Advisory Note

A Service to A.G. Coombs Group Clients.

Heat Pumps for Carbon Neutral Heating

Heat pumps are a well-established technology that can provide a pathway toward on-site carbon neutrality not possible in buildings that rely on gas for heating. Electricity used to drive heat pumps can be sourced from renewable or Carbon neutral sources. In some parts of Europe heat pumps are the most popular form of heating.

Why Heat Pumps?

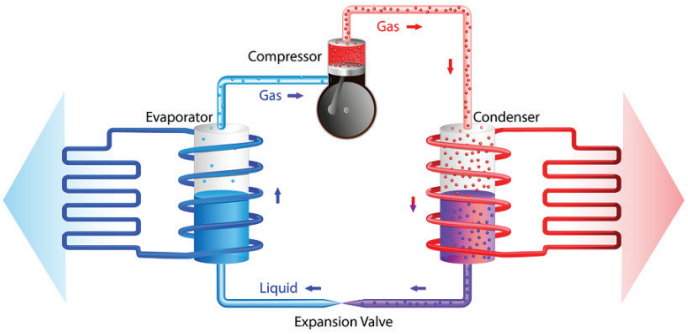
There are a number of factors behind the increasing application of heat pumps for heating:

+ Heat pumps have a superior efficiency for heat production when compared to gas-fired hot water systems because of the way they generate heat.
+ Escalating gas prices and potential gas supply constraints can make gas fired boilers a less attractive option.
+ Avoided gas installation and connection costs in new developments.
+ Potential to use on site or externally generated Carbon neutral electricity, or ground or water source heat sinks to contribute to sustainability ratings.

How they Work

Heat pumps work on the same principle as a refrigerator or air-conditioner. These technologies transfer heat from one place (a lower temperature "heat reservoir" or source) to another (a higher temperature "heat sink").

A heat pump transfers heat by circulating refrigerant between two heat exchange coils. In one coil, called the "evaporator", liquid refrigerant evaporates to a vapour at low pressure and in doing so, absorbs heat from its surroundings (the heat source). An electrically driven compressor then pumps this gaseous refrigerant to the other "condenser" coil under high pressure, where the refrigerant condenses back to a liquid and releases the heat energy it absorbed earlier in the cycle to the heat sink. An expansion device then lowers the refrigerant pressure and the cycle is repeated.



Types of Heat Pumps

There are several types of heat pumps available:

Air source heat pumps use the ambient (outside) air as a heat source, as in the case of reverse cycle split systems. Heat energy is consistently replenished in ambient air due to solar heat gain, and air source heat pumps can transfer this energy to building space heating or domestic hot water systems. This is often the most commercially viable option adopted for retrofit application relative simplicity of installation. The installation requirements are essentially the same as an air-cooled chiller, requiring a dedicated external (or ducted to external) rooftop plant area with adequate ventilation clearances. Air source heat pumps are also increasingly being adopted in residential properties to deliver domestic hot water.

Ground source heat pumps utilise the relatively stable and consistent temperatures found below the earth surface level as a heat source, and requires the burying of heat exchanger pipework loops. Due to the extent of excavation and pipework infrastructure installation required, ground source heat pumps are most often considered in new build applications where there is access to adequate open land area.

Water source heat pumps utilise the relatively stable temperatures found within a large body of water such as a lake, river or the sea as a heat source.

Each type of heat pump can transfer heat from its respective heat source to either air (for direct space heating), domestic hot water or heating hot water. Heat pumps are typically low maintenance devices requiring similar attention as for direct expansion air conditioners.

Applications & Opportunities

Traditional building heating hot water systems rely on supply water temperatures between 60-80°C. Until recently, heat pumps have produced comparatively low leaving water temperatures of 40-55°C. Recent developments have seen heat pumps supply water temperatures above 60°C, with some water-to-water heat pumps capable of producing water temperatures up to 85°C.

The successful application of heat pump technology is dependent on site specific characteristics. It is recommended that an engineering analysis is performed to identify technical feasibility and assess financial viability.

Heat pumps are now a viable option that can be considered in many applications for producing heating hot water for space heating and can also deliver domestic hot water. Their high efficiency and potential to use Carbon neutral electricity can make them particularly attractive.

For advice or assistance, please contact:

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