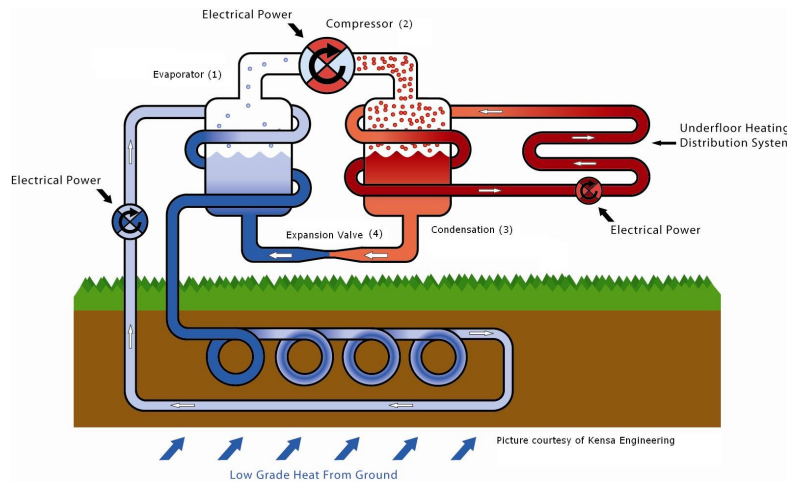


How Ground Source Heat Pumps work

Heat pumps basically extract solar energy stored in the ground, water courses and in the air and convert this to a higher temperature to use in a building's heating distribution system. They work in a similar manner to a fridge in reverse, where the inside of the fridge is the heat source and the grill at the back of the fridge is the heating system.



A ground source heat pump (GSHP) extracts heat from the ground by circulating a cold solution of water and antifreeze (brine) around pipes buried in the ground. As these pipes are buried below 1m in depth, where the temperature of the ground remains pretty constant (8 to 10°C), heat is absorbed from the ground into the fluid (approximately 5°C). This brine is then passed through one side of a heat exchanger (called the evaporator) and a refrigerant through the other. The refrigerant has a very low boiling point and by absorbing the energy in the brine this causes the refrigerant to evaporate.

The refrigerant gas is then passed through a compressor where its pressure is increased which in turn increases its temperature. This high pressure hot gas then flows around a second heat exchanger (called a condenser) with the heating distribution fluid passing through the other side of the heat exchanger. Energy is then transferred from the refrigerant into the heating distribution system; this in turn causes the refrigerant to condense.

This high pressure cold refrigerant is then passed through an expansion valve (or throttle) and the pressure is reduced. The whole cycle is then repeated.

GSHPs are an extremely energy efficient technology, with every unit of electricity used (to drive the pumps and compressor) producing between 3 and 4 units of heat.

Facts at a glance

Stored Energy

Ground source Heat Pumps extract renewable solar energy stored in the ground. This is done by circulating a mixture of water and antifreeze through pipes buried in the ground.

Refrigerant

The energy from the ground is transferred into a refrigerant which turns into a gas and is compressed. Compressing this gas increases its temperature. This hot gas then gives up its heat to the heating distribution fluid and turns back into a liquid.

Heating Distribution System

The energy transferred via the refrigerant is then circulated around the heating distribution system.

Efficiency

GSHP are extremely efficient and for every one unit of electricity used can produce 3 to 4 units of heat energy.

CO2 Emissions

Due to a GSHP high efficiency and use of renewable energy GSHP also have significant carbon dioxide savings against traditional fossil fuel heating systems.