

Case study

London District Heating with Ammonia Heat Pumps

A blueprint for the use of waste heat from public facilities



Photo credit: Islington Council

The Bunhill 2 Energy Centre in London is a pioneering district heating project developed by Islington Council in partnership with GEA and other stakeholders. Utilizing GEA's ammonia heat pump technology, it captures waste heat from the London Underground to provide sustainable heating and hot water to over 1,350 homes, a primary school, and leisure centers. This project significantly cuts carbon emissions, improves air quality, and lowers energy costs for residents. It also aligns with Islington's goal to reach net-zero carbon emissions by 2030.

The new energy center uses state-of-the-art technology on the site of a London Underground station that has been decommissioned for almost 100 years. The remains of the station, once known as City Road, have been converted into a huge underground air extraction system that draws warm air from the tunnels underneath.

Key information

Client: Islington Council, Transport for London (TfL)

Supplier: GEA

Type of facility: Heat pump

Refrigerant: Ammonia

System start-up: 2019

Requirements

The project was driven by Islington Council's bold commitment to achieve net-zero carbon emissions by 2030. A key requirement was to provide an energy system that could reduce greenhouse gas emissions while simultaneously cutting energy costs for households, many of which rely on social housing or face economic hardship.

The technical challenge lay in identifying a sustainable heat source that could serve a densely populated urban area without adding to air pollution. London's aging and energy-intensive infrastructure posed additional constraints, requiring a system that could be retrofitted into existing environments with minimal disruption. The solution also had to support broader objectives around public health, urban regeneration, and long-term energy resilience - making it essential that the chosen technology was both environmentally sound and socially inclusive.

Solution

To meet these ambitious goals, Islington Council collaborated with key partners including GEA, Colloide Engineering Systems, and Transport for London to develop the Bunhill 2 Energy Centre. The centerpiece of the solution is a state-of-the-art ammonia heat pump system that captures waste heat from the London Underground - specifically from warm ventilation air in tunnels of the Northern Line - transforming it into usable energy for heating homes, a school, and leisure facilities in the area.

The heat pump, housed in a compact container at street level near the disused City Road Underground station, uses advanced components including a combined evaporator/separator, three compressors, and four high-efficiency heat exchangers. It operates with the natural refrigerant ammonia—which has zero global warming potential and no nitrogen oxide (NOx) emissions, making it highly suitable for urban deployment. The system achieves an impressive Coefficient of Performance (COP) of over 3.5, delivering water temperatures of up to 80°C through a 1.5 km district heating network. Designed for reliability, safety, and efficiency, this solution not only addresses current energy needs but also sets a new global benchmark for sustainable urban heating systems.

Key benefits and features

- **Environmental Impact:** Cuts CO₂ emissions by ~500 tonnes/year
- **Economic Benefit:** Reduces heating costs by approx. 10% vs. communal systems
- **Efficiency:** Heat pump achieves a Coefficient of Performance (COP) > 3.5
- **Scalability:** Adds to existing network capacity, with potential to expand to 2,200 homes
- **Sustainability:** Uses ammonia as refrigerant with zero global warming potential and no NOx emissions
- **Social Value:** Includes local youth engagement initiatives through schools and training

Technical data

Cooling capacity: 1.000 kW

Refrigerant charge: 350kg

Heat source temperature: London underground ventilation air (18 to 30°C / 64 to 86°F)

Heat sink temperature: District heating water (55 to 80 °C / 131 to 176°F)

Main components:

- GEA Grasso reciprocating compressor

More info: <https://video.gea.com/reusing-waste-heat-from-london>

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