GR Edwardes Ltd

Electrical, Plumbing & Renewable Energy

Guide to Air Source Heat Pumps

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Contents

1. What are Heat Pumps?

The heat pump works in the same way as the fridge you have in your home. Your fridge uses refrigerant to transport heat energy from the food inside the cabinet and that heat energy is transferred to the kitchen via the condenser; the warm tubes on the back of the fridge.

With the heat pump we take heat from the air and the heat given off by the condenser is enough to supply hot water for heating and showers or baths.

Like the fridge at home, heat pumps are very reliable and cost little to run especially when compared to oil, LPG or electric.

Air source heat pumps use air as the source of ambient heat energy. They do not rely on a collection system and simply extract the heat from the source at the point of use. Air source heat pumps can be fitted outside a house or in the roof space and generally perform better at slightly warmer air temperatures.

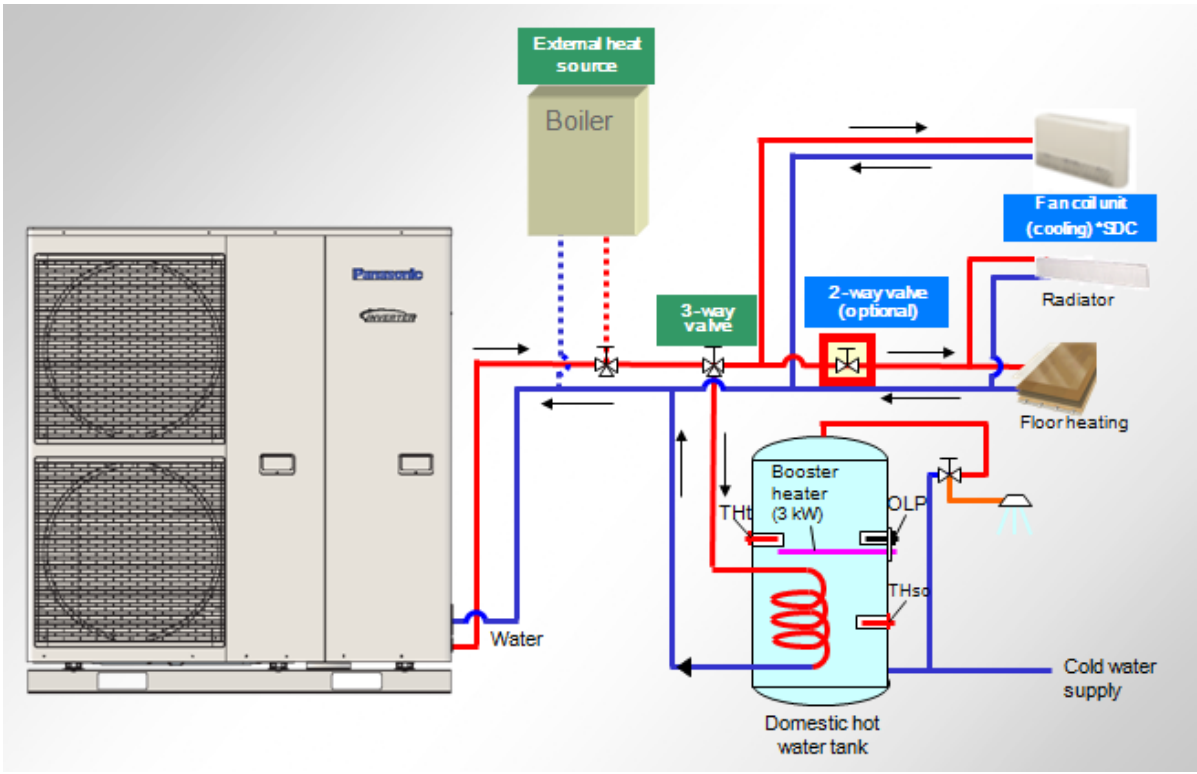
There are two types of applications in which an air source heat pump can be used:

1.1 Heating

Distributes heat via a wet central heating system. Heat pumps work much more efficiently at a lower temperature than a standard boiler system so they are more suitable for larger radiators and under-floor heating systems which give out heat at lower temperatures over a longer period of time.

1.2 Cooling

A heat pump can also be used for cooling with the addition of a valve to reverse the direction of the working fluid. This can work through the same pipe work system as the heating system and the use of fan-coils could mean that you would be able to use just one appliance to heat and cool. Fan coil units are more common in high end residential and commercial applications.



