



## ▶ SOUTHWARK HEAT NETWORK UPGRADE



J & E HALL WAS CALLED-UPON TO DEVELOP BESPOKE WATER SOURCE HEAT PUMPS FOR SOUTHWARK'S HEAT NETWORK UPGRADE WHEN IT BECAME CLEAR THAT THE TECHNOLOGY NEEDED DIDN'T CURRENTLY EXIST ON THE MARKET.

### INTRODUCTION

The London Borough of Southwark identified greening homes as a top priority as part of its climate strategy action plan. Council buildings are responsible for 75% of the borough's carbon emissions, with the highest emissions coming from residential properties at 28%.

In order to improve the environmental credentials of its housing stock, Southwark Council approached cleantech design and build company, ICAX, to upgrade the existing gas-fired district heating system with water source heat pumps (WSHP), delivering high temperature heating and hot water to over 2,000 homes, using water circulated from the London Aquifer.

### PROJECT OVERVIEW

Three sites across Southwark have been upgraded with heat pumps developed by J & E Hall:

- Consort – 1 x Hi1000: 1,000 kW WSHP
- Newington – 2 x Hi600: 600 kW WSHPs
- Wyndham – 2 x Hi600: 600 kW WSHPs

Taking just under two-years to complete, the project was delivered by J & E Hall, ICAX, Southwark Council and Vital Energi, part-funded by a low interest loan from the Mayor of London's Energy Efficiency Fund. The loan will be repaid using income from the non-domestic Renewable Heat Incentive (RHI).

### KEY FACTS & STATS

- Over 2,000 homes benefit from the upgraded heat network
- 1,744 tonnes of CO<sub>2</sub>e per annum are predicted to be saved by the scheme
- 34% energy usage reduction across the three sites
- Improved air quality thanks to dramatic reduction in nitrogen dioxide and other gases/particulate matter





### SCHEME BENEFITS

ICAX had previously commissioned J & E Hall to develop a high temperature heat pump for one of its R&D projects at London South Bank University. This collaboration proved invaluable when developing the heat pumps for Southwark.

Southwark needed a high temperature heat pump that would be suitable for replacing or working alongside gas fired boilers in the existing plant rooms. New refrigerant R515B, a mixture of HFO-1234ze(E)/HFC-227ea, was chosen thanks to its low flammability, low GWP (299) and relatively low condensing pressure at high temperatures - an advantage when designing high temperature heat pumps.

The use of R515B allowed J & E Hall to build the heat pump with a single stage compressor which simplified the design and reduced the capital costs.

### MINIMAL DISRUPTION

The plant rooms where the heat pumps are installed all contain the main gas-fired boilers which remained live during the installation process. The gas boilers have been retained to provide resilience on the coldest days of winter.

A 3D model was built for each plantroom to allow coordination with existing services - the WSHPs have been designed to work with the existing heat distribution system – pipework, radiators etc. The high temperature flow and return of 75/70°C ensures the heat pumps deliver the same hot water output as a gas boiler, allowing the heat pumps to hold-off the boiler firing for the majority of the time.

Over the life of the installation, the flow temperatures can be gradually lowered in in-line with fabric and emitter upgrades across the network. Despite the high temperatures, the system is still very efficient achieving a coefficient of performance of 2.9.

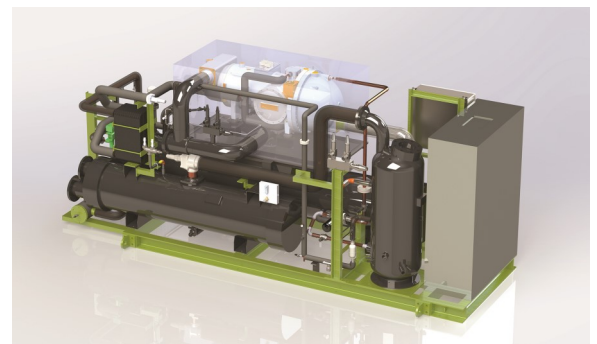
### COOLING EFFECT

Low grade heat for the heat pumps is taken from the London Chalk Aquifer using a non-consumptive open-loop scheme. Water taken from the depths of the aquifer is passed through the heat pump evaporator directly where heat is extracted. The cooled water is returned to the rejection borehole with no effect on nearby pumping stations.

The scheme has a knock-on positive effect of cooling the aquifer, reversing the effects of steadily increasing temperatures as a result of buildings utilising 'free cooling' directly from the aquifer over recent years.

### HEAT PUMP SPECIFICATIONS

- HallScrew single screw compressor
- Shell & tube water cooler
- Integral sub-cooler to improve efficiency
- Water-cooled condenser to heat water
- Small approach temperatures for all heat exchangers
- J & E Hall Fridgewatch controller



ICAX and J & E Hall continue to work together to provide a wraparound, turnkey solution for Southwark, which includes ongoing Planned Preventative Maintenance to ensure a smooth transition to decarbonised heating and cooling.