



DSEN Factsheet 7: Ground Source Heat Pumps *Stover Country Park*

INTRODUCTION

Ground source heat pumps (GSHPs) are electrically powered systems that tap the stored energy of the greatest solar collector in existence, the earth. These systems use the earth's relatively constant temperature to provide heating (and sometimes cooling and hot water) for buildings and processes. As fluid passes through a network of buried plastic pipe it gradually absorbs heat energy from the surrounding environment. The fluid then returns to the heat pump slightly (perhaps 5 C°) warmer than it left. The mass of low grade heat from the ground is compacted by the heat pump which upgrades this heat to a higher level to provide heating - the higher it raises the temperature, the less efficient the heat pump, the more electrical energy (ie running costs) and the larger the heat pump needs to be. The heat is then used to around the building. An important factor being the heat produced is at a lower temperature than that of a gas boiler, so installations are more common in new builds, where heating demands are lower and the system (ground loop) can be installed in construction.

STOVER PARK VISITOR AND INTERPRETATION CENTRE

Built by sailor James Templar in 1765, Stover Country Park is now operated by Devon County Council as a nature reserve focusing on the dragonfly and wildfowl population in this UK Site Of Special Scientific Interest. The new Visitor And Interpretation Centre was opened in July 2000, and is heated and cooled by geothermal energy from the nearby 10 ha man made lake.

A 24 kW geothermal heat pump passes water through a closed-loop of plastic pipe sunk in the middle of the lake to absorb heat in winter and to reject heat from the building in summer. No regular servicing is ever required, there are no CO₂ emissions on site and no gas/oil tank is required. Cost about £14,000.



Figure 1. Nature interpretation centre at Stover

DESIGN ELEMENTS AT STOVER

New build

The Interpretation centre was a new build. GSHPs can be combined with radiators but under floor heating is better as it works at a lower temperature. Standard radiators operate with water up to 80°C which is far hotter than a heat pump can achieve efficiently. Under floor heating pipes can provide sufficient room heating at 40-50°C and are therefore a good match with a heat pump. This system works best in well insulated homes. The heat pump is sized to meet the full space heating losses from the building - no larger, and no smaller. The better insulated the house, the smaller the heat pump required - and the less money it will cost. Lower operating temperatures of heat pumps lead itself towards use in lower energy buildings, and can be built into new builds to compliment the reduced heat demand.

