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Kensa – Supplier Perspective on Heat Pumps

Case study

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Introduction

Founded in 1999 and based in Truro, Cornwall, **Kensa** has grown over the past 26 years into a leading British manufacturer and installer of turnkey, large-scale ground source heat pump (GSHP) projects. Kensa focuses on providing the **lowest lifecycle and running costs**, helping to **alleviate fuel poverty** and **reduce carbon emissions** more effectively.

Kensa is poised to scale GSHP technology for mass retrofitting and new build across the UK, making it suitable for any home, anywhere.

We spoke to Stuart Gadsden, Commercial Director, and Katie Maundrell, Head of Content and Communication, about the Shoebox heat pump.

What makes the Kensa Shoebox heat pump different?

One of Kensa's notable innovations is the **Shoebox heat pump**, which has been in use for over 10 years. This compact and quiet unit is ideal for many UK properties, including flats, challenging the misconception that GSHPs require extensive space. The Shoebox heat pump is widely used in social housing, Connecting shared ground infrastructure, to individual heat pumps inside each property, known as networked heat pumps and akin to a modern version of the gas network. Kensa's newest innovation the Shoebox NX is being widely used in new build properties as well as social housing, where it can in some instances raise an EPC level by 2 bands.

Technology and operation

Why was the Kensa Shoebox heat pump needed?

- **Compact size:** The Shoebox GSHP is small enough to fit inside individual flats, making it ideal for low-rise, mid-rise and high-rise buildings where space is limited
- **Low running and operational costs:** The high efficiency of the Shoebox GSHP ensures low running costs for residents. The system's design ensures low maintenance and operational costs. The external pipework is straightforward to maintain, while the internal heat pump requires minimal upkeep
- **Safety and efficiency:** Unlike gas boilers, the Shoebox GSHP eliminates safety concerns associated with gas, as it does not use gas. It also offers significantly higher efficiency compared to traditional electric systems
- **Networked Heat Pumps:** The Shoebox GSHP can be integrated into a networked system, mimicking the gas grid. This approach allows for



decentralised heating solutions that are both cost-effective and environmentally friendly

How are the heat pumps installed in each flat?

Step 1: Designing the system

Kensa begins by calculating the peak and annual heating, cooling and hot water requirements of the building, considering factors such as fabric insulation levels, building size, and local climate to ensure optimal performance.

This information is then used in conjunction with Kensa's detailed understanding of below ground geology to design the ground array, confirming the number and depth of boreholes required to sustainably heat and cool the building.

Additionally, Kensa sizes the heat pump, radiators and hot water cylinder so that they are designed to meet 100% of the property's demand from the GSHP system.

Step 2: Installing boreholes and trenches

Boreholes of up to 300 meters deep are dug, with trenches to connect them. This process is often carried out in a car park or garden area, which is temporarily closed during the installation. Once the boreholes and trenches are completed, the area is restored, leaving no visible evidence of the work. Any previous use can then be reinstated.

Step 3: Connecting the array to the building

Pipework is then installed to connect the borehole array to the building. This involves laying pipes from the boreholes outside the building to a designated riser location inside the building, ensuring a secure and efficient connection.

Step 4: Connecting pipework to each flat

The pipework is then installed vertically in risers and goes to every storey in the building, with pipework teed off at each storey and run horizontally to each individual flat. This ensures that each flat is directly connected to the borehole.

Step 5: Installing the GSHP in each flat

Finally, the ground array pipework is connected to the individual Kensa Shoebox GSHP located in each flat. Additionally, new radiators, a new hot water cylinder and new controls are installed and connected to the GSHP to complete the installation.

Outcome

The installation of Kensa's heat pumps is completed with minimal disruption to the residents who remain in their homes throughout the installation. The system provides sustainable and cost-effective heating and cooling, enhancing the overall comfort and energy efficiency of the building.

Applications

What sort of homes are the Shoebox heat pump suited to?

