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OUSE VALLEY ENERGY SERVICES COMPANY

Air source heat pumps

Low-cost, electric powered space heating

Air source heat pumps are an economical and low-carbon space heating option for well-insulated homes

Air source heat pumps take the warmth from the air outside (even when it's freezing) and use it to heat the home. Other types of heat pump use the warmth in the ground and in water, but air source heat pumps are suitable for a wider range of homes or buildings.

There are two types of air source heat pump: air-to-water, and air-to-air.

1) Air-to-water systems are more common; they heat water which is then circulated around the home via radiators or an underfloor heating system. They can be used to heat water in a storage tank for the bathroom or kitchen.

2) Air-to-air systems typically use fans to circulate warm air around the home and cannot be used to heat water.

Because the air (or ground, or water) is heated by the sun, the energy that heat pumps produce is still classed as 'renewable', even though the pump itself is powered by electricity. And since the UK now produces most of its electricity from low-carbon sources, a heat pump that works efficiently is likely to be the lowest carbon form of heating for your home.

How do air source heat pumps work?

Air source heat pumps use the same type of technology as a fridge but work in reverse.

In a nutshell, the heat pump draws heat from the air outside your home – even on a cold day – and transfers this warmth to a special liquid called a refrigerant. As it warms up, the refrigerant turns into gas which is compressed to make it even hotter. This heat is transferred to a separate body of water which is distributed to a central heating system to warm the house. The gas condenses back into liquid and the cycle begins again.

This photo, reproduced with permission from Baxi

How efficient are air source heat pumps?

To power itself, the heat pump uses electricity. But because the heat pump has taken some heat from the air, every unit (kilowatt hour or kWh) of electricity you put inwill provide more than 1 usable unit of heat energy out. This is known as the 'coefficient of performance', or CoP.

Typically, a heat pump has a maximum CoP of 3 to 4, meaning for 1kWh of electricity you will get 3 to 4 kWh's of heat.

It's important to note that the CoP rating supplied by the manufacturer describes how the heat pump performs under laboratory conditions, which is useful for comparing the efficiency of different models of heat pump.

But the actual efficiency of your installed air source heat pump system will be different to this depending on all the variables of your unique home. And the efficiency will change throughout the year too.

The overall installed efficiency of a heat pump system, averaged out over one whole year, is referred to as the 'seasonal coefficient of performance' or SCOP, and this figure is the most important when assessing your heat pump's performance.

Is my home suitable for an air source heat pump?

Heat pumps work most efficiently in well-insulated buildings, places that once they reach a comfortable temperature, stay warm and don't lose their heat. So, if you're considering a heat pump it is vital to ensure your home is well insulated first.

Heat pumps produce heat at a lower temperature than conventional central heating systems, that's one of the reasons that insulation is so important. Underfloor heating is ideal, but radiators can also be used.

Heat pumps make most financial sense in properties heated by storage heaters or LPG boilers. And bear in mind that while the heat pump itself doesn't take up a lot of space, they need to be positioned somewhere outside with adegquate air flow. An air source heat pump contains a fan which makes a low background noise, so you might need to consider your neighbours when deciding where to put it.

Heat pumps also require properties to have a hot water cylinder. If you do not already have one of these (because you have a gas combination boiler for example), then you will have to think about where in the property you would be able to install one.

Costs and savings

The typical cost of installing an air source heat pump unit is £7,000–£13,000 depending on the size of the property it needs to heat. On top of this, additional works may be required to upgrade the heat distribution system, for example larger radiators to help distribute the heat.

System being replaced	Old (G-rated)	New (A-rated)
Gas boiler	£590	£115
Oil boiler	£295	-£135*
LPG boiler	£780	£230
Night storage heater	£1,500	£870
Coal	£470	n/a

Figures from Energy Saving Trust and based on electricity and other energy prices in October 2022.

** At current prices (January 2023) air source heat pumps are not cheaper to run than A-rated oil boilers*

Remember if you want your heat pump to operate efficiently then insulate your home well.

The running costs of an air source heat pump will vary depending on the size and insulation levels of your home, what type of distribution system you have and the room temperature you want, as well as the CoP of the system. The type of fuel you're currently using will determine how much you save on your annual fuel bill. Based on a 3-bedroom detached home, potential yearly savings are: Air source heat pump installations can be funded by the government's Boiler Upgrade Scheme. Subject to availability, this give you £5000 off the cost and installation.

Maintenance costs for air source heat pumps are low. They are reliable, work automatically and most will operate for 20 years or more. Your installer should advise on any maintenance required, such as an annual check by you and a service every few years by a professional.

How do I heat my home with an air source heat pump?

Heat pumps are designed to run for long periods of time and work more efficiently when the temperature demands on the system are gradual rather than sudden. This means they need to be controlled differently to traditional central heating systems.