2. How do heat pumps work?

Heat naturally flows from a warmer place to a cooler place. However, heat pumps use a special fluid that constantly evaporates and condenses in a closed circuit controlled by valves and a compressor in order to reverse this natural process. In heating applications, heat is removed from ambient air using a heat 'collection loop' and delivered to where it is needed, usually into the heating and hot water systems of the house.

Heat pumps need electricity to run but they use less electrical energy than the heat energy they generate. This makes them much more efficient than other electrical heating options. Typically you only need one unit of electricity to deliver 2 to 5 units (200 – 500% efficient) of heat with a heat pump. As heat pumps need electricity to run there will still be some resulting carbon dioxide emissions, although these can be lower than other types of heating systems.

Heat pumps can be combined with a solar hot water heating system to provide hot water. However, you may still need additional top-up heating from, for example an immersion heater to heat the hot water to the required temperature in the winter.

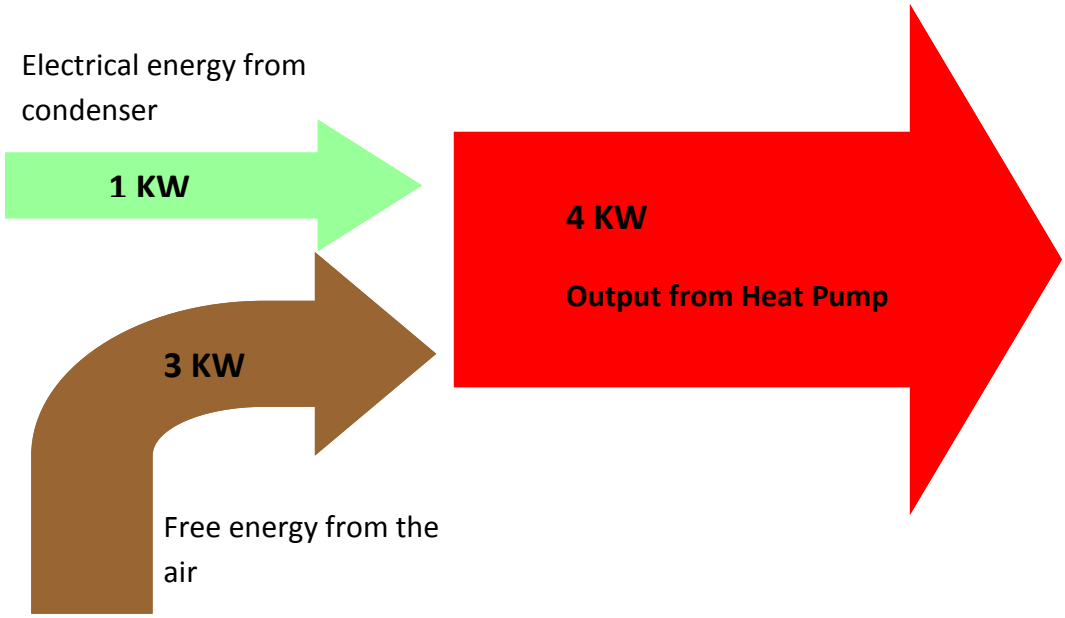
2.1 What is inside an Air Source Heat Pump?

1. Fan
2. Evaporator
3. Condenser
4. Compressor
5. Sight glass
6. Electrical connections
7. Control panel
8. Control unit (may be remotely sited)
9. 4 port valve
10. Expansion valve

2.2 How is the heat generated?

The central component of a heat pump is the compressor which is the hardest working component. This is usually driven by an electric motor, although gas engine driven compressors are also available. As heat is absorbed from the heat source the 'working' circulating fluid (refrigerant) evaporates changing from liquid to gas. This vapour is then compressed causing it to heat up. The heat from this process is absorbed via a 'heat exchanger' into your homes heating system which means the vapour loses its heat and condenses back into a liquid. This is then circulated through the heat source once more.

2.3 Heat Pump Efficiency



The diagram above shows the amount of energy needed to create a larger amount of heat energy. Heat pumps take free energy from the air and convert them to the heat distribution system.

