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Heat Pumps

Heat pumps provide low carbon heat, and cooling, to many types of buildings across the UK. If you're looking to reduce the carbon emissions associated with heating or cooling your building, then a heat pump could be a good option. However, it's important to understand the different types of heat pumps, their applications, financial aspects, and ongoing operational and maintenance requirements. This knowledge can help you to decide when to choose heat pumps as an option for heating and ensures that the systems are installed and operated efficiently.

What is a heat pump?

A heat pump works by taking heat from one location, raising the heat's temperature, and moving the heat to another spot. A fridge works in a similar way. It takes heat from inside the fridge, moves it to the grill at the back of the fridge, and eventually releases that heat into the kitchen or room where the fridge is placed. When used to heat a building, the heat pump gathers heat from the outdoor air or ground, then brings it indoors to warm up the rooms using either a system of circulating water or air.

A heat pump uses electricity to collect heat energy, raise its temperature and pump that heat indoors, but the heat energy it supplies is much more than the electrical energy needed to power the system.

This makes heat pumps a more energy efficient way to heat a building than a traditional gas or oil boiler. It also produces far fewer carbon emissions than other heating systems.

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What kind of heat pump should I get?

There is a wide range of heat pump technology available. An experienced heating, ventilation and air conditioning (HVAC) engineer is best able to advise on what is right for your building following a site survey. However, there are some key questions to answer to help you and your HVAC engineer determine whether a heat pump might be suitable, and if so, which kind.

Building information

- What size is the building and how many floors does it have?
- How is the building used? (eg is it occupied all the time, are some areas or zones used more commonly, do they all need to be at the same temperature?)
- How well insulated is the building?

Current heating system

- How is the building currently heated?
- Does the building have any cooling requirement?
- How old is the existing heating and/or cooling system?
- What is the building's typical energy consumption and spend for heating and cooling?

Space available

- Is there space available to install external heat pump units? (the size required can be advised by a HVAC engineer)
- Is there space available internally for a plant room, buffer tanks or distribution system like air ducts or radiators (the space required can be advised by a HVAC engineer)

Types of heat pump

The type of heat pump best for your building can be advised by the HVAC engineer, but we've provided some detail about the most common types below.

Air to water heat pumps

An air-to-water heat pump transfers heat from the outside air to water. This heated water can heat water circulating your building via radiators or underfloor heating. It can also heat water stored in a hot water cylinder for showers and hot water taps.

Air-to-air heat pumps

Air-to-air heat pumps transfer heat from the outside air, warming air that enters your building through a series of fan coil units, or 'blowers', or via ducted air.

Air-to-air heat pumps are sometimes referred to as air conditioning. While many people think of air conditioning as a way of cooling buildings, it can also be used for heating. In non-domestic buildings, heating, cooling and ventilation are all provided by a single HVAC system – the cooling will always be supplied by an air-to-air heat pump, but the same heat pump could also provide heating.

Ground source heat pumps

A ground source heat pump (also known as a ground-to-water heat pump) transfers heat from the ground outside your building to water. This heated water can heat water circulating your building through radiators or underfloor heating. It can also heat water stored in a hot water cylinder, ready to use for hot taps and showers.

Digging trenches for a ground loop

If you have the space, then you can have a ground loop system. The ground will need to be suitable for digging and accessible to machinery from a road entrance. The area will need to avoid trees, as roots will cause problems when digging trenches.

The length of ground loop and trenches depend on the size of your building and the amount of heat you need.

Boreholes

If space is limited, it may be possible to drill vertical boreholes to gather heat. This is usually more expensive than digging trenches and usually needs a specialist ground (thermogeological) survey. The ground is generally warmer the deeper you dig, so these systems can be more efficient than ground loop systems.

Commercial buildings may require more than one borehole. A borehole is drilled only about 20cm wide, but somewhere between 75 and 200 metres deep. The depth of the borehole depends on your heat demand and the underlying geology.

Exhaust air heat pumps

If your building has a mechanical ventilation system then it may be possible to fit a heat pump to the extract air flow. This is an air source heat pump that recovers heat from the extract air before it is blown out of the building. The heat could be used to pre-heat incoming ventilation air (if you have a balanced ventilation system that includes input air as well as exhaust air) or to heat a hot water cylinder.

Indicative costs and savings

Installation costs

The cost of an **air source heat pump** installation varies depending on:

- the size of heat pump or heat pumps.
- the size of the property.
- whether it's a newbuild or an existing property.
- whether you need to change the heat distribution system inside the property.

Because they require digging, **ground source heat pumps** are typically more expensive to install than air source heat pumps. In addition to the air source heat pump considerations, the cost of a ground source heat pump installation will also vary depending on the access to the ground and whether you choose trenches or a borehole to lay the ground loop.

Savings

Commercial heat pumps have the potential to be a money-saving solution for businesses and organisations, the extent of the savings depends on the system being replaced and the efficiency achieved by the new system. When compared to traditional electric heating or gas-fired conventional heating systems, heat pumps can provide significant energy and carbon savings. They often outperform standard electric heating systems in terms of cost savings. While they may also offer savings compared to gas-fired heating systems, this varies based on factors such as the purpose of the system (e.g., heating only, or both heating and cooling) and the relative costs of gas versus electricity your organisation pays. So, it's important to carefully consider these factors when evaluating the potential benefits of installing a heat pump for your building.

How long does it take to install a heat pump?

Air source pumps are quicker and easier to install than ground source, as ground source pumps require a lot more planning and preparation. Depending on your building, the system chosen and the complexity of the installation, the work can take from a few days to a few weeks to be completed.

Disruption during installation

Installing a heat pump may cause some disruption to your organisation, depending on how much work needs to be done.

Typical work in a heat pump installation includes:

- Building a plinth outside for an air source heat pump or pumps to stand on.
- Digging trenches or boreholes to install the heat pipe for ground source heat pumps.
- Adding pipes through the wall to where your existing boiler is.
- Installing or replacing a hot water cylinder.
- Upgrading radiators, or air ducting, where needed.

While your organisation may decide to keep the building closed during the installation, it’s often possible to stay open as usual while work takes place.

Can I do this by myself?

Heat pumps are not a technology that you can install by yourself. You will need to talk to an installer who will assess your needs and evaluate your building before proposing which system could be right for you. Click here to learn more about this.