



Industrial Heat Pumps, Second Phase

IEA Heat Pump Programme Annex 48

Task 2: Structuring information on industrial heat pumps and preparation of guidelines United Kingdom Report

October 2019

Prepared by
IZW e.V.
Postbox 3007
30030 HANNOVER
GERMANY
email@izw-online.de

Based on presentations and data from Ulster University, Neil J. Hewitt

Contents

| | | |
|----------|---|------------|
| 1 | Selection of 9 case studies | 1-4 |
| 2 | Description of practice examples | 2-5 |
| 2.1 | Nestle in Halifax | 2-5 |
| 2.2 | Kingston Heights in London | 2-6 |
| 2.3 | Scottish Borders College in Galashiels | 2-7 |
| 2.4 | Wandsworth Riverside Quarter in London | 2-8 |
| 2.5 | Enfield in London | 2-9 |
| 2.6 | Bunhill in London | 2-10 |
| 2.7 | Bridgford Garden centre in Nottingham..... | 2-11 |
| 2.8 | Pusey House in Oxford | 2-12 |
| 2.9 | North Kilworth Marina in Lutterworth | 2-13 |

1 Selection of 9 case studies

A total of nine case studies in the United Kingdom were collected in the framework of IEA HPT Annex 48.

The projects are:

- Nestle (Food)
- Kingston heights (Space Heating)
- Scottish Borders College (Space Heating)
- Wandsworth Riverside Quarter (Space Heating)
- Enfield (Space Heating)
- Bunhill (Space Heating)
- Bridgford Garden centre (Space Heating)
- Pusey House (Space Heating)
- North Kilworth Marina (Space Heating)

2 Description of practice examples

2.1 Nestle in Halifax

| | | |
|-------------------|---------------------------------------|--------------------|
| Identification | No | 1 |
| | Projects (reference) | Nestle |
| Installation | Industry | Food |
| | Application | Chocolate |
| | Process applied | VCHP |
| | Location | Halifax, UK |
| | Year of installation | 1990? |
| | User (company) | Nestle |
| Technology System | HP technology | Vapour Compression |
| | HP system | Neat Pump |
| | Working fluid | R-717 |
| | Heating/cooling capacity (kW) | 1600 kW Heating |
| | Supply temperature (°C) | 60 |
| | Heat source | Processes |
| | Heat source temperature (°C) IN | 0 |
| | Heat sink | Water |
| | Heat sink temperature (°C) OUT | 60 |
| | Heat source/ heat sink | Process |
| Effects | Savings energy (%) | |
| | Savings CO ₂ emissions (%) | 120 t |
| | Savings energy cost (%) | |
| | Others: additional effects | |
| | Remarks | |

1.6 MW, 61°C, Process heating
 Evaporating temp. -5°C
 Glycol/water 5 to 0°C
 Condensing temp. 60°C
 Process heating water 12 – 60°C



2.2 Kingston Heights in London

| | | |
|-------------------|---------------------------------------|--------------------------|
| Identification | No | 2 |
| | Projects (reference) | Kingston Heights |
| Installation | Industry | Heating |
| | Application | Space Heating |
| | Process applied | VCHP |
| | Location | London, UK |
| | Year of installation | 2016 |
| | User (company) | NHP Leisure Developments |
| Technology System | HP technology | Vapour Compression |
| | HP system | Ecodan x 41 units |
| | Working fluid | R410A |
| | Heating/cooling capacity (kW) | 2300 heating |
| | Supply temperature (°C) | 45 |
| | Heat source | River Thames |
| | Heat source temperature (°C) IN | 25 down to 4 |
| | Heat sink | Water |
| | Heat sink temperature (°C) OUT | 45 |
| | Heat source/ heat sink | Under floor |
| Effects | Savings energy (%) | |
| | Savings CO ₂ emissions (%) | 500 t/y |
| | Savings energy cost (%) | |
| | Others: additional effects | |
| | Remarks | |

