



Information Sheet No. 27

Heat Pumps – a beginners guide

In Shropshire considerable carbon emissions come from the central heating systems in our homes. But things are changing. From 2025 no new build properties will be allowed to have natural gas piped in so there is now a lot of interest in heat pumps. Although these pumps at present only take up around 1% of the market for domestic heating in the U.K., they are becoming ever more popular as they can provide a fossil free source of heating.

So what is a heat pump and how do they work?

Heat pumps have been in existence for 150 years and are most commonly found in fridges and freezers. As the name suggests, they pump heat from one source to another, are exceptionally reliable and should have a much longer life expectancy than a combustion boiler. They absorb heat from water, the ground or the air and transfer this low grade heat to a refrigerant gas through a heat exchanger. The gas is compressed which increases its temperature and as it passes through a second heat exchanger the heat is transferred into the water that circulates through your heating system. The gas then goes into an expansion vessel where it condenses, cools and is ready to begin the whole process again. Air source heat pumps will still work when air temperatures drop below freezing and are very energy efficient. They do require some electricity to run them; however for every unit of electricity used, an air source heat pump will produce around four units of heat. Ground source heat pumps are slightly more efficient as the low grade heat from the ground is more consistent but installation costs are greater.

Gas and oil boilers produce hot water at between 60 and 70 degrees for radiators. Heat pumps however run most efficiently at between 40 to 50 degrees. They are most suited for underfloor heating systems in very well insulated homes, however where necessary, increasing the size of existing radiators overcomes this lower heat output. A skilfully designed heat pump system will work perfectly adequately in many homes and the technology is improving all the time. They will provide hot water as well as heating so if changing from a combi boiler a hot water tank is necessary.

Although the carbon savings and running costs and are greatest when converting from solid fuel, oil or L.P.G. there are still savings to be made when converting from gas to heat pump heating but how much will depend on the unit cost of your existing heating fuel and electricity supply.

With renewable electricity, heat pumps provide a fossil free heating system and at present are eligible for the Government Green Homes Voucher scheme and also The Renewable Heat Incentive subsidy. These grants should cover most if not all of the installation costs.

Questions to consider before installing an Air Source Heat Pump.

Heat Pump technology is complex, far more so than a conventional gas or oil boiler and the ordinary customer must be confident that any potential installer really knows their subject and will guarantee an installation will perform satisfactorily.

1. *How well insulated is your home?* Installing any type of heat pump in a poorly insulated home could prove unsatisfactory. Knowing the EPC (Energy Performance Certificate) rating of your home is a good start; a poor EPC will need rectifying before considering installing a heat pump heating system. (G is very poor, A is excellent) Because heat pumps work at a lower water temperature than a conventional gas or oil boiler they will take longer to heat the home and if the property loses heat quickly because of poor insulation, they may never heat the home adequately. They will also prove expensive to run as they will use a lot of extra electricity to try and bring inside temperatures to an acceptable level. It has been suggested an EPC of C should be sufficiently good for a heat pump system to perform adequately.
2. *Does your home have micro bore radiator pipes?* In some instances these will not carry sufficient water round the radiators for the heat to be dispersed; though with a skilfully designed system this can usually be overcome. A second circulation pump may sometimes be necessary.
3. *Where will the unit be placed?* Ideally it needs to be on a south (ish) facing outside wall and must, because of planning regulations be at least 1 meter inside the property boundary. The fans do make some noise (40-50 decibels at 1 metre distance) so must be sited with consideration to neighbours. With listed buildings and those in a conservation area there are additional restrictions. (50 decibels is roughly equal to the level of indoor conversation.)
4. *Do you have a hot water tank?* Heat pumps require a hot water tank and small houses with a combi-boiler may not have room for one.
5. *Is your existing heating system adequate?* If the home or certain rooms are already under heated because of poor insulation or under sized radiators these issues will need to be resolved and pointed out to any installer.

Now to some questions to ask a potential installer.

How do you choose an installer before inviting a quotation? Ask around to see who locally has a heat pump installation. They will love to show it off, especially if it is satisfactory. Can you find any which are not satisfactory and discover why not? Get at least three quotes and carefully note how the installer proposes to overcome any difficulties your existing system may present. The lowest quote may not necessarily be the best. Also consider any future additional costs if for example the installer suggests leaving existing radiator sizes and waiting for a heating season to see if the house is warm enough!

1. *Is the company (micro generation certificate scheme) MCS accredited?*

The Government is currently offering the Renewable Heat Incentive, <https://www.gov.uk/domestic-renewable-heat-incentive> and Green Homes Voucher Scheme <https://www.gov.uk/guidance/apply-for-the-green-homes-grant-scheme> for renewable heating technologies installed into residential properties. In order to take advantages of these financial incentives both the product and the installation company must be certified under the Microgeneration Certification Scheme (MCS).

2. *How many air source heat pumps have the company installed?* In order to build up suitable experience, a company needs to have installed this complicated technology over a number of years.

