

Ground Source Heat Pumping



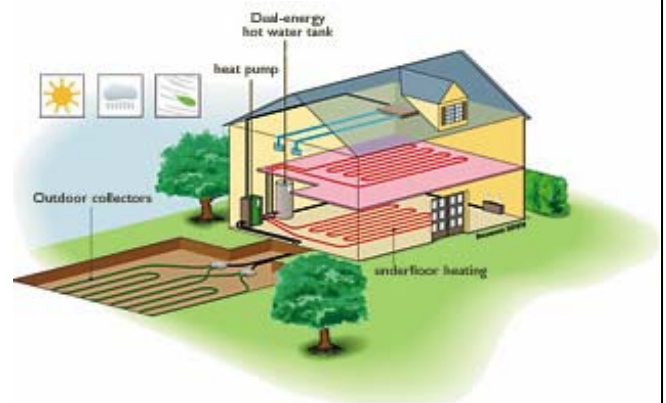
Heat pumps are possibly the only machine that delivers more energy than they consume. Impossible ?, well it's true. By using the well known thermodynamic properties of refrigerant gasses, a heat pump can supply as much as 4kW of heat output for just 1kW of electrical energy used. This concept is not new, refrigerators and air conditioning machines designed to transfer heat from one place to another use the same technology and are commonplace in households and offices. The GSHP is simply a variation of the common refrigerator.

During the Summer months the Earth absorbs radiation from the sun. Whilst ground temperature varies seasonally at shallow depths, from 10m downwards the ground maintains a fairly constant temperature of between 11 to 13°C and in winter it is warmer than the air above it. A series of closed loops of plastic pipe are buried in the ground, either in boreholes drilled to a depth of between 15 to 100 metres or a horizontal trench to a depth of 1 to 2 metres.

The most common system in the UK uses a polyethylene pipe filled with a water/antifreeze solution, which is circulated in the pipe absorbing heat from the ground. At the heat pump the heat from the ground loop is transferred to a refrigerant loop where the compressor raises the temperature to around 60-70°C.

The refrigerant then moves to a condenser coil where the heat is transferred to a secondary circulated water loop, which can either be used to heat a tank of stored water for washing or, more typically for space heating via low surface temperature radiators or an under-floor heating system at around 40°C.

Correct sizing of the heat pump and the ground loops is essential for the operation of the system. If sized correctly a GSHP can be designed to meet 100% of space heating requirements. Installation should be carried out by trained and accredited installers to attract available grants.



Costs for professionally installed GSHP systems depend on a number of factors. Borehole systems are more expensive than trenching due to greater installation costs of drilling. Direct evaporation ground loop collection systems can be less than dual water heat exchanger systems and of course, size matters too.

Heat Pump technology is low in maintenance as systems have very few moving parts and whilst they use electricity to operate, the Coefficient of Performance (CoP) of a heat pump, now up to 4 or 5 for top performing machines, means that energy bills and CO² emissions are reduced by 35-40%.

Further carbon savings can be made if the electricity used comes from a renewable energy source such as Solar Photovoltaic, Wind or Hydro power generation. (see separate information sheets for details on these technologies.)

A quality product installed into a well engineered system can be expected to have an operating life of over 40 years.

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