3. What are the key benefits of heat pumps?

Heat pumps are already well established across Europe and are becoming more popular in the UK. As well as low running costs and reduced carbon dioxide emissions, heat pumps have other benefits:

- *Integration* - Heat pumps can be incorporated into many UK homes. They are more suited to newer highly insulated properties and are not always suitable for flats. Once installed and connected to the heating and hot water circuits they are fully automatic. Heat pumps are also easily integrated with solar hot water systems to provide a comprehensive heating and hot water system.
- *Versatility* - Water source heat pumps need a source of water such as a lake, river or stream and air source heat pumps simply need the outside air.
- *Fit & Forget* - Very little maintenance is required if a well designed heat pump system is installed properly. Equipment should operate automatically with very little noise.
- *Reliability* - Heat pump components have long life expectancies and high reliability. Life expectancy for the pump is around 20 years.
- *CoP* - Heat pumps give out more energy (heat) than they use (electricity), sometimes much more. If a heat pump has a 'coefficient of performance' (CoP) of four that means at a given point in time it is generating 4 units of its own heat for every unit of electrical energy used. However, the average system efficiency of the whole system over the year, including any top-up electricity for water heating will be less than the quoted CoP.

Heat pumps can be used to provide all the heating and hot water needs for your home, or they can be installed to provide only some of your home's heating and hot water to work alongside an additional heat source for example a boiler, electric immersion heater or wood stove for the coldest days.

4. Is a heat pump suitable for my home?

Heat pump systems can be integrated into most heating systems but will be more cost effective in some homes than others. Before installing a heat pump consider:

Energy efficiency first

Heat pumps work most efficiently in a highly insulated building so ensure you improve the energy efficiency of your home before you install a heat pump.

Your current heating system

Heat pumps are most likely to save money and carbon dioxide when they are used to replace electric, Oil, LPG or coal heating systems. Heat pumps work better with slow response, low temperature heating systems such as under-floor heating rather than conventional wet radiator systems. Low temperature heating systems work better in buildings with a high 'thermal mass'. If your home heats up and cools down quickly, a low temperature heating system is unlikely to provide the heating you require and a heat pump may not be the best option for your home.

Disruption & Mess

Installing an air source heat pump will cause little disruption and mess to your home, installation is typically only 1-2 days.

Getting Connected

Heat pumps need high electrical currents to start up. You will need to check (or we can on a site survey) that your electrical supply is up to the job. Some heat pumps are available with a 'soft start' option to minimise this effect. A heat pump is usually connected to its own breaker in the fuse board.

5. Integrating with existing heating system

Heat pumps are most efficient if they provide heat over a long period of time to a heating circuit that runs at a lower temperature (usually around 35-55°C) than conventional systems. To benefit from this lower temperature output your home will need to be reasonably 'air tight' and well insulated. (The energy saving trust can offer you free advice on how best to insulate your home as well as tell you about any grants available for energy efficiency measures).

Heat pump systems can be particularly effective when used to run under-floor heating. This will allow the pump to work at a consistent level over a period of time and to provide sufficient heat while operating at a lower temperature. If it is necessary you can use a secondary heating source to raise the temperature in some rooms such as the living room or even throughout your entire home. This can be done by using a conventional heating system or individual room heaters. A pellet wood stove or traditional log burner would do this without adding to your carbon foot print.

It is important that the heat pump is sized correctly and this is why we carry out all our own design work in house to give you peace of mind. Over or under sizing the heat pump can increase running costs and reduce operating efficiency. This will mean the pump may be prevented from operating continuously resulting in more intensive 'stop-start' heating which will in turn increase running costs.

6. ***Costs and Savings***

The cost of a professionally installed heat pump will vary, a typical heat pump fully designed, installed and commissioned by G R Edwardes Ltd will cost between £4,000 and £7000.

The running cost of any heat pump will depend on several factors such as the size of the installation, insulation levels of the property and the heating pattern of the house. For a typical 3 bedroom semi-detached house with reasonable insulation levels, the annual cost of providing space and water heating would be around £640. This is based on current electricity prices and a standard tariff. Using an Economy 10 or Economy 7 tariff may give slightly lower running costs depending on the heating pattern, the control strategy and the thermal performance of the building.

At current fuel prices, these running costs are unlikely to deliver financial savings compared to most gas heated systems. Savings are much more favourable when replacing an oil, coal, LPG, or electric heating system, although the payback period may still be long in some cases.

We carry out all the design work and present a performance expectation of every system, which we compare with your existing energy bills to ensure that you achieve the maximum benefit.

7. *The Renewable Heat Incentive*

The Renewable Heat Incentive (RHI) is the world's first long-term financial support programme for renewable heat.

The RHI pays participants of the scheme that generate and use renewable energy to heat their buildings. By increasing the generation of heat from renewable energy sources (instead of fossil fuels), the RHI helps the UK reduce greenhouse gas emissions and meet targets for reducing the effects of climate change.

