kensaheatpumps

Fact Sheet

Ground Source Heat Pumps versus Air Source—Social Housing Sector

Facts at a glance:

Grant Funding
ASHP are now covered by LCBP grants, however for CERT funding the units need to be individually type tested to enable qualification.

SAP Ratings
GSHP have a higher base figure of 3.2 when calculating carbon emissions under SAP, ASHP have a figure of 2.5 which is decreased to 1.75 if the ASHP is producing DHW. This is roughly equivalent to a gas boiler.

Performance Ratings
ASHP performance is often quoted at an air inlet temperature of 7°C whereas GSHP are quoted at a ground inlet temperature of 0°C.
GSHP have a higher efficiency than ASHP, however it is often claimed they are similar using figures obtained under these different inlet temperatures.

Buffer Tanks
GSHPs generally do not require buffer tanks where as ASHPs do.

Life
GSHP have a design life of around 25 years, ASHPs due to their large moving components have an expected like of approximately 10 years.

Planning Permission
GSHP are currently a permitted development right which means that they do not require planning permission. Currently ASHP do need planning permission and an acoustic assessment.

Interest in the use of heat pump technology is growing rapidly as efforts are made to comply with increasingly stringent building regulations and planning requirements.

Most interest is focused on closed loop GSHPs (Ground Source Heat Pumps), open loop GSHPs and air-to-water ASHP's (Air Source Heat Pumps).

Kensa Engineering supplies all three types of heat pump so the purpose of this Fact Sheet is to provide some general information to assist with the decision-making process. More specific information relating to a particular development can be supplied upon request.

The most suitable option for any development is not always straightforward and will, inevitably, be influenced by the motivations of the purchaser. For example, the requirements of a housing association – the continuing obligation to service the properties and the desire to offer lower income tenants the cheapest possible running costs – are quite different from a speculative housebuilder who may simply wish to select a product which economically satisfies regulatory issues.

Most initial interest has been focussed on GSHPs although an increasing number of ASHP vendors are now vying for the increased business triggered by the need to achieve CSH Level 3 on new developments. In many cases, specifiers are initially tempted by ASHP's until the full facts become apparent.

It is beyond dispute that GSHP's are more efficient. The average ground temperature in winter will always be significantly warmer than the average winter air temperature so GSHP's perform more efficiently.

That said, a "dedicated" heating-only ASHP is simple to fit and requires no expense on ground arrays in trenches or boreholes. It also has the benefit of coming "in a box" like any other heating appliance, and therefore needs no ground array expertise. Some appear much cheaper than others but the distinction is between 'dedicated' units and air conditioning chillers which can heat but are optimised to cool. The latter category is certainly not suited to the UK's winter climate and there is no case study experience to dispute this claim.

That all said, the acknowledged reduction in efficiency of an ASHP appears to more than offset by the extra cost and complexity of a GSHP solution. However, other factors need to be taken into consideration.

Continued...

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Grant Funding and Pricing
ASHPs are now covered by the Low Carbon Building Programme, however the grant is lower than GSHPs For Carbon Emissions Reduction Target grant funding offered by the Energy Companies the levels of grant funding under CERT for GSHPs are such that the price differential with ASHP technology is significantly eroded. Also for Air Source each type of unit needs to independently tested to enable qualification for CERT funding.

Drilling costs, linked to the provision of boreholes for GSHPs, are becoming more competitive as drillers are able to mitigate the risk (and added expense) of unfavourable site conditions across a greater volume of projects. In addition, more companies are entering the market which reduces prices through greater competition, and increased levels of expertise.

Finally, many housing associations are developing sophisticated lifetime ownership cost models (see separate section) to justify the selection of GSHPs.

