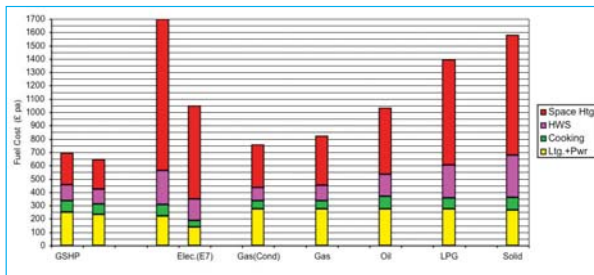


Ground Source Heat Pumps Cutting Carbon Emissions

CALOREX GROUND SOURCE HEAT PUMPS PLAY A VITAL ROLE IN GOVERNMENT PLAN TO CUT ENERGY CONSUMPTION AND REDUCE CO₂ EMISSIONS...

Calorex's award-winning ground source heat pumps can help UK householders slice more than half off their annual heating bills.

With home energy use responsible for 27 per cent of UK CO₂ emissions, the green machines are set to become a vital weapon in the battle to improve the nation's carbon footprint. Designed specifically for residential use in the UK, the ground source units offer considerable running cost advantages against gas and oil fired systems and up to 70% savings over other common fuels such as LPG, electric storage heating and solid fuel. The icing on the cake is that the property can boast a



■ Annual Fuel Cost Comparison (100m² - September 2006 tariffs)

client requirements consistently challenge historical decision making and common practices in the UK building services and construction industries," says Tony Barnes, Calorex's Domestic Heating Sales Director.

"As ever-increasing gas and oil prices continue to dominate the news, alternative renewable and

heating and hot water worked out at just over £240 per annum per property. The average seasonal performance factors for the heat pumps were calculated at 4.1 when delivering low temperature water to the under-floor heating and 2.25 when delivering high temperature water to the primary coil of the hot water cylinder.

"Carbon emissions, renewable energy, sustainable communities, life-cycle costs and many combinations of

sustainable energy options now demand a much higher profile when specifications and project options are discussed and agreed," he added.

A typical Calorex Ground Source Heat Pump will produce 4kW of heat for every 1kW used to operate the heat pump giving a typical efficiency of 400%. Once the system is installed the only cost is associated with the function of extracting the heat from the ground.



complete zero carbon emission footprint when supplied by green tariff electricity.

The heat pumps can be used with either radiators or under-floor heating and can deliver domestic hot water (DHW) at 65°C. Following a study of more than 40 houses over both summer and winter periods, figures demonstrated more than a 50% reduction in overall carbon emissions while annual average running costs for

Ground Source Generates Free Heat from the Ground

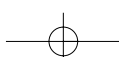
For every unit of electricity used, three or four units of heat are produced by the ground source heat pump. Available in four sizes with thermal power outputs of 3.5 kW, 5.0 kW, 8.0 kW and 12 kW respectively, the units are suitable for houses with floor areas up to around 280m² built to present day Building Regulation standards.

The units are unusual in having a dual control mode which delivers either a high



temperature output (up to 65°C) when heating domestic hot water, or low temperature (selectable within the range 35 to 55°C) when providing space heating to underfloor or radiator based systems. This wide range of output temperature means that the total requirements for both space and water heating can be provided without recourse to the use of direct acting electric flow boilers or immersion heaters which

have less efficiencies and are very expensive top-up devices.



Capturing The Earth's Energy

The Calorex ground source heat pump is a simple device designed to collect the solar energy stored naturally at low temperature in the ground around a building and transfer it into the heating system.

It is such an efficient process, it can provide 100% of dwelling space and water heating at lower running costs than a condensing gas boiler.

The system is extremely simple and consists of a long length of very tough plastic pipe buried in the ground (called the 'ground heat exchanger' or 'ground loop') connected through a water circulating pump (the 'source pump') to the evaporator of a vapour compression refrigeration unit (the 'heat pump').

Connections

The building's heat distribution system is connected to the condenser ('output' or 'load') side of the heat pump, in the same way as connecting to the flow and return of a conventional boiler.

The highest operating efficiencies arise when low temperature systems such as underfloor heating are used, although radiators are perfectly acceptable providing

they are sized appropriately.

Domestic hot water at 65°C is provided from a specially designed indirect cylinder. There is no need for any supplementary immersion heater top-up.

The ground loop heat exchanger is made from high density polyethylene pipe and is virtually indestructible. This pipe is buried in the ground in a configuration and size

designed to suit both the site layout and the energy needs.

Vertical borehole loops require less land but require specialist installation, horizontal layouts need a lot more space but can be installed on a DIY basis.

The earth gives ground temperatures which are not only stable but, on average in the UK, are within the range 8°C - 14°C.

