

# HOT news

Technical Series 2006  
No.1

THE HEATING CONTRACTS UPDATE FOR STAFF & MANAGEMENT OF THE HOUSING EXECUTIVE & HEAT, ENERGY & ASSOCIATED TECHNOLOGY

## Technical Bulletin

### Pilot Scheme Air Source Heat Pump

Renewable Energies and Alternative Heating in conjunction with Leeds City Council (LCC) and Leeds North West Homes (LNWH)

As a pilot programme with Leeds City Council (LCC) Property Management Services and Leeds North West Homes (L.N.W.H), HEAT has completed another new project utilising an Air Source Heat-Pump (ASHP) providing a heat and hot water system utilising a new hybrid thermal store. The wet heating system comprises a total of 7 radiators and a hi-line unit sized for the low water flow temperature of 50°C.

The property identified by L.N.W.H was No. 2, Warren Lane, Arthington, Leeds. The property had existing Economy 7 heaters coupled with a solid fuel stove in the living room and solid fuel heater in the dining room. This system was extremely inefficient and the running costs excessive for the original tenant.

The initial plans were to install a natural gas High Efficiency boiler with full central heating but it became apparent that this was not possible, as the area is outside of the Transco licensed natural gas area. The cost to provide gas for this property and neighbouring properties was prohibitive. This prompted L.N.W.H to work with



No. 2 Warren Lane, Arthington, Leeds

HEAT to consider alternative heating solutions. Considering carbon emission reduction, ASHP was the ideal solution for heating only, but this still left the efficient provision of domestic hot water to be a problem.

### The Challenge

The challenge was to identify a way to combine the principles of a thermal store with the limitations of operating an ASHP. Fortunately, Gledhill Appliances have been working on developing a solution so HEAT and LCC visited the Gledhill factory in Blackpool to see the product in operation. It became clear that it is possible to provide both heating and mains pressure hot water from an ASHP renewable energy source.

The combination of the ASHP with the Gledhill Thermal Store has two main benefits: (1) it allows the heat pump to run for longer cycles which maximises the efficiency of the heat pump; (2) it allows the heat pump to deliver the majority of the hot water up to 50 deg and then boost it when required in the top tank to remove the risk of legionella forming in stored water. The Gledhill hybrid solution overcomes these impracticalities by the use of an innovative design.



The primary tank is designed to have a distinct thermal stratification between the upper portion, from which the heating flow is extracted and the tank base section to which the heating return is directed. The DHW contribution is derived from a secondary unvented tank, physically located above the primary tank, in which a single internal exchanger coil is fed from the upper stratified area of the primary tank offering a pre-heat capability approaching 50°C. The unvented DHW tank can then be boosted to a set temperature above 60°C, a minimum requirement in the prevention of legionella using direct electrical heating, utilising off-peak tariffs.

## Identifying the Products

At the outset of the scheme, research was carried out by HEAT and L.C.C Property Management Services, to decide on products that would be "fit for purpose". After visits to a number of manufacturers, the Heat King "B Warm" product range from Marstair was identified as a viable, well packaged air source heat pump available as a standard production item. The hybrid Boilermate HP thermal store, developed and manufactured by Gledhill Water Storage is thought to be unique in the market, offering energy storage and modulation capable of addressing heating and DHW needs using ASHP derived energy. All parties were very keen to put the



Heating B-Warm Air Source Heat Pump

project together as this installation is the first commercial deployment combining the two product technologies, in addition to the significance of the application in social housing without gas connection. Throughout the UK housing stock, there are currently a large number of electrically heated multi-occupancy high rise dwellings in need of a viable replacement heating system. The ASHP can be used at any elevation, requires minimal maintenance and offers up to 3 fold improvement in respect of carbon emission reduction, when compared with direct electric boilers.



Gledhill Boilermate HP

If deployed in volume this approach could have a significant impact on the achievement of decent home standards, with a positive contribution to the alleviation of fuel poverty and the carbon reduction profile in social housing.