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Pond loop

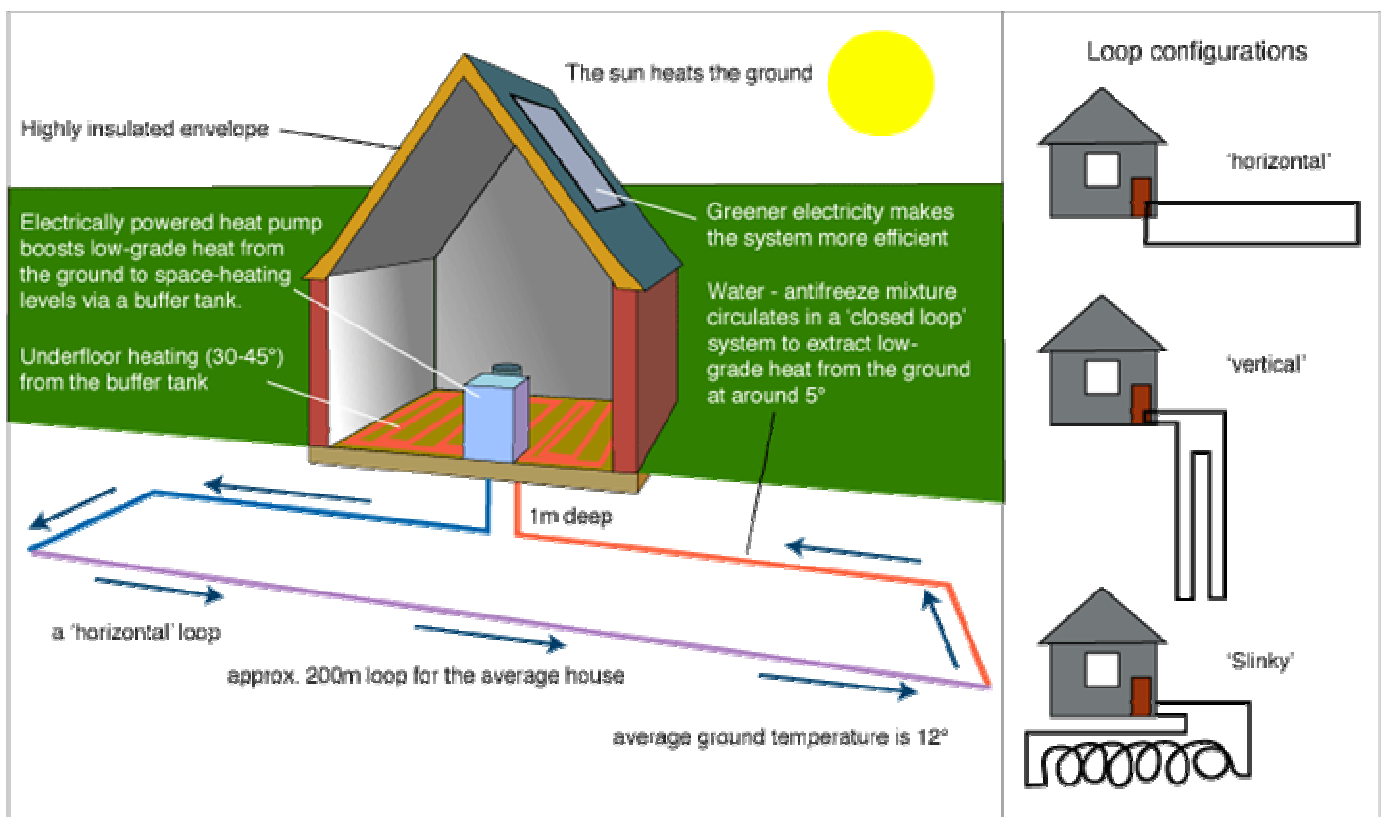
Closed loops system are near standard for the UK. These are basically plastic pipe that is buried in the ground, usually in one of three ways : -

- Horizontally (the most popular type are called slinkies)
- Vertically (Drilled bore holes)
- in a pond/lake

Which system is chosen will depend on:

- Space available for a trench or borehole to accommodate a ground loop
- Ground material suitable for digging a trench or borehole?

Stover uses the lake as the source for the heat. In summer, the system reverses and dissipates the heat back into the lake.



SUSTAINABLE CONSTRUCTION

The whole centre was designed to take into account as many sustainable features as possible.

These include:

- Site carefully chosen to reduce the impact on existing habitats.
- Existing trees and shrubs were retained where possible.
- The Centre is raised off the ground which has minimised the amount of excavation required and therefore the need to remove surplus material from the site.
- Where possible materials have been used in the buildings construction which are either recyclable or easily disposable.
- Timber from a farmed renewable resource is the main structural and cladding material, and is carbon dioxide neutral over its lifetime.
- The cedar roof shingles with a turf roof on the classroom make use of sustainable building materials.
- Insulation material used is recycled newspaper.
- A heating system has been incorporated which transfers heat energy from the Lake to the Centre and connects to an under-floor heating system.
- The building is naturally ventilated through high level windows and roof lights
- The windows are all double glazed.
- An abundance of natural light reduces the need for excessive artificial lighting.

COST BENEFITS

In a low energy building over a ten to twenty-five year period, there is a cost benefit over a mains gas-condensing boiler. However, as gas prices rise compared to electricity (which comes from a mix of sources), this time period will reduce. There are also no servicing or maintenance costs.

FURTHER INFORMATION

For further information on Stover park see <http://www.devon.gov.uk/stover.jpg>

For information on ground source heat pumps visit the Energy Saving Trust website at :

<http://www.est.org.uk/myhome/generating/types/groundsource/>

There are grants available to domestic householders and communities for renewable energy projects. For information on this call 0800 915 7722 or visit: www.est.org.uk/housingbuildings/funding/lowcarbonbuildings/

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