

Ground source heat pumps *Almost free energy.*

Each day, our planet absorbs solar energy which is stored up in the ground as warmth. With a little effort we can exploit this constantly refilled reserve of heat. It is **inexhaustible and free.**

Collecting this thermal energy, transforming it to make it usable, and making use of it to heat buildings, is possible thanks to a machine called **the Ground Source Heat Pump (GSHP).**

This equipment is powered by electricity; however the energy used is well invested. For every one kilowatt-hour (unit) of electricity consumed, a GSHP system can harvest three to four kilowatt-hours of heat. A good part of a buildings heating can thus be delivered in the form of free, renewable and non-polluting energy taken from the ground; especially if the electricity used comes from a renewable source.

The most commonly used heat pump system is that in a refrigerator. In a fridge, heat is extracted from inside and disposed of via elements on the back. Basically, a GSHP takes a little heat from a large area and turns it into a lot of heat in a smaller area. The heat pump concentrates the heat it collects.

A major advantage of GSHPs is that they can also work in reverse offering cooling in the summer, removing heat and releasing it to the ground. This way a single unit can replace an air conditioning *and* heating system.

While heating is usually from gas, cooling and air conditioning systems are usually powered by much more expensive and polluting electricity. Global warming is increasing average temperatures, and electricity costs are increasing as fossil fuels run low.

As the world gets hotter due to global warming there will be a greater and greater need for summer cooling in buildings, especially workplaces and those housing people more in danger of heat related ill health

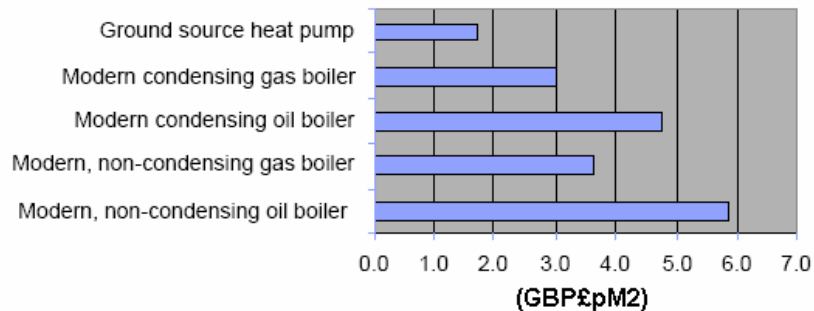
Combined systems replacing electric air conditioning and heating can dramatically reduce fuel bills in large buildings and offices. 80% of GSHP installations in Canada are solely for air conditioning systems.

Systems are usually sized to meet 100% of the heating and cooling needs of a building.

By 2003 there were 262 of these systems installed across the UK. In 2004, around 70,000 heat pumps were sold in the EU, 60,000 of these 70,000 heat pumps have a British made compressor. Heat pumps are very much a "British" technology but are under-represented in UK installations.

Installed cost for commercial systems are usually £1000-£1700 per kW

Annual heating cost indices



Systems should usually be integrated at the building design stage, but can be retrofitted; usually at a higher cost. Systems also qualify for lower VAT, Enhanced Capital Allowance and Clear Skies funding.

This type of low energy climate control system is ideal for large new build projects such as are being planned in the Building Schools for the Future Programme. A few different types of installations have already been carried out in schools in the UK. Many more systems have been installed recently in other innovative new build projects such as The Dunston Innovation Centre and The Metropolitan Housing Trust offices in Nottingham as the costs of heating and cooling buildings continue to rise.

The 'Classroom of the future' at Chumleigh Community College- September 2003

This is part of a national £13m project funded by the DfES. Although designed to be a low energy building the extensive use of IT equipment dictated that cooling was of equal importance to heating. The obvious choice of a renewable technology to meet both heating and cooling loads was a ground source heating system. With a floor area of 415m² the heating load and cooling loads proved to be around 22kW and 24kW respectively.



The system was based on four boreholes capable of meeting these loads when coupled with heating and cooling heat pumps. Additionally passive cooling was designed into the system to be used when the cooling loads were lower, thus reducing overall energy consumption throughout the year.

The Digital Media Centre at the Falmouth College of Arts. October 2001

Due to the large amount of IT equipment and high intensity lighting installed in the building there was a substantial cooling requirement.

A GSHP system was installed to contribute towards the overall cooling requirement of the building. The system provides up to 40kW of cooling to the building. Six individual ground loops are installed in 75 metre deep boreholes to provide the cooling element required by the system.

The ground loop installation and heat pump were commissioned in October 2001 and the building was then later officially opened by HRH Prince Andrew Duke of York.