Frequently Asked Questions – Heat Pump Selection

What are Heat Pumps ?

Heat Pumps, like fridges and freezers, are just units that move heat energy from one place to another. A fridge moves heat from inside its box to outside, whereas Heat Pumps harvest 'low grade heat' from the ambient environment (Air, Water or Ground) and convert it into useful 'high grade heat' for use in the home. This conversion is performed by a compressor-driven refrigeration cycle which consumes electricity in the process. This process is very energy efficient however, with heat pumps producing significantly more energy in heat than they consume in electricity. This efficiency is measured by a figure called the Coefficient of Performance (C.o.P), and is typically in the range 2.5 – 4. This advanced heating technology used in heat pumps make them ideal for use in the UK's ambient temperatures and hence perfect for the domestic market.

What are the different forms of Heat Pumps ?

Heat Pumps use the low grade heat found in the surrounding air, water (e.g lakes and rivers) or the ground. The basic components of a heat pump are the same but use different mechanisms for collecting the low grade heat it harvests. Air Source Heat Pumps (A.S.H.P's) draw air through the unit installed outside, usually assisted by a fan. These look like the outdoor unit of a conventional air conditioning system (because they are essentially the same albeit used predominantly for heating). Ground Source Heat Pumps (G.S.H.P's) are normally installed inside the house (or suitable out building) because the outdoor part comprises just the ground collector (loops of plastic pipe connected via a manifold). Water source heat pumps can be sub divided into "open loop" and "closed loop" systems. Open loop systems draw ground water through the machine itself. Closed loop systems are the same as G.S.H.P's with their collector immersed in a suitable body of water.

Does a Ground Source Heat Pump (G.S.H.P) use Geothermal Energy ?

No. Geothermal energy is derived from heat from the magma at the earth's core. However the term is commonplace in respect to G.S.H.P's. They use the energy stored in the ground from solar radiation and the resulting atmospheric temperatures. Below depths of 10m (in the case of bore holes) the ground remains at a constant 10 - 14°C (dependant on local geology and soil conditions), which is a result of the annual average air temperature. At depths of 1.5m (in the case of ground loops) the ground temperature with vary with the seasons above and below the annual average air temperature.

Which Type of Heat Pump Should I choose?

There is no standard answer to this question as the decision is driven by the individuals own circumstances. These circumstances may be defined by a finite budget for the project; the land available around the property; local geological conditions; personal preferences for where equipment is installed (indoors or outside); planning restrictions; or any combination of these factors. In the case of water source heat pumps, maintenance considerations and the ability to obtain permission to use the water source is also a factor.

What is a typical cost of a Heat Pump heating and hot water system?

The total cost of the project includes the capital cost of the equipment, installation labour, ground works (in the case of G.S.H.P's) and commissioning. A.S.H.P's are the simplest to have installed (no ground works required) but do not yield the same running cost efficiencies as G.S.H.P's. Depending on the size of heat pump required to meet the "heat loss" of the property, you should budget in the region of £6-10,000 for a A.S.H.P and £12-20,000 for a G.S.H.P's (depending on type of collector, E.g. horizontal loops or vertical boreholes). In the case of the later, having boreholes drilled can add £5-10,000 to the capital cost of the system.

Why are G.S.H.P's more energy efficient than A.S.H.P's ? Should this matter?

The coefficient of performance (C.o.P) of a G.S.H.P is most always higher than that of a A.S.H.P making it more energy efficient. This is because it functions in more consistent operating conditions (ground temperature). A.S.H.P's use ambient air temperature as its medium. This temperature varies greatly and efficiencies (hence output energy) reduces in proportion to ambient air temperature. This results in a lower C.o.P or more correctly Seasonal C.o.P (S.C.o.P.) in this case. The question of "should this matter to you" is answered based on your personal circumstances and the economics of capital cost vs. the running cost benefits of G.S.H.P's compared to A.S.H.P's.

What information do I need to collate to obtain a quotation for a Heat Pump System?

In order to obtain a quotation for a heat pump heating and hot water system you will need to provide the following information.

1. Heat Loss Calculation for your property – This needs to be done by a professional individual (Energy Assessor) or if it's by the company quoting for the heat pump, they must be a Microgeneration Certification Scheme (M.C.S) approved Installation company with membership of industry accredited bodies (E.g. REAL Assurance, CORGI etc.)
2. You may have been provided with a home energy performance certificate when you purchased the property and possibly the SAP calculation worksheet that defined it. In the case of a new build property this is a requirement of the building control authority and part of the planning application process. This is useful for the company providing your quotation but does not satisfy the need for a full heat loss calculation.
3. You will have decided on the type of heating distribution system you require E.g. Radiators or Underfloor Heating. This must be stated.
4. The number of bathrooms and occupants of the property in order to define the domestic hot water demand.
5. The size of the property and area of its grounds.
6. Any unusual attributes such as large glazed areas and their orientation (north or south facing).
7. The year the property was constructed.
8. The major materials and structural makeup of the property (E.g. brick and block or timber framed).
9. The number of open fire places
10. The type of ventilation system (E.g. background window vents or mechanical)
11. The options for the location of equipment (internally and externally)
12. Is the property supplied by a Natural Gas main?
13. What is the capacity of the electricity supply to the property (E.g. 100A)
14. The post code of the property (for geological survey purposes)
15. Is the property located in a conservation area or a listed building?