In particular, it is usually cheaper - and warmer - to leave them running during the day, rather than time them to go on in the morning and evening.

Heat pumps also respond slowly to adjustments to the controls; you can't just whack the heating up like you can with a gas central heating system. So when you want to turn the temperature up, change the setting of your room thermostat by one or two degrees at a time. Wait to see if you are comfortable at this new setting before turning it up further.

In some systems you can control the temperature in individual rooms – either with radiator valves or zone controls if you have underfloor heating. Air source heat pump controls are generally simple and similar in size to central heating control units (see inset picture).

Additional considerations ...

INSULATION

If your home lacks insulation or is draughty then it may struggle to get warm and your running costs will be higher. This is because the heat pump will have to work harder to maintain a constant interior temperature.

HOT WATER TANKS

The heat pump should heat your hot water tank to around 35-40°C. However, this is not hot enough to kill any bacteria within the tank. Therefore, the tank should be timed to heat up to 60°C once a week - you will notice a corresponding spike in your electricity usage.

CONTROL UNIT

The main control unit is often in a cupboard and should only be adjusted by a trained engineer (e.g. at an annual service), otherwise accidental changes risk increasing your running costs. A separate 'user' unit should include the settings you need to use.

ELECTRICITY TARIFFS

In general, heat pumps are best run on a single-rate tariff rather than Economy 7 (where you have cheaper night electricity, but it's more expensive during the day). Your electricity company can advise on which tariff suits your usage.

Should I turn off my air source heat pump in summer?

Heat pumps should never be turned off completely. This is because they will be extremely expensive when turned back on as they will try to raise the temperature as quickly as possible. It can also take several days to restore the home to a comfortable temperature.

AT NIGHT: Lower the temperature to around 10-15°C, and then set it to slowly increase in the morning so that the room is a comfortable temperature when you wake up.

AWAY FOR A DAY: Just leave the system running as usual.

AWAY FOR A WEEK: The system's control panel should have a 'frost protection' or 'holiday' setting which will lower the room temperature while you're away. This will also prevent the pipes freezing in cold weather.

DURING THE SUMMER: Your heat pump might have a 'summer' mode, or you can simply turn down the room thermostat. This means the heating will not come on, but you will still get hot water. You can raise your thermostat temperature again slowly as autumn approaches.

If the heat pump turns off ...

If you have a power cut the heat pump will turn off, and may need to warm itself up before it can heat your home again. Check your instructions as this may happen automatically or you may need to select a setting.

If you have a pre-payment electricity meter you risk the heat pump turning off if the meter runs out of money. So always try to keep money on your meter, or consider changing your meter and paying monthly or quarterly bills instead.

More information

For more technical information see the website of the Heat Pump Association www.heatpumps.org.uk

And to find approved installers, see the website of the Microgeneration Certification Scheme (MCS) www.microgenerationcertification.org

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A few ways to cut your electricity and gas use, and save money ...

Give your clothes a day in the sun; and give your tumble drier a break. Clothes dried in the fresh air feel great, and there are drying days in winter, too.

When you're cooking, keep the oven door shut as much as possible; every time you open it, nearly a quarter of the heat escapes.

Food in the oven cooks faster when the air inside flows freely, so don't put foil on the racks.

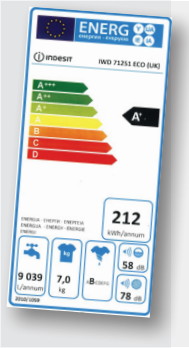
Don't leave your phone on charge all night. It only needs three hours – and try not to leave the TV and other kit on stand-by.

Catch 'em young. Encourage your children to switch off electric toys and lights that they're not using. They'll soon get the hang of saving energy.

Cup of tea or coffee? Only fill the kettle kettle with as much water as you'll actually use (but make sure you cover the metal element at the base).

Dodge the draught!
Fit draught-excluders to your front door, letter box and key hole, and draw your curtains at dusk to keep the heat in.

Buying a new appliance? Check the energy label and buy A-rated goods for the most efficient.



Be a friend to your freezer. Defrost it regularly to help it run more efficiently.

Turn your heating down by just 1 degree. You'll hardly notice the change in temperature, but it'll make a big difference to your heating bill.

Wait until you have a full load before running the dishwasher or washing machine. One full load uses less energy (and water) than two half-loads.

Sleep tight. Make sure all the lights are turned off when you go to bed, or use a low-wattage night light if you do need to leave one on.

New computer?
Laptops typically use around 85% less energy than a new desktop PC.

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We offer a free energy bill health-check and impartial advice to residents.
To book a 1-1 or speak to an energy champion, contact:

email energyadvice@ovesco.co.uk

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