The Kensa Shoebox heat pump is versatile and can be installed in various types of properties:

- **Residential properties:** It comes in two sizes, 3kW and 6kW, making it suitable for one-to-four-bedroom homes. For larger properties, larger heat pumps are available like their Shoebox NX and Evo heatpumps.
- **Clustered existing housing:** It works exceptionally well in clusters of existing properties, such as low-rise, mid-rise, and high-rise flats, as well as housing estates under the same ownership. The Shoebox is popular in social housing retrofit
- **New builds:** The Shoebox is particularly suitable for new build properties, which tend to have better insulation and so larger properties can benefit from this technology. It is often installed by infrastructure companies that replace gas installations with these heat pumps in new developments

In addition, the system is designed to keep costs low for residents. Passive cooling can be included for ultra-low running costs, as it does not require the heat pump itself to run. Instead, only two small circulation pumps and, where fitted, a fan coil unit operate, keeping electricity use to a minimum.

Does it work for complex to decarbonise properties?

Kensa Shoebox heat pump is effective for hard-to-treat properties for the following reasons:

- **Cooling and heating:** It can provide both heating in winter and cooling in summer. During winter, it extracts heat from the ground to warm the property. In summer, it circulates the cold fluid from the ground within the property to provide cooling, typically using a small fan coil unit to circulate the cooling efficiently
- **Maintenance:** The external pipework is uncomplicated and easy to maintain, while the internal heat pump requires minimal upkeep. There is no central plant room containing equipment that needs ongoing servicing and maintenance

The heat pump uses a mixture of water and detoxified glycol (anti-freeze) in an 80:20 ratio, ensuring efficient and safe operation throughout the year.

How have residents responded to the new heating systems?

In Thurrock, the residents have responded positively to the new GSHP systems. Here are some key points:

- **Reduced energy bills:** Since the installation of the GSHP systems, energy bills have significantly decreased, providing financial relief to the residents
- **Improved water pressure:** The replacement of the old gravity-based system with a pressurised system has allowed residents to enjoy showers instead of baths, enhancing their daily comfort and convenience
- **User-friendly technology:** The system includes easy-to-use technology, such as thermostats, making it simple for residents to control their heating.
- **Ongoing support:** While Kensa is on site, they provide assistance with any issues. If Kensa has left the site, residents can contact the client, who has been trained by Kensa, or reach out to Kensa directly for support

Overall, the new heating systems have been well-received, improving the quality of life for the residents with lower running costs and higher levels of indoor comfort.

Can homeowners access support for installing a Kensa Shoebox heat pump?

Homeowners can apply for a Boiler Upgrade Scheme (BUS) grant, while registered providers have access to Warm Homes Funding. Additionally, Kensa offers a finance solution to registered providers and new build developers, which helps reduce upfront capital expenditure. In one model, Kensa retains ownership of the ground array and provides ongoing servicing and maintenance, with the costs recovered through standing charges paid by the landlord or homeowners.

Challenging locations

Central London case study

Project Details

Working with Clarion, Kensa got involved in upgrading houses built in 1913, in a densely populated part of central London. Despite the buildings' disrepair, demolition was not an option. The project therefore formed part of an overall upgrade, which included internal wall insulation (IWI) and upgraded glazing, while preserving the original facades.

GSHP boreholes were discreetly installed, so that manhole covers were the only visible external sign of the system. The Shoebox heat pumps themselves were

placed in cupboards. Since the works, all 81 properties are fully occupied, with residents benefiting from improved energy efficiency and comfort.

Unique challenges

Being involved in the wider retrofitting of Edwardian-era housing at this scale presented several unique challenges for Kensa. They required meticulous planning and execution:

- **Deep boreholes:** The project required drilling boreholes that were 180 meters deep. This depth was necessary to ensure the efficiency of the ground source heat pumps. The team carefully planned the drilling schedule to align with the overall project timeline
- **Coordination with scaffolding:** In planning, it was proposed that the drilling of individual boreholes would commence as scaffolding was dismantled. However, the drilling progressed faster than anticipated, necessitating a temporary halt and return to the site once the scaffolding was fully removed
- **Complex drilling maneuvers:** The site had four narrow strips of land where the drill rig had to maneuver. This involved navigating down each strip, drilling, reversing back, and then moving to the next strip via the main road. This complex maneuvering required precise planning and coordination with the local authority
- **Health and safety considerations:** The challenging drilling conditions demanded extensive health and safety preparations. This included liaising with traffic management to ensure safe and efficient movement of the drill rig and maintaining a safe working environment for the team

