

# The slow rise of the heat pump

Are heat pumps best as a stand-alone technology or in conjunction with condensing boilers?

**Keith Reed** discusses the topic further

Although air source heat pumps have had a good airing in the press and have certainly made bold inroads into the domestic market, their impact and use in commercial applications has been less prolific. These installations have been dominated by the gas boiler, with sales in the replacement market continuing to grow – especially as boiler upgrades can still offer excellent savings on overall running costs.

Of course, the situation for building services engineers today is a lot different to a few years ago. Whereas the boiler used to be the first and only choice, the sheer variety of heating technologies available at present is far greater. And as a result, there are now installations where maximum energy efficiency can be achieved using a system that harnesses one of the latest renewable technologies.

In the case of new build applications, more consultants and engineers are realising the savings on offer from the incorporation of air source heat pumps (ASHPs), especially as their reliability and efficiencies have greatly improved in recent years. Better still, there is often a natural harmony between heat pumps and condensing boilers, which can often help form a system that outperforms one technology alone.

## Performance indicator

The key performance indicator for successful installations is the coefficient of performance (COP), and in the case of ASHPs, can often be as high as 4.0. However, as outside air temperatures fall, ASHPs present a double edged sword. When the temperature drops in winter, and there is a call for higher output from the building's heating system, there is a corresponding reduction in heat energy available from the ambient air, so consequently there is a negative impact on the COP.

So, how can a condensing boiler fit in? The answer is to design a bivalent arrangement of heat pumps



A new generation of modular heat pumps is beginning to come to the market

**“There are now installations where maximum efficiency can be achieved using a system that harnesses a new renewable technology”**

in conjunction with condensing boilers, with the principle being that the heat pump is sized to meet the heat load of a building for the majority of time that heating is required. This allows ASHPs to operate at favourable COPs, yet when the outside air temperature reaches a low threshold (and the output of the heat pump/s becomes insufficient), a condensing boiler is brought on-line to ‘top-up’ the difference. The bivalent switching point is predetermined in the design stage and the boilers are switched on/off by the outside air temperature sensor that is connected to the heat pump.

In essence, two sets of heat loss calculations are carried out for the

building in question, with one set at an outside air temperature of approximately +4°C, and another at the normal design conditions for outside air temperatures that would be applied (let’s say -5°C). The heat pump is selected on the basis of the heat output needed at the +4°C outside air conditions, while the condensing boiler (‘top-up’) is selected for the difference between the two sets of heat loss calculations. So, for example, a selection of plant could comprise an air source heat pump of say 26kW output, operating independently and efficiently for the majority of the time heat is needed. However, when the outside air drops below +4°C, a modulating condensing

boiler of some 13kW output is brought on-line to ‘top-up’ the load. The only alternative to this arrangement is to install a heat pump of approximately 39kW output, but this is likely to be over-dimensioned for its average heat loading and not suitable for the application.

## Cascade heat pumps

Just as modular or cascade installations have been used with boilers for decades, they’re now becoming popular with heat pumps, with cascade installations of up to four units possible. When air source units of up to 35kW output (available from MHS Boilers product range) and ground/water source heat pumps of up to 43kW are combined in cascade, they can deliver fairly sizeable and useful outputs. This makes them perfect for apartment blocks or small community heating schemes where there is a wide diversity of load on a building.

Since modular or cascade installations are becoming more and more popular, manufacturers are responding by designing new products that enable installers to fit this new generation of modular heat pumps quickly, simply and economically. Plus, as additional built-in functionality and controls are added, it will assist the specifier to integrate the technology into any project with ease.

Although air source heat pumps have not made a huge impact on the commercial market to date, there are likely to be many more opportunities for their integration into projects – particularly on the road to the 2020 carbon reduction targets. With this mind, it’s still important for consultants and building services engineers to take all factors into account before opting for one choice, as exploiting the advantages of renewable technology, combined with traditional heat sources, could produce the most efficient system. ☉

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