The features of a geothermal system can benefit our region's residential, school and business consumers in much the same way.

At times, people confuse geothermal systems with air source heat pumps. While both transfer energy, air source heat pumps try to remove heat from the outside air and there is simply not enough heat in that air during the winter in our region.

Business



Residential

Schools