Pictured left and above right are both products on site at 2 Warren Lane.

## The Aims of the Pilot Scheme

The object of the pilot scheme was to look at alternative heat sources to natural gas & oil utilising available technologies which can reduce CO2 emissions and provide an economical means of heating for LNWH tenants. This scheme is complimentary with a previous pilot scheme installed by Heat at 13 Albert Square, Leeds, utilised a High Efficiency natural gas condensing boiler coupled with a retro-fit "overlay" under-floor heating system. The lower operating temperature of the under-floor heating system allowed the condensing boiler to operate more often in condensing mode, ensuring a more evenly balanced system and lower running costs - the estimated weekly running cost is £6.45, based on monitoring systems employed by Ian Parker of L.C.C Property Management Services.

# Principles of Air Source Heat Pumps

The principles of the ASHP are to use similar technology to that employed in domestic refrigerators. It is an electrically powered appliance consisting of a compressor, a carefully matched evaporator coil and heat exchanger. The unit is designed to provide space heating through either a wet radiator or under-floor system, by extracting heat from the outside air.

Typically the heat passed into the property will be 3 times the energy used by the compressor and fan delivering a Coefficient of Performance (COP) of 3.

## Environmental Implications

The carbon emission is thus reduced from 0.422kg/kWh (SAP2005 value for grid electricity) to 0.14kg/kWh, a figure less than gas (0.194kg/kWh).

For the record, using a Ground Source Heat Pump (GSHP) can deliver a COP of 4, reducing the effective emission level to 0.11kg/kWh.



## Monitoring Consumption

In order to monitor the performance of both appliances, meters have been fitted to record both the hot water consumption and use of electric purely for the ASHP and Thermal Stor.e

A separate meter was fitted to record the usage of the 2 kW electric fire in the living room, compared to the over-all system. LCC will be closely monitoring the system



A water meter records the usage of hot water

performance over the coming months as there are 4 other properties in Warren Lane with Economy 7 heating in need of a more controlable and cost efficient solution.

## Benefits to the Tenant

On completion the system is to be set up on an Economy 10 tariff, or similar, and closely monitored by L.C.C Property Management Services.

A new tenant has been identified and informed of the new system being installed in the property. In regards to ease of use by the tenant, a Danfoss TP5000 programmable room thermostat has been installed and will be set according to the requirements of the tenant.

The system has initially been set up to work in its most cost effective manner with a daytime set temperature and a night-time setback. The Heat-pump unit operates simply on demand from the primary store controller. This will ensure that the property is kept at its optimum temperature throughout, increasing the comfort level and provide mains pressure hot water on demand.

To improve running costs, the original 8kw electric shower has been removed and replaced with a new "Grohe" thermostatic shower, running off the unvented store, working at mains pressure.

The thermostatic shower will provide the tenant with optimum convenience and reduce the risk of scalding.

## And the final analysis

It is still early days for this type of installation but all parties involved are extremely confident that it will not only be a success, but hopefully be an introduction to looking at future programmes for installations on a wider scale. With regards to Renewable Energies, HEAT, L.N.W.H & L.C.C are also jointly investigating the specification options for Solar Thermal systems for consideration as the next project pilot.

### HEAT's Kieran Adams who project managed the scheme comments



“It is refreshing to have clients such as LNWH and LCC who are prepared to take that extra leap forward and think ‘outside the box when it comes to alternative and innovative solutions to local authority heating and hot water requirements.”

This project, and the project in Albert Square, have given HEAT the opportunity to use their expertise and dedicated design team, based in Belfast, to the best of their abilities.

It is refreshing to have clients such as LNWH and LCC who are prepared to take that extra leap forward and ‘think outside the box when it comes to alternative and innovative solutions to local authority heating and hot water requirements. With soaring energy costs and questionmarks over the long term availability of natural gas, the days of just fitting a gas combi boiler on the wall appear to be fading.



Danfoss 5000 TP programmable room thermostat



A Grohe thermostatic shower



[www.heat.co.uk](http://www.heat.co.uk)