- Kingston Heights, Surrey UK
 - Constructed May 2013
 - 2.3MW heat pump for heat & cool
 - 10°C water from River Thames; 45°C flow temp
 - 137 apartments & 145-room hotel



2.3 Scottish Borders College in Galashiels

| | | |
|-------------------|---------------------------------------|--------------------------|
| Identification | No | 3 |
| | Projects (reference) | Scottish Borders College |
| Installation | Industry | Heating |
| | Application | Space Heating |
| | Process applied | VCHP |
| | Location | Galashiels, UK |
| | Year of installation | 2015 |
| | User (company) | Sharc |
| Technology System | HP technology | Vapour Compression |
| | HP system | Sharc |
| | Working fluid | R134a |
| | Heating/cooling capacity (kW) | 800 heating |
| | Supply temperature (°C) | 60 |
| | Heat source | Sewerage |
| | Heat source temperature (°C) IN | 7-13 |
| | Heat sink | Water |
| | Heat sink temperature (°C) OUT | 60 |
| | Heat source/ heat sink | Radiators |
| Effects | Savings energy (%) | |
| | Savings CO ₂ emissions (%) | 1700 t/y |
| | Savings energy cost (%) | |
| | Others: additional effects | |
| | Remarks | |

- First sewage heat recovery system in the UK
- 800kW Carrier heat pumps using sewage as heat source
- Provides heat to 5 remote plant rooms via preinsulated heat network
- Annual heat demand c.1.6GWh
- Average SCOP 3.8 (23 months)
- Saves 152te CO₂/year or 40% of gas alternative
- Generates £112k/year RHI + heat sales
- Annual electricity bill £53K
- IRR >10%



2.4 Wandsworth Riverside Quarter in London

| | | |
|-------------------|---------------------------------------|------------------------------|
| Identification | No | 4 |
| | Projects (reference) | Wandsworth Riverside Quarter |
| Installation | Industry | Heating |
| | Application | Space Heating |
| | Process applied | VCHP |
| | Location | London, UK |
| | Year of installation | 2013 |
| | User (company) | |
| Technology System | HP technology | Vapour Compression |
| | HP system | J&E Hall WHP 602 |
| | Working fluid | R134a |
| | Heating/cooling capacity (kW) | 1150 heating, 1100 cooling |
| | Supply temperature (°C) | 45 |
| | Heat source | Borehole |
| | Heat source temperature (°C) IN | 14-16 |
| | Heat sink | Water |
| | Heat sink temperature (°C) OUT | 45 |
| | Heat source/ heat sink | |
| Effects | Savings energy (%) | |
| | Savings CO ₂ emissions (%) | |
| | Savings energy cost (%) | |
| | Others: additional effects | |
| | Remarks | |

Wandsworth Riverside Quarter

Building scale: 504 apartments
 Type: New build
 Heat pump type: 2.5 MW Aquifer Thermal Energy Storage (ATES) system using heat pumps
 Status: In operation
 Contact: Iftech



2.5 Enfield in London

| | | |
|-------------------|---------------------------------------|--------------------|
| Identification | No | 5 |
| | Projects (reference) | Enfield |
| Installation | Industry | Heating |
| | Application | Space Heating |
| | Process applied | VCHP |
| | Location | London, UK |
| | Year of installation | 2019 |
| | User (company) | Enfield Council |
| Technology System | HP technology | Vapour Compression |
| | HP system | Kensa |
| | Working fluid | R410A |
| | Heating/cooling capacity (kW) | 2500 heating |
| | Supply temperature (°C) | 45 |
| | Heat source | Borehole |
| | Heat source temperature (°C) IN | 14-16 |
| | Heat sink | Water |
| | Heat sink temperature (°C) OUT | 45 |
| | Heat source/ heat sink | Under floor |
| Effects | Savings energy (%) | |
| | Savings CO ₂ emissions (%) | |
| | Savings energy cost (%) | |
| | Others: additonal effects | |
| | Remarks | |