Solving key challenges

Challenge 1: Tougher Drilling Conditions

Solution: The experienced in-house team and subcontractors at Kensa were prepared for tougher drilling conditions. They employed mitigating actions such as using different drill bits to handle the challenging geology effectively.

Challenge 2: Car Park Closure

Solution: Communication was key. The car park closure was managed by the resident liaison officer (RLO) through notice boards and direct communication. Alternative parking arrangements were provided to minimise inconvenience. Keeping residents informed ensured smooth operations and maintained trust.

Challenge 3: Resident Engagement

Solution: Establishing a relationship with residents early on was crucial. Close communication was maintained with residents and clients, being mindful of individual health and other needs. This proactive approach helped in addressing concerns and ensuring cooperation.

Challenge 4: Resident Refusal

Solution: In cases where residents were hesitant to accept the new system, Kensa and the client have engaged in discussions to address their concerns. For instance,



in a recent project in Thurrock, Kensa successfully installed Shoebox heat pumps in 273 flats, replacing old-fashioned electric storage heaters. This was achieved through effective communication and collaboration

Looking ahead

Scaling up Shoebox installs

There are several challenges to overcome to enable scaling up the deployment of Kensa Shoebox heat pumps:

- **Massive decarbonisation task:** With 25 million properties to decarbonise by 2050, the scale of the task is enormous. This equates to needing to decarbonise approximately 1 million properties per year, a target that is ambitious given the current pace of installations
- **Funding:** Government funding is limited, so the bulk of the financial support must come from private finance. Investors, like Kensa's major shareholders Octopus and Legal & General, recognise the need for large-scale retrofitting, but securing sufficient private investment remains a challenge
- **Owner-occupier market:** The owner-occupier market presents a significant hurdle. Achieving widespread adoption in this segment requires a shift comparable to the installation of the gas network in the 1950s and 60s. This necessitates substantial buy-in from homeowners and effective incentives
- **Government support:** While private finance is crucial, government support is also necessary to drive the scale of change required. Policies, incentives, and regulatory frameworks need to be aligned to facilitate large-scale deployment
- **Economies of scale:** To make the deployment cost-effective, scaling up delivery is essential. Achieving economies of scale will help reduce costs and make technology more accessible to a broader market

Future innovations

Kensa is actively developing innovations to enhance the next generation of their heat pumps:

- **Finance solutions:** Kensa is working on new finance products, similar to those developed for the newbuild market with GTC Infrastructure, to reduce upfront capital expenditure for homeowners. These solutions will allow homeowners to pay an ongoing fee that covers both the capital costs and maintenance of the technology
- **Social housing sector:** Kensa is developing tailored finance products for the social housing sector, aiming to make heat pump installations more accessible and affordable for this market

- **Future Homes Standard:** The upcoming Future Homes Standard will play a crucial role in new builds, ensuring that new properties are built with high energy efficiency standards and are equipped with sustainable heating solutions from the outset

Engagement and resources

To meet net zero targets, widespread adoption of heat pumps is essential. Heat pumps are a sustainable and eco-friendly alternative to traditional heating systems, reducing carbon emissions and helping combat climate change. They are highly efficient, providing both heating and cooling with lower energy consumption, which translates to reduced energy bills for homeowners.

The need to change to low carbon heat sources is pressing, as delaying action only exacerbates the environmental crisis. By investing in and promoting heat pumps now, we can make a significant impact and safeguard the future of humanity. Kensa is therefore keen to raise awareness of the technology, and provides [online resources](#) for:

- Homeowners
- Installers
- New build developers
- Social housing providers



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