



Heat pumps – challenges for new build and retrofit in domestic applications

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EDITORIAL

Heat pumps – challenges for new build and retrofit in domestic applications

Heat pumps are a proven high-efficiency heating systems with numerous European examples of best practice in both new build and retrofit. However in the UK, in particular, there is a growing body of evidence that suggests a lack of understanding in determining the advantages for a particular house (whether new build or retrofit), thus the system does not meet expectations, and poor installation and operation again lead to the unit not meeting the expectations.

Heat pumps are tested according to EN14511 which is the European test standard. The data stated can be true at one particular point, e.g. for a brine to water heat pump, the coefficient of performance (the ratio of heat supplied to electricity used) is at brine of 0°C and water supplied at 35°C. Careful attention to performance is required to systems that operate outside these parameters.

Heat pumps for domestic applications come in a number of types, namely ground source (brine to water), air source (air to water) and more rarely air-to-air and therefore will be discounted. The ground source heat pump extracts heat from either, for example, the garden with horizontal coils of pipe at about 1.2m deep or vertically in a series of boreholes. In each case, plastic pipe is utilised and its advantages include the fact that the ground temperature is warmer than the winter air and thus the system operates efficiently, especially when used with lower temperature underfloor heating systems. Thus, these systems are ideally installed in a new build or major refurbishment scenario where the significant disturbance can be accommodated as part of the build process.

However, the challenges arise from underestimation of the ground area for horizontal systems, for example. The ground area for horizontal systems is important as it stores solar energy typically in the summer and allows the heat pump to draw upon this in winter. Area is important along with the pipe length and spacing calculations. However there is often an overestimation of the winter soil temperature. Average soil temperature is often used and can be stated as high

as 12°C from limited publications based in the south of England. However winter soil temperature at 1.2m in the North can be 6°C colder, and thus sizing a ground source heat pump must always recognise this. The temperature at which the underfloor heating system is designed also takes its part with very few being at 35°C.

Air-source and ground-source heat pumps are often quoted as requiring a secondary heating source. Given their low temperature of operation, the boost heaters designed to overcome legionella fears can act in this role in that the additional electric heating to bring domestic hot water to a temperature greater than 60°C once a week can act as additional heating in exceptionally cold weather or at times of heat pump failure. Such boost heaters are usually accommodated in a buffer tank which allows the heat pump to run for a sufficient period of time even in milder weather. Air-source units are deemed acceptable for retrofit applications where higher temperature cascade heat pumps, for example, coupled with more efficient household heating radiators can provide efficient heating with minimal retrofit disturbance.

Sizing of heat pumps presents the greatest challenge. Sizing for a design point of, for example, -3°C would mean that for longer periods the heat pump would be oversized. This would lead to short-cycling operating periods and therefore reduce lifespan coupled with higher capital cost for a larger unit. Yet, the homeowners want a heating system that meets their demands. The buffer vessel is one solution and variable speed heat pumps are another (one whose compressor speed is reduced to meet demands), but the application of what were deemed European best practices must be in their entirety and not piecemeal to suite installation conditions and costs. Thus, please consider the installation most carefully!

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Editor