There are two parts to the RHI:

- Domestic RHI – launched 9 April 2014 and open to homeowners, private landlords, social landlords and self-builders
- Non-domestic RHI – launched in November 2011 to provide payments to industry, businesses and public sector organisations

The domestic RHI scheme opened on 9 April 2014.

It is a financial incentive scheme designed to encourage uptake of renewable heating among domestic consumers. The domestic RHI is targeted at, but not limited to, homes off the gas grid. Those without mains gas have the most potential to save on fuel bills and decrease carbon emissions.

The scheme will cover single domestic dwellings and will be open to homeowners, private landlords, social landlords and self-builders. It will not be open to new build properties other than self-build.

For Air Source Heat Pumps, the domestic RHI will pay the 7.3p per unit of heat generated for seven years.

Air Source Heat Pump: returns from the renewable heat incentive

m² of property	Est. renewable heat (kWh)	Est. RHI payment over 7 years	Assumed System
100	9534	£4,871.87	**6 kW Panasonic heat pump**
140	13348	£6,820.83	**9 kW Panasonic heat pump**
180	17162	£8,769.78	**12 kW Panasonic heat pump**
220	20976	£10,718.74	**14 kW Panasonic heat pump**
260	24789	£12,667.18	**16 kW Panasonic heat pump**
300	28603	£14,616.13	**2 x 9 kW Panasonic heat pump**

Other assumptions: Estimated heat losses of 60w/m², Property heated to 19°C, Located in South of England.

NB: The seven year figure above is the total amount you should get over the whole period. Divide by seven for annual income.

For further information is available from Ofgems website: https://www.ofgem.gov.uk/environmental-programmes/domestic-renewable-heat-incentive

8. Maintenance

Heat pump systems typically come with a 10 year manufacturer's warranty. You can expect them to operate for 20 years or more, however they do require regular scheduled maintenance. A yearly check by you and a more detailed check by G R Edwardes Ltd every 3 -5 years can ensure that any problems and inefficiencies are picked up and rectified before the warranty period runs out.

Any heat pump system installed by G R Edwardes Ltd will be left with a maintenance schedule detailing the checks that need to be made to ensure that the heat pump is working properly.

One of the yearly checks that you will be required to do is to check that the air inlet grill and evaporator are free of leaves or any other debris. Any plants that have grown near the heat pump will also need to be removed.

To prevent the heat pump from freezing in cold weather it has a 'crank case' heater to give the system a 'kick start' and anti-freeze is used within the distribution system for all pipe-work. The levels of the anti-freeze is a check that will be carried out by G R Edwardes Ltd during a service of your heat pump.

9. Microgeneration Certification Scheme

G R Edwardes Ltd are members of the Microgeneration Certification Scheme (or MCS) which demonstrates that we can install to the highest quality every time, using MCS certified products that have met rigorous testing standards. All MCS approved products will come with a guarantee for a set period of time, which we will clearly explain to you when commissioning your heat pump system. We will also leave copies of all the guarantees with you in your handover documentation pack.

10. Renewable Energy Consumer Code

All MCS certified installers must belong to an office of Fair Trading backed consumer code of conduct programme. G R Edwardes belongs to the Renewable Energy Consumer Code which covers consumers' interests, such as protection against excessive deposit payments and workmanship warranties. You can find the RECC consumer guide at: www.recc.org.uk or you can contact us directly and we will be able to send a copy to you.

11. Deposit and Workmanship Warranty Insurance Scheme

All RECC members must provide protection for deposits and advance payments that they take from domestic customers. G R Edwardes Ltd has access to an insurance scheme known as the 'Deposit and Workmanship Warranty Insurance Scheme'. This scheme is designed to provide protection for payments made before works have begun, just in case the company ceases to trade before we deliver the goods to you.

The Deposit and Workmanship Warranty Insurance Scheme has been arranged between RECC and the insurance scheme administrator (DAWWI). Once we receive your contract we register it with the scheme administrator and you will then receive an insurance policy by post.

For further information on this scheme you can visit: www.qanw.co.uk/pg-homeowner.

12. Quotation

We provide a full design and quotation service which is tailored to your individual site, as all sites are different and there are thousands of alternatives. We believe it is important to discuss your requirements and quote accordingly, providing you 'the customer' exactly what you would like. We offer our best prices to all of our customers, this way everyone is happy and there is no pressure put on you to make a decision. We rely on our highly trained team of renewable energy experts to provide the best pricing service and quality on the market.