3. *Can the installer explain which heat pump they would choose for your installation and why?*

This discussion can bring to light any difference in what your installer believes are your priorities and what you consider them to be. It will also help reassure you that your installer knows what he is talking about.

4. *What is lowest ambient temperature the proposed heat pump will cope with and what will the installer do to ensure it provides adequate heat below this level?*

This will help you understand exactly how much of your heating the installer is planning your heat pump to supply on its own and how much it will need boosting with electricity.

For your information the design temperatures specified in Microgeneration Installation Standard: MIS 3005 for different areas of the UK are as follows:-

Belfast: -1.2C Birmingham: -3.4C Cardiff: -3.9C Edinburgh: -1.8C Glasgow: -3.9C
London: -1.8C Manchester: -2.2C Plymouth: -1.2C

5. *How will the system deal with hot water pasteurisation or the "legionella" issue?*

Legionella bacteria can breed in water with temperatures between 25C and 45C and if particles of water containing the bacteria are breathed in, when having a shower for example, it can cause illness. The bacteria will however die within a few minutes if exposed to temperatures over 60C. The domestic hot water therefore has to be raised above this temperature at least once a week to ensure the bacteria has no chance of surviving. Is this automatic with the proposed installation?

6. *What warranty is offered?*

The heat pump units will come with a manufacturers guarantee and the system should separately be guaranteed by the installer. Make sure that warranty includes a guarantee that the system will adequately heat to a satisfactory level all the rooms in your home and the hot water. This is usually 20 degrees for living rooms and 18 for other rooms. Domestic hot water needs to be able to reach 60 degrees though is usually kept lower.

7. *Can the existing the hot water tank be used?*

If replacing a combi boiler system, a new hot water tank is necessary. It may be possible to reuse an existing hot water tank but tanks designed for heat pump systems tend to heat up quicker. If using an existing tank does the installer propose an additional heat exchanger to speed this process up? It is unlikely the heat pump will heat both radiators and hot water simultaneously so it is useful to know how long it will take to heat the hot water, usually before heating is required, especially in the winter

8. *What are the noise levels of the heat pump?*

(They tend to run at about 50 decibels and this may influence location.)

9. *What is the cost of the proposed installation?*

Will this cost include any necessary upgrading of radiators, additional heat exchangers etc. to overcome issues associated with micro bore pipework. Will the hot water tank have an immersion heater? Will the quote include a room and hot water thermostat? Does the system have weather compensation - a small outdoor sensor to adjust the system controls to compensate for changes in outdoor temperature automatically?

10. *If you have solar P.V. how would installer propose to take advantage of any surplus generation?*

There are electronic systems which can be installed to allow surplus generation to be used to power an immersion heater before exporting back to the grid. This of course is much more cost effective than running the heat pump throughout the year.

11. *Can the installer roughly predict what the cost saving are likely to be?*

Having designed a system for you the installer should be able to provide data to show what the likely running costs

will be, though these will depend on how well insulated the property is, how warm you keep it, the price of your current heating fuels, your electricity costs and variable weather conditions.

14. *Are there any low interest loans available?*

~~~~~

\* *Though we are not able to recommend a particular installer we have the details of two contractors who have been interviewed by our Trustees and their work seen. These installers pay us a small commission following any installation referred by us but we do not act as agents for them. We would recommend you obtain at least two and preferably three quotations. If you would like the details of these two installers, please let us know.*

\* *If applying for Government grants the property must have an up to date EPC.*

\* *Since heat pumps tend to run mostly in the evenings and early mornings, look at what tariff rates and times are offered by your electricity supplier. You may wish to change supplier to take advantage of cheaper variable tariff rates.*

\* *There is further excellent information available from The Energy Saving Trust and The Centre for Sustainable Energy, Bristol. (CSE)*

[https://energysavingtrust.org.uk/advice/air-source-heat-pumps/?qclid=EA1aIQobChMImtlz8Xw7QIVz-3tCh01dw4cEAAYAiAAEqLY8PD\\_BwE](https://energysavingtrust.org.uk/advice/air-source-heat-pumps/?qclid=EA1aIQobChMImtlz8Xw7QIVz-3tCh01dw4cEAAYAiAAEqLY8PD_BwE)

<https://www.cse.org.uk/advice/renewable-energy/air-source-heat-pumps> (CSE)

\* *User Guide. The installer should provide clear instructions for using the heat pump as operation is very different to that of a gas boiler. The following link from The Centre for Sustainable Energy, Bristol. (CSE) is useful .*  
<https://www.cse.org.uk/advice/renewable-energy/making-the-most-of-your-air-source-heat-pump>

\* *What if the installation does not do what you were led to believe it would? MCS as a quality assurance scheme, is at the centre of a network of organisations set up to advocate consumer protection and to ensure that its members comply with the industry standards which underpin scheme membership.*  
<https://mcscertified.com/complaints-compliance>

*“ This information is provided in good faith but individual circumstances of the property, use and equipment may vary, as will fuel prices. We cannot take responsibility for the accuracy of this information in these circumstances.”*

January 2021