Energy Sources V2

A number of energy sources can be used for the heat source for heating buildings. Most commonly, heat pumps draw heat from the air or from the ground. The heat drawn from the ground is, in most cases, stored solar heat, and it should not be confused with geothermal heat, though the latter will contribute in some small measure to all heat in the ground. Other heat sources include water; nearby streams and other natural water bodies can be used.

Ground Source

Below 1m the ground stays at a fairly constant 8-10^{o}C all year round. This provides an adequate energy source for a heat pump to generate enough heat to comfortably heat buildings. A mixture of glycol and water is pumped around pipe buried in the ground. This pipe absorbs some of the energy in the ground and transfers this energy back to the heat pump.

There are a number of different configurations of pipe that can be laid in the ground:-
1. Slinky Pipe, 2. Straight Pipe, 3. Borehole

Slinky Pipe

Slinkies are the most cost effective way of installing ground arrays as they reduce the amount of digging required. These were developed by the University Of Oklahoma, and are one of the world's most popular heat sources for heat pumps. In simple terms, slinkies are a length of coiled plastic pipe buried in the ground using a digger. They can be installed on their vertical edge or horizontally.

Straight pipe can also be used, however this can increase the amount of digging required by up to 5 times and hence the cost of installation. There is no difference in the amount of ground required as the energy source for slinkies or straight pipe and both have the same performance. Kensa heat pumps can work with both types of ground array and we can supply both. However due to the advantages of slinkies we would always recommend these.

Facts at a glance:

Slinky Pipe v Straight Pipe—Performance is broadly the same, however slinky pipe reduces the required digging by approximately five times. The amount of ground required by both systems is the same.

Boreholes—Boreholes can be around 100m deep and need a specialist contractor to drill. Boreholes tend to be an expensive option.

Lake Systems—These can be open or closed systems and are a lower install cost than ground systems, however there must be sufficient flow or volume of water to provide an adequate energy source.

Air Source—Air source has a lower performance than ground source in space heating applications, planning permission is required and there maybe noise and life issues.

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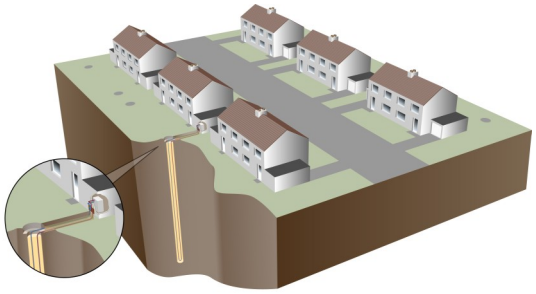
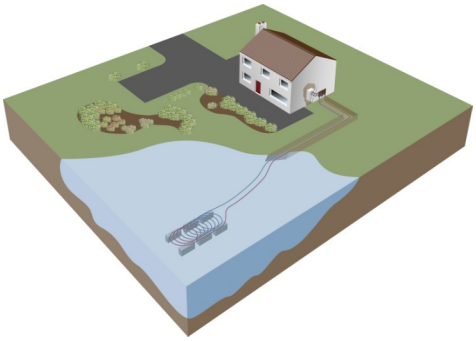
Borehole



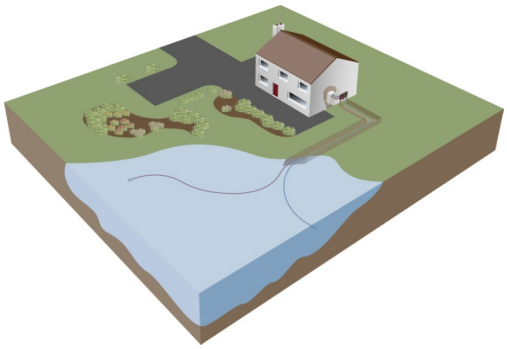
If there is insufficient area to install slinkies or straight pipe then an alternative is to drill vertically down. Boreholes tend to be 60-100m deep and usually consist of a single pipe inserted within the borehole, which is then backfilled with thermal grout. The depth and number of boreholes will vary depending on the makeup of the ground the borehole is being drilled in. A specialist contractor is required to drill boreholes and hence they can tend to be an expensive alternative to slinkies.

Boreholes become economically viable on large commercial projects and any site which has a heat load of above 100kW should carry out a thermal response test to calculate the actual amount of heat that can be obtained from a single borehole. For any borehole application contact us for further details and a list of drilling contractors.

Lake Systems



If the property is next to a lake then it is possible to use the lake water as the energy source. This is generally the most cost effective means of installing arrays as digging is kept to a minimum. Lake systems can be either open source or closed source. The most popular lake system is a closed loop system. In this system a food grade glycol and water mix is circulated around the slinkies, which are sunk to the bottom of the lake. The slinkies are attached to a frame (pond mat) and will absorb energy from the surrounding water. The lake has to be sufficiently deep to avoid freezing around the slinky and to avoid any damage from passing boat traffic.



Open source systems involve water being pumped out of the lake or borehole, passing through the heat pump and then being discharged, either back to the lake or another acceptable discharge area. Consideration needs to be taken with regards to corrosion issues, filtration, extraction licenses and possible freezing within the heat exchanger. It is also important to consider the electrical energy required to pump the water to the heat pump. For more information on any lake systems please contact us.

Air Source

With air source heat pumps air is drawn over a heat exchanger (coils) and the heat is extracted from the air. They work all year round even with temperatures as low as -15^{o}C, however their efficiency tends to fluctuate due to daily and seasonal air temperature variations and is lower during the heating season than a ground source heat pump. Air source heat pumps can tend to be quite noisy and have lower life spans than ground source, however the installation costs are lower than ground source as no trenching is required.