G R Edwardes Ltd will not provide you with a quotation until all the areas of uncertainty have been identified and resolved and we are confident that we can meet every aspect of your requirement. We will however be able to provide you, at an early stage, with a budgetary estimate so you can make an early assessment of the level of funding that will be required.

G R Edwardes Ltd follows a very clear and simple process in order to be able to give you an all-inclusive and accurate full turn-key quotation for your heat pump installation.

1. **Initial Evaluation**. Based upon the information you provide G. R. Edwardes Ltd will assess the suitability of your site and proposed project for a heat pump system. If there are any areas of concern we will discuss these with you and ensure they can be addressed before proceeding to the next stage.
2. **Site Survey**. A full site survey may be undertaken by a member of the G R Edwardes Ltd team to both ensure that the site is suitable and to obtain all the information that will be required to generate a complete quotation and subsequent planning and funding applications, if applicable.
3. **Analysis**. We will analyse all the information gathered from you, and possibly the site survey, and fully cost any special items that have been identified during the process. We will then produce a complete quotation for a turn-key installation including the heat pump unit, electrical installation, plumbing alterations, ground works etc.

Once you've had chance to review your quotation you will want to discuss any issues with your G R Edwardes Ltd account manager and make any changes that you think are needed. You are then ready to progress to the next step.

13. Ordering

Once you have obtained planning permission, and secured whatever funding you are entitled to, you are ready to place your order for your air source heat pump and its installation.

G R Edwardes Ltd will confirm your quotation, including any amendments that may have become necessary following the planning process, and provide you with re-validated written full quotation and estimated installation date for your system. If you are happy with the quotation and wish to proceed then all you need to do is sign the order confirmation and send it back to G R Edwardes Ltd along with your deposit, which is usually for 25% of the total value.

It is a mandatory part of the REAL scheme that we give you a **7 day cooling-off period** after you have placed your order, during which time you may cancel with no loss. Whilst this does provide you with some protection against making a hasty decision, it does mean that we cannot actually start work until 7 days after you place the order unless we have written consent from you (an agreement that can be sent out if you require a quick turn-around.)

G R Edwardes Ltd will endeavour to keep you fully informed of any changes in the expected delivery date and will work closely with you to ensure that all aspects of the installation proceed as smoothly as possible.

14. Delivery

G R Edwardes Ltd holds stock of all the items required for a system installation at its warehouse facilities and G R Edwardes Ltd will arrange for all the required items to be delivered to the site as close to 9AM as possible on the first day of installation or as otherwise discussed.

G R Edwardes Ltd offer free delivery for all systems and we do not offer a self collect service as the materials are of high value and are impossible to insure due to them being a glass product.

15. Installation

The installation comprises of multiple different aspects and it is possible that these will be undertaken by different engineers, possibly on different days. G R Edwardes Ltd will however always seek to minimise the disruption at your site and will discuss and agree with you the dates and method of each aspect of the installation.

The key steps in the process are:

1. **Electrical**. G R Edwardes Ltd will supply and install all the electrical components that enable the heat pump to be connected to your heating system.
2. **Mechanical**. G R Edwardes Ltd will supply and install all the components that enable the heat pump system to be connected to the heating and hot water system.
3. **Components**. The system will be delivered to your site and installed as required.
4. **Commissioning**. Once all the elements are in place the system will be commissioned and will start to generate heat and save you money.

16. Next Steps

If, having read this guide, you are interested to progress your air source heat pump enquiry with G R Edwardes Ltd, then these are the most important next steps:

1. Review carefully the information in this document, and on G R Edwardes Ltd's web site www.gredwardes.co.uk
2. Let us know by phone 01308 422637, email to info@gredwardes.co.uk or by filling in the enquiry form at the back of this brochure that you wish to proceed.
3. Review the RHPP information: www.decc.gov.uk
4. If you live in a sensitive landscape area, e.g. an AONB or conservation area, then we strongly recommend that you talk to the local planning authority for guidance on your proposed installation.
5. Also discuss your plans with your immediate neighbours to make sure they are happy with what you have in mind.
6. G.R. Edwardes Ltd will then work with you to progress your enquiry and assist you with your planning.
7. If however you decide that you do not wish to progress your enquiry, then please send us an email saying so to info@gredwardes.co.uk and we will try not to disturb you again.

For more information or to book a free no obligation site survey
contact us on 01308 422637
or
You can find more information and even see how much you could save with our savings calculator at www.gredwardes.co.uk