Results from two developments of small well insulated 'Housing Association' bungalows with total annual useful space and water thermal energy requirements of 8000 kWh (60m²) and 12500 kWh (100m²).

| HEATING AND HWS SYSTEM | ANNUAL FUEL COST [£ P.A.] (SEPT 2006) | ANNUAL CO ₂ EMISSIONS [TONNÉS P.A.] |
|--------------------------------------|---------------------------------------|--|
| House Floor Area: | 60m ² - 100m ² | 60m ² - 100m ² |
| Typical Heat Loss (kWth): | 2.1 - 3.5 | 2.1 - 3.5 |
| Annual Useful Heat (kWth): | 8000 - 12500 | 8000 - 12500 |
| Ground source heat pump | £261 - £380 | 1.1 - 1.6 |
| Condensing gas boiler | £310 - £460 | 2.0 - 3.0 |
| Non-condensing gas boiler | £360 - £535 | 2.3 - 3.5 |
| LPG (bottle) (non-condensing) | £540 - £835 | 2.9 - 4.5 |
| Oil (28sec) (non-condensing) | £390 - £600 | 3.1 - 4.8 |
| Electricity (storage + panels) | £950 - £1475 | 3.9 - 6.2 |
| Smokeless coal (stove + back boiler) | £700 - £1075 | 6.8 - 10.4 |

Calorex Ground Source Pumps Rise To Meet UK CO₂ Challenge

The UK has challenging targets for the reduction of greenhouse gases both in the long and short term.

The short-term target is to reduce carbon emissions by 20 per cent by 2010 with a 60 per cent reduction target by 2050.

So all eyes were on an accumulated total of 600,000

hours of service provision that has been recorded from the first two sites in the country to adopt Calorex GSHP technology.

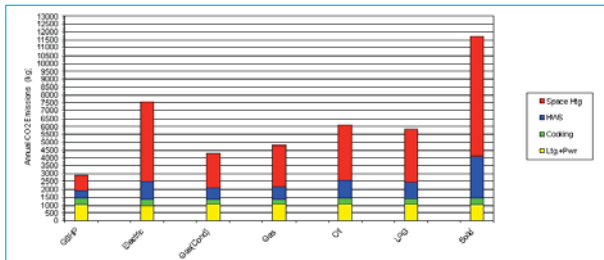
Statistics

One site has been continuously measured for three years, the second site for two years. All the houses were retirement

bungalows of similar size, shape, heat loss, occupancy, and usage with a mix of underfloor heating and radiator space

quite wide dependent on individual requirements of the occupiers.

Average domestic hot water



■ Comparison of total annual CO₂ emissions (100m²).

heating. All DHW requirements were serviced by conventional gravity fed hot water cylinders.

The useful space heating requirement averaged 8150 kWh pa (= c.97kWh / m²) across all the sites, although the range across individual houses was

usage averaged 2550 kWh per annum per house (= c. 7.0 kWh / house / day). Average annual electricity consumption by the heat pump for space heating was just over 2038 kWh, and for domestic hot water provision around 1135 kWh.

calorex
the UK's leading manufacturer of heat pump technology



- Market leading range of Ground Source and Air Source heat pumps up to 12kW for domestic applications.
- More domestic Ground Source installations in UK than any other manufacturer.
- Award winning products designed specifically for UK housing stock.
- Small compact units ideal for optimising valuable living space.
- Single phase 240v electrical supply.
- Controlled with standard central heating programmer and room thermostat.
- Simple to install.
- Ideal for new build or retro fit installations.
- Deliver domestic hot water at 65°C without electrical back up.
- Provide space heating with either radiators or underfloor heating.
- Low running costs and negligible whole of life costs.
- Zero carbon emissions from installation property.
- High COP's.



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Green Machines Are Double Winners

Calorex is celebrating after supplying the ground source heat pumps featured in two recent high profile award wins.

Since 2005 Calorex has worked in partnership with Carrick Housing Association on a Cornish housing scheme of circa 200 properties. This collaboration received national recognition in November 2006 when Carrick Housing was awarded the South West Green Energy Award for best renewable energy initiatives in housing.

At Interbuild 2006 held at Birmingham's NEC, Calorex ground source heat pumps, offered through Powergen as Heatplant by Calorex, scooped the Best New Energy-Saving Product Award.



■ Simon Waters, left, and Tony Trolley, right, from Carrick Housing pictured with a Calorex ground-source heat pump unit.

The ground source heat pump is specifically designed to provide all the space and water heating for the typical small well insulated houses being built by Housing Associations and other social landlords. They are particularly suitable in areas of the country not served by mains gas.

The larger units in the Calorex range are suited to well insulated New Build properties up to 280 m² and can assist developers in achieving renewable energy caviats in planning conditions.