

INFORMATION GUIDE

Air Source Heat Pumps

ISSUE 32



LIVING ENVIRONMENTAL SYSTEMS



Air Source Heat Pumps

This is an independent guide produced by Mitsubishi Electric to enhance the knowledge of its customers and provide a view of the key issues facing our industry today. The guide accompanies a series of seminars, all of which are CPD accredited.

The changing face of construction in the 21st Century demands that designers, specifiers and suppliers work as teams to create better buildings for occupants and the environment. Mitsubishi Electric aims to be a part of this by encouraging employees and customers to work together to increase their knowledge of the latest technology, legislation and markets.



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Air Source Heat Pumps

A GREENER FUTURE FOR HEATING

In UK domestic buildings, space and water heating together account for just over 80% of energy use.* For commercial buildings this figure is 55%. With all buildings in the UK producing almost half of the country's carbon emissions, reducing the energy required to provide heat and hot water to our homes and other buildings is a vital objective for the Government.

Significantly, the Government is committed to reducing UK greenhouse gas emissions by 34% by 2020 with the goal of reaching an 80% reduction in greenhouse gas emissions by 2050.

The importance of these objectives is reflected in an ever-increasing body of legislation that is driving down the use of energy in buildings. Part L 2006 required a 25% reduction in emissions from commercial buildings against 2002 standards. The next iteration of Part L, due out later in 2010 looks set to require a further 25% cut on 2006 standards.

New and existing homes are being targeted for energy usage cuts as well. The Code for Sustainable Homes sets

high standards for new-build projects, but the Government is heavily focused on reducing heating and hot water energy requirements in our existing dwellings.

As well as legislative drivers, Government is introducing financial incentives and schemes to encourage homeowners and businesses to adopt new, low-carbon technologies. In the domestic market, the aim is to reduce the impact of the capital cost of switching to 'green' heating solutions, which are currently priced above traditional technologies such as gas boilers. For example, the VAT level on a domestic heat pump is 5%, rather than 17.5% to help reduce the initial cost to consumers.



It is important to note that although the RHI looks set to launch in 2011, installations completed after 15th July 2009 will be included in the scheme, as if they had been installed when the RHI was in force.



The Renewable Heat Incentive (RHI) is a programme currently under consultation (July 2010) that could be introduced in April 2011[†]. The RHI would apply to both domestic and commercial buildings. The aim of the RHI is to give the renewable heating market a boost by bridging the gap between the cost of conventional and low-carbon heating market. Technologies covered by the RHI include air and ground source heat pumps, solar thermal and biomass among others.

Current proposals are that payments from the RHI scheme will be claimed by and paid to the owner of the equipment, and will be based on the amount of heat generated expressed in kilowatt hours (kWh). There are a number of conditions attached to the payments, such as the continued operation and maintenance of the equipment. Installers of the equipment

must also be accredited under the Microgeneration Certification Scheme (MCS). Tariffs paid to owners will be reviewed regularly to take new technologies and changes in costs into account.

It is important to note that although the RHI looks set to launch in 2011, installations completed after 15th July 2009 will be included in the scheme, as if they had been installed when the RHI was in force.

In the commercial sector, there are additional factors that are forcing building owners and managers to consider energy efficient forms of heating. The Carbon Reduction Commitment Energy Efficiency scheme (CRC) has already begun its registration period. Over five thousand businesses using more than 6,000 megawatts of electricity per year will be involved.

The CRC will encourage businesses to cut their carbon emissions by creating a market for carbon, and by publishing regular league tables of businesses showing which are improving their carbon performance – and which are not. Reducing energy use wherever possible will be key to successful performance in this scheme.

As the cost of fossil fuels rises, more business and domestic customers are examining alternatives to traditional space and hot water heating technologies. Air source heat pumps are an increasingly popular option, since they offer many advantages for commercial buildings and homes.

* Figures from DECC Energy Trends September 2008

[†]The RHI is currently being considered by the Government after a consultation process. As such, information given on RHI is only provisional.

Air Source Heat Pumps

A NEW APPROACH TO HEATING

Air source heat pumps (ASHPs) are now well-established technologies and are widely used across Europe, and increasingly in the UK domestic and commercial markets.

ASHPs operate by extracting heat energy from the air, and moving it to where it is required – either for space heating, hot water heating or both. Heat pumps work by circulating a refrigerant around a compression/expansion cycle. The technology inside a heat pump is therefore similar to that found in any domestic refrigerator using the same cycle.