SAP
The main selling point for any heat pump is carbon savings over boilers. For a GSHP, the base figure in SAP is 3.2, whereas it's just 2.5 for an ASHP. If a heat pump, ASHP or GSHP, is connected either to heat DHW, or to radiators (as opposed to underfloor heating) then its efficiency under SAP is further reduced by a multiplier of 0.7. So, a GSHP goes down to 2.24, whereas an ASHP goes down to 1.75. A condensing mains gas boiler has a COP equivalent under SAP of between 1.7 and 1.9. For these reasons, an ASHP is unlikely to be sold on a carbon saving against a gas boiler. Equally, it will not be able to compete on an economic basis. This means that ASHP technology is unlikely to appeal to any house needing to achieve Code Level 3 or above if mains gas is available.

Ratings
The performance of an ASHP is often quoted with "A7" (this being the air at 7 deg C) – whereas GSHPs are almost always quoted at B0 (this being the ground at 0 deg C). For this reason, ASHPs are often portrayed not only as being as efficient as GSHPs, but also having a higher output that they would achieve in the field.

ASHPs are often quoted as "operating down to –15 deg C ambient" even though the power output is never quoted at that figure. At such temperatures, the output is very low almost to the point where there is no effective heat at all since the heat pump is almost permanently in defrost mode. As a result, the efficiency declines significantly.

Buffer tanks
GSHPs generally do not require a buffer tank. ASHPs generally require a buffer tank when connected to underfloor heating to cope with the defrost cycle. Besides putting up the capital cost and the complexity substantially, there is often an issue over where to put a buffer tank in a small house.

Lifetime Ownership Costs
Under the CERT funding proposals, DEFRA has acknowledged that the design life for a GSHP is 25 years. ASHPs are not listed as a specific energy saving measure under CERT so there is no equivalent figure although most manufacturers will not claim anything beyond ten years. As ASHPs are located outdoors, they are more susceptible to damage, and certain components, including those involved in the defrost mode, are more prone to failure due to their workload. As a consequence, the lifetime ownership cost of a GSHP is lower since there is a longer design life and a lower exposure to emergency maintenance/

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replacement caused by component failure, climatic conditions or vandalism.

Acoustic Issues
ASHPs require planning permission, which includes an acoustic assessment. At the moment, planning is often not being obtained, and no acoustic assessments are being undertaken. There are movements underway to provide ASHPs with Permitted Development GPDO (General Purpose Development Orders) providing that minimum acoustic requirements are met, however this has not yet been passed. For an isolated dwelling, acoustic issues are not likely to be an issue – but, then, many an isolated dwelling would have land to accommodate slinkies and a GSHP.

For any sort of dense residential area, in a town or village, it will be safer to obtain full planning permission before fitting an ASHP – which will require a full acoustic report, written by a specialist acoustic engineer. This becomes even more important if more than one ASHP is planned to be fitted, for example in any high density social housing scheme, as the risk multiplies significantly. Most urban areas will now not allow ANY increase in noise levels at all – and it is likely that permission will be denied, as it is entirely inappropriate for the planning process to permit development that could give rise to a statutory nuisance. Acoustic readings may be taken in bedrooms, with the window open. ASHPs will have to run throughout the night to maintain adequate temperatures so the nuisance will occur when many people are trying to sleep, which is entirely different to office air conditioners running in a commercial or industrial environment

Even if the acoustic report is undertaken, and planning permission is granted, any resident can make a formal complaint to their local authority, and the following procedure then applies.

Where a local authority is satisfied that a statutory nuisance exists, or is likely to occur or recur in the area of the local authority, the local authority shall serve a notice ("an abatement notice") imposing all or any of the following requirements: -

- Requiring the abatement of the nuisance or prohibiting its occurrence or recurrence;
- Requiring the execution of such works, and the taking of such other steps, as may be necessary for any of those purposes

Effectively, it will demand the removal of the heat pump.

Conclusion
ASHPs appear to be a straightforward and easy technology for salesmen to "box shift".

There is a lack of expertise of those selling and installing ASHPs – and this extends to those that are buying them because the technology has been "over-sold".

In practice, GSHPs are likely to be the better choice, for the longer time, in most applications.