Energy-efficient hot water storage

Geoff Egginton of HWA member Advance Appliances looks at heat pumps and how they can be used effectively in conjunction with solar hot water storage systems

The government is promoting heat pumps for domestic central heating systems for their potential to reduce carbon emissions.

Grants are available to certified installers using certified equipment, and this is having a positive impact on sales.

Heat pumps use low-grade heat either directly from the air or indirectly from ground sources, which includes lakes and rivers.

The heat pump converts this low-grade heat into a more useful higher flow temperature.

The actual temperature achieved depends on the design of the heat pump system.

Virtually all heat pumps can achieve temperatures of 50°C and some go to 65°C or above, albeit at lower efficiency.

These flow temperatures are sufficient to be used in central heating systems and can also make a useful contribution to the generation of domestic hot water.

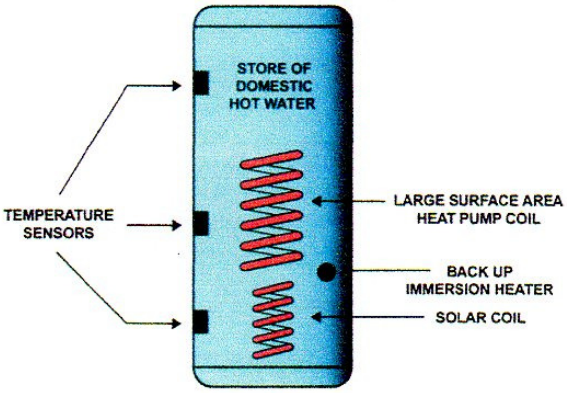
Hot water storage systems are perfect for the harvesting of renewable and low-carbon energy sources such as solar heat, as the energy can be banked and used throughout the day when required.

The same principle applies with heat pumps – energy from the heat pump is used to heat indirectly a store of hot water via a heat exchanger, usually a coil, although externally-mounted plate heat exchangers are sometimes the preferred choice as these can be designed specifically to the application requirements.

This energy is banked in the usual way and used when required.

Heat pumps operate at lower flow temperatures than gas or oil boilers, therefore the heat exchanger performance is usually enhanced to provide better heat transfer and ensures that the heat pump doesn't cycle too often during the re-heat period.

HEAT PUMP AND SOLAR HOT WATER STORAGE THE BEST OF BOTH WORLDS?



Designed to reduce carbon emissions further and improve SAP ratings

This enhancement usually involves significantly increasing the coil surface area to achieve a closer match to the requirements of the heat pump.

It should be noted that the characteristics of different heat pumps should be taken into consideration when specifying hot water storage systems, especially with regard to heat exchanger performance.

Plate heat exchangers can be specified to close tolerances to match the requirements of specific heat pumps.

The hot water storage tank can be open-vented or unvented.

It is a matter of choice, as the principle of hot water generation stays the same.

It is important to use hot water storage systems which meet current regulations, and this is where the Hot Water Association becomes a good point of reference.

One improvement that can be exploited to reduce carbon emissions further, and is ideally suited to hot water storage and heat pump installations, is the introduction of an additional coil or other heat exchanger for solar water heating.

This coil is situated low down in the water tank to maximise solar gain.

Effectively, during the solar season, from April through to September, when most domestic hot water demand can be met, the heat pump isn't used.

This best of both worlds solution would improve SAP ratings and offer householders an excellent energy efficient system with all the benefits of hot water storage such as quick bath filling and multi-outlet use without significant falls in flow rate across the system.

It is also possible to use primary storage systems with heat pumps.

These can help to buffer the demand on the heat pump, particularly for space heating applications where the instantaneous load, once a property has warmed up, may be very small.

These primary stores can also be used with heat pumps to preheat the heat bank for domestic hot water.

However, further top up will inevitably be required from a backup heat source such as biomass or solar, and usually a separate hot water cylinder is required.

This naturally leads to consideration of group heating schemes with commercial duty heat pumps.

These heat pumps can achieve outputs for a number of dwellings with the aid of buffer stores and individual heat exchangers or buffer vessels for space heating requirements.

Whatever system is chosen, due attention must be paid to low temperature systems to ensure that any Legionella risk is minimised.

In practice, this means that an electric immersion heater or a back up boiler must be used to provide additional heat to the water at given periods.

Demand for heat pump systems is increasing and installers should see this as an opportunity to enhance their own business and meet the challenge. HVP reader enquiry 256