One major advantage of air source heat pumps is that they offer 30% to 50% reductions in CO₂ emissions compared to conventional gas boilers. If all 200,000 new domestic properties built each year installed heat pumps, that would save over 720,000 of CO₂

emissions per annum. And if a heat pump replaced 10% of the gas boilers installed in domestic properties each year, that would increase the savings to more than 2 million tones of CO₂ by 2016.

ASHPs also offer high energy efficiency levels, and lower energy bills for users. The latest ASHP models use inverter-driven compressors to modulate the system to match the exact capacity required along with weather compensation in central heating mode. The table below gives some useful comparison figures for air source heat pumps applied in the commercial field.

Technology	Annual running cost per kW delivered
Air source heat pump to water	£60.71
Air source heat pump to air	£68.52
Biomass	£102.57
Mains gas	£82.36

(Assumed 55.887kWh heat delivered annually by a 25kW system. Efficiency/COP used for calculations: Air to Air 3.26; Air to Water 3.68; Biomass 0.85; Gas 0.95. Figures are calculated using annual temperature profile data from UK weather centres. Each kW of duty required for the building will have an annual cost as above. Prices are from uSwitch commercial tariffs and the Biomass Energy Centre as at November 2009)

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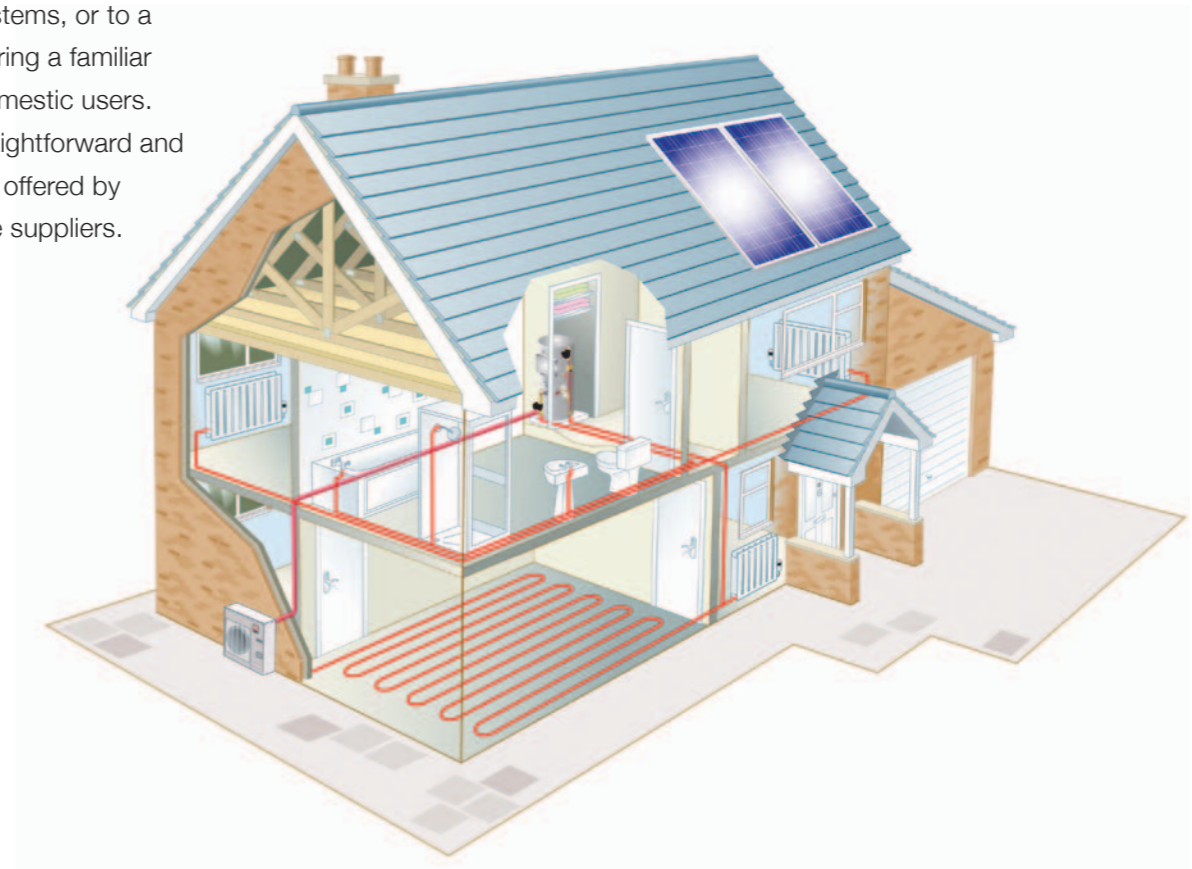
Installation is also straightforward and the equipment is now offered by a number of reputable suppliers.

