Heat pumps in hot water

Christian Hadley, renewables product manager for Dimplex, outlines the main points to be considered when specifying a cylinder for heat pumps.

Modern properties are increasingly having unvented cylinders installed to provide mains-pressure hot water with high flow rates. Using a heat pump can be an efficient way of generating all the domestic hot water if the unvented cylinder and heat pump are closely matched.

It is a widely held misconception that heat pumps are only suitable for space heating. However, heat pumps also have the ability to provide plentiful hot water either as the sole water heating appliance or, if preferred, in conjunction with another heat source such as solar or a gas-fired boiler. Before designing a hot-water system, it is important to understand that there is a number of differences between a cylinder designed to operate with heat pumps, and a standard cylinder that would be used with a gas or oil system.

**FLOW TEMPERATURE**

With a heat pump, efficiency is a function of the efficiency of the heat pump and the efficiency of the cylinder. The flow temperature of the cylinder is much higher at low flow temperatures, which increases the system efficiency.

Heat pump cylinders are frequently designed to store the water at the temperature that will be used. Heating the cylinder to 60°C and then mixing the water down to 45°C decreases system performance unnecessarily.

**VOLUME**

In a standard system, a 100-litre cylinder with water stored at 60°C produces 100 litres of water when mixed down to a usable temperature of 45°C.

To offer a comparable amount of hot water, a heat pump cylinder that stores water at 45°C will have to be considerably larger than the current cylinder.

**INSULATION**

For a heat pump cylinder, levels of insulation are particularly important when the customer is interested in maximizing system efficiency. Higher insulation levels ensure that the heat loss from the cylinder is decreased, which in turn means that system running costs and carbon emissions are lower. Having a good level of insulation is critical to minimize heat loss – particularly if the cylinder is heated using a heat pump.

A 300-litre heat pump cylinder pump with off-peak electricity.

If this is the case, the water might not be used until late in the afternoon, which means good insulation is required to stop the temperature falling and prevent energy being wasted.

**LEGIONELLA**

Where there is a requirement to pasteurize against legionella, water temperature can be raised in a number of ways. A high temperature heat pump capable of flow temperatures above 65°C can be programmed to bring the cylinder up to 60°C for the desired amount of time. If the heat pump can only reach these higher temperatures, a direct electric immersion heater can be used to finish off the sterilization process. This is very cost-effective, and the immersion can either be controlled by the heat pump or through a separate standalone timer.

**COIL SIZE**

To counteract the low temperature gradient between the primary water flow and the desired cylinder temperature, it is imperative to use a coil or other heat transfer mechanism with a large surface area to speed up the rate of heat transfer. Typically, a heat pump cylinder coil would be 2.5 times larger than a standard cylinder coil of the same storage capacity.

**TEMPERATURE**

Most heat pump cylinders store water at 65°C rather than 60°C because the higher flow temperature increases the system efficiency.

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