



Geothermal

What is... Geothermal?

Geothermal energy is essentially the use of different grades of thermal energy stored within the earth.

In the most extreme of cases, heat from deep within the earth's interior can heat water entering faults in the earth's surface, which can then reappear as hot springs, geysers and steam vents. In some cases this water can become trapped below the surface forming a thermal reservoir with temperatures in excess of 400°C.

One of the most common and practical methods of harnessing energy from the ground, is through the use of Ground Source Heat Pumps (GSHPs).

Ground Source Heat Pumps

The first system was installed in the UK over 50 years ago. Since this time the basic operation has changed very little, although operating efficiency has improved dramatically.

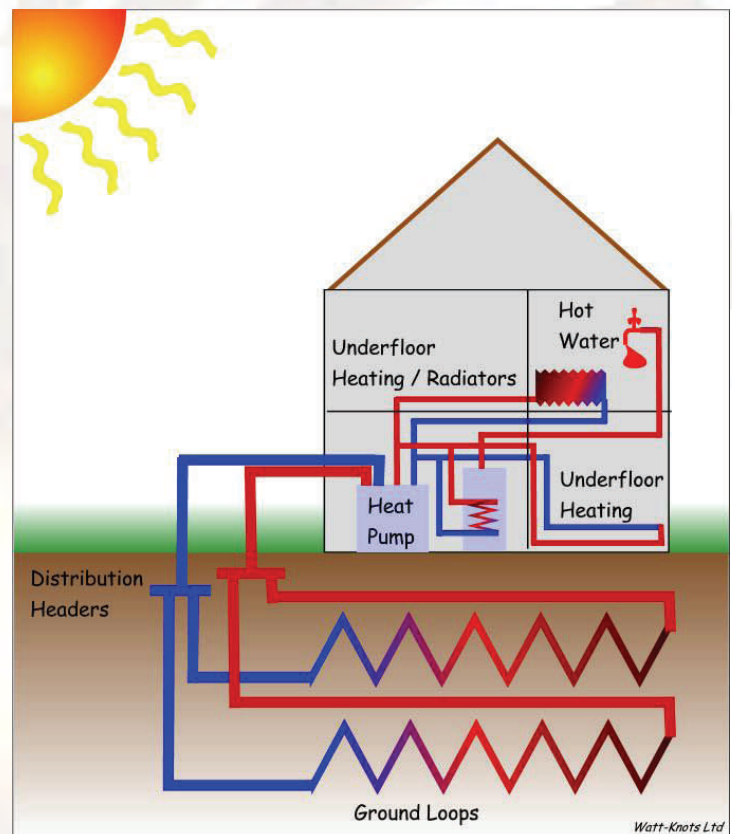
GSHPs work on the same simple technology as a domestic fridge, where heat is collected from a source (the contents of the fridge) and expelled from an element at the back of the fridge.

The main difference in operation relates to the source of heat and the manner in which this is subsequently used to provide heating and hot water within a building.

The Source Of Heat

As its name would suggest, GSHPs use the ground as a source from which to extract heat. At depths of only 1 - 2 metres below the surface, the temperature remains a fairly constant 10°C - 12°C all year round. Although this is a fairly low grade heat source, it is free and readily available.

There are a number of ways of extracting this heat, but the most common methods involve either burying lengths of piping in trenches at a depth of around 1.8 metres, or using a number of boreholes at depths of typically 70 metres. The trench method of installation is cheaper, but does require a sizeable area of land for the trenches. The borehole method allows installation where land is not so freely available and may therefore prove the preferred method for many commercial installations.



Simple GSHP system providing heating and hot water

Whilst the heat from the ground is free, there is a cost involved in the electricity for running the heat pump. However, the efficiency of the process generally allows approximately 4 units of energy output as heat, for every 1 unit of electricity put in.



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Operation

GSHPs have a number of advantages over the traditional gas or oil fired boiler installation. Since there is no combustion involved, there is no need for the installation of a flue or for the storage and ongoing provision of fuel oil.



Viessmann Heat Pump Installation with Domestic HW cylinder

The heat pump circulates water through the ground loops extracting low grade heat energy from the surrounding ground. The heat pump converts this energy into hot water that is typically between 40°C and 65°C. This is then circulated into the building to provide heating and hot water services.

Heating is typically of the under floor variety since this is ideally suited to the lower flow temperatures produced by the heat pump. However, radiator systems can also be used, although this may require larger than normal surface areas to provide suitable heat output based upon a lower flow temperature.

Hot water is provided via a modern high efficiency indirect water cylinder. It is also possible to combine these systems with a solar water heating system in just the same way as the traditional boiler. Immersion heating elements are also frequently installed.

Although these systems are becoming very popular in modern high efficiency housing, they also have much to offer in large commercial and community projects.



640kW Local Heating System by Viessmann

Cooling?

Since these systems are based upon the simple task of transferring heat from one place to another, this technology can also be used to provide cooling within a building. Many systems can now offer this added feature.

Ground Source Heat Pumps offer an excellent alternative to the more traditional gas and oil fired boilers.

Contact us for more details on how Watt-Knots can assist you in reviewing this technology.