There are a number of other practical benefits that air source heat pumps offer. For example, an ASHP has few moving mechanical parts and so offer low-maintenance performance. They are also very flexible in how the heat can be delivered into a building. Air source heat pumps can deliver space heating through air-based systems such as ducted fan coil units for offices.

They can also be connected to underfloor heating systems, or to a radiator system – offering a familiar heating method to domestic users. Installation is also straightforward and the equipment is now offered by a number of reputable suppliers.

Developments in air source heat pump technology mean that both commercial and domestic customers have a wide range of options, so they can specify the correct size for their property requirements. For example, smaller existing home or medium-sized new home could successfully use an ASHP of around 5kW. For larger existing homes that require heating and hot water there are suitable units sized at around 14kW.

In the commercial market, modular packaged units are now available, to ensure design flexibility and ease of installation. Using a combination of units means that design engineers can deliver exactly the level of heating required for the building.



Under the FiTs scheme, electricity suppliers are obliged to make payments to owners of renewable energy generating equipment such as photovoltaics (PVs).

Air Source Heat Pumps

A PRACTICAL SOLUTION FOR ENERGY EFFICIENT HEATING

A growing number of air source heat pumps have now been installed in UK residential and commercial buildings. Ease of installation and the availability of equipment from reputable manufacturers have helped to grow the market, along with a growing number of financial incentives.

ASHPs are proving particularly popular with householders not connected to the mains gas network, and are more cost-effective than oil-fuelled boilers. Furthermore, there is no need to store fuel on-site, and ASHPs take up only a small amount of space on the exterior of a building.

The commercial market is also embracing air source heat pumps. Where air source heat pumps are used for heating and hot water, it may be possible to avoid connecting to the gas grid.

ASHPs also offer a way to achieve renewables targets on projects. Many local authorities now require projects

to include a certain percentage of on-site renewables, and air source heat pumps are a very useful option. Combined with a possible Renewable Heat Incentive, such drivers will make the ASHP a real alternative to combustion based heating systems.

While considering the issue of renewables in the built environment it is interesting to note another factor which may help to offset the capital costs of installing air source heat pumps. Feed-in Tariffs (FiTs) were introduced in April 2010, and apply to commercial and domestic buildings. Under the FiTs scheme, electricity suppliers are obliged to make

payments to owners of renewable energy generating equipment such as photovoltaics (PVs).

Payment are made for use of on-site generated electricity, and for power exported back to the grid. This means that owners of the systems will benefit from reduced electricity bills as well as payments for power generated.

While a domestic-sized PV system would not be expected to generate enough power to provide heating and hot water through an ASHP system (even on the domestic scale) combining the two could provide an additional financial incentive.

Case study

Finding an alternative to oil-fired heating systems is now much easier for homeowners who can't connect to the gas grid thanks to heat pump technology. Charles and Claire Fox live in a 200-year-old four bedroom detached cottage in a small Wiltshire village. When the time came for them to replace their ageing oil-fired heating system, they wanted to find a more cost-effective and environmentally friendly system.



Charles and Claire considered a number of options including biomass, wood and solar power. However, none of these could meet their needs or proved too involved to install, run and maintain.



Heat pump solution for off-the-grid home

The Foxes were keen to make their historic home as energy efficient as possible, so they first insulated the building to help maximise energy efficiency. Searching for an appropriate technology to provide heating and hot water, Charles and Claire considered a number of options including biomass, wood and solar power. However, none of these could meet their needs or proved too involved to install, run and maintain.

Using an 8.5kW Ecodan heat pump combined with new radiators to replace their 15-year-old oil fired heating system was the ideal choice. Not only was the heat pump simple to install, taking only two days, it has proved much more efficient and effective to run.

The Fox family no longer have to rely on increasingly expensive oil, and they estimate an annual saving of around £500 on their heating bill. The heat pump is also making their home much more comfortable - combined with more efficient radiators heating is more even around the 170m² of living space and the family no longer have to boost heating with log fires as they have done previously. They now also have copious amounts of hot water.

By tapping into the low-energy solution of a heat pump system, the family are helping the environment and enjoying a more comfortable lifestyle while saving themselves money on fuel bills.

Further information

You can find more information on the topic of **Air Source Heat Pumps** and related issues at the following websites:

www.decc.gov.uk

For information on the Government's targets and updates on programmes such as the Renewable Heat Incentive.

You can also find the latest figures on energy use in the UK.

www.communities.gov.uk

A source for information on all Building Regulations, including Part L and also the Code for Sustainable Homes.

Regional Sales Offices

If you missed the CPD seminar on **Air Source Heat Pumps** you can call your Mitsubishi Electric regional sales office to arrange an in-house presentation of this information.

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