2.6 Bunhill in London

| | | |
|-------------------|---------------------------------------|---------------------|
| Identification | No | 6 |
| | Projects (reference) | Bunhill |
| Installation | Industry | Heating |
| | Application | Space Heating |
| | Process applied | VCHP |
| | Location | London, UK |
| | Year of installation | 2019 |
| | User (company) | Islington Council |
| Technology System | HP technology | Vapour Compression |
| | HP system | GEA |
| | Working fluid | R717 |
| | Heating/cooling capacity (kW) | 1000 Heating |
| | Supply temperature (°C) | 75 |
| | Heat source | London Under ground |
| | Heat source temperature (°C) IN | 24 |
| | Heat sink | Water |
| | Heat sink temperature (°C) OUT | 75 |
| | Heat source/ heat sink | Radiators |
| Effects | Savings energy (%) | |
| | Savings CO ₂ emissions (%) | |
| | Savings energy cost (%) | |
| | Others: additional effects | |
| | Remarks | |

2.7 Bridgford Garden centre in Nottingham

| | | |
|-------------------|---------------------------------------|-------------------------|
| Identification | No | 7 |
| | Projects (reference) | Bridgford Garden Centre |
| Installation | Industry | Heating |
| | Application | Space Heating |
| | Process applied | VCHP |
| | Location | Nottingham, UK |
| | Year of installation | 2018 |
| | User (company) | Bridgford Garden Centre |
| Technology System | HP technology | Vapour Compression |
| | HP system | CIAT |
| | Working fluid | R410A |
| | Heating/cooling capacity (kW) | 400 heating |
| | Supply temperature (°C) | 45 |
| | Heat source | Air |
| | Heat source temperature (°C) IN | Air |
| | Heat sink | Water |
| | Heat sink temperature (°C) OUT | 45 |
| | Heat source/ heat sink | under floor |
| Effects | Savings energy (%) | |
| | Savings CO ₂ emissions (%) | |
| | Savings energy cost (%) | |
| | Others: additonal effects | |
| | Remarks | |

2.8 Pusey House in Oxford

| | | |
|-------------------|---------------------------------------|---------------|
| Identification | No | 8 |
| | Projects (reference) | Pusey House |
| Installation | Industry | Heating |
| | Application | Space Heating |
| | Process applied | VCHP |
| | Location | Oxford, UK |
| | Year of installation | 2018 |
| | User (company) | Pusey House |
| Technology System | HP technology | |
| | HP system | |
| | Working fluid | |
| | Heating/cooling capacity (kW) | |
| | Supply temperature (°C) | |
| | Heat source | |
| | Heat source temperature (°C) IN | |
| | Heat sink | |
| | Heat sink temperature (°C) OUT | |
| | Heat source/ heat sink | |
| Effects | Savings energy (%) | |
| | Savings CO ₂ emissions (%) | |
| | Savings energy cost (%) | |
| | Others: additional effects | |
| | Remarks | |

- Pusey House, Oxford

- Georgian Grade 2 listed building
- 292kW heat pump, 3,000l buffer vessel
- 300m horizontal ground collector
- Replaces oil fired boilers
- District heat scheme encompasses other estate buildings



2.9 North Kilworth Marina in Lutterworth

| | | |
|-------------------|---------------------------------------|-----------------------|
| Identification | No | 9 |
| | Projects (reference) | North Kilworth Marina |
| Installation | Industry | Heating |
| | Application | Space Heating |
| | Process applied | VCHP |
| | Location | Lutterworth, UK |
| | Year of installation | 2017 |
| | User (company) | North Kilworth Marina |
| Technology System | HP technology | Vapour Compression |
| | HP system | EcoForest |
| | Working fluid | R410A |
| | Heating/cooling capacity (kW) | 200 heating |
| | Supply temperature (°C) | |
| | Heat source | water |
| | Heat source temperature (°C) IN | |
| | Heat sink | water |
| | Heat sink temperature (°C) OUT | |
| | Heat source/ heat sink | under floor |
| Effects | Savings energy (%) | |
| | Savings CO ₂ emissions (%) | |
| | Savings energy cost (%) | |
| | Others: additional effects | |
| | Remarks | |