

# HEAT PUMP NEWS

## *Saving Energy*

**HPA**  
HEAT PUMP ASSOCIATION

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Issue: 1 Autumn 2002

## WELCOME...

to the first issue of HPA Heat Pump News. Our aim is to present the interesting variety of uses for heat pumps, making it easier to grasp where they maybe installed.

- HEAT PUMP TECHNOLOGY IS AVAILABLE TODAY.
- HEAT PUMPS OFFER LEVELS OF EFFICIENCY UNATTAINABLE BY BOILERS OR ELECTRIC HEATING.
- HEAT PUMPS REDUCE CO<sub>2</sub> EMISSIONS AND ARE RECOMMENDED BY THE GOVERNMENT SPONSORED CARBON TRUST AS A RENEWABLE TECHNOLOGY.

Heat pumps are all around you — reverse cycle air conditioners are heat pumps, as are dehumidifiers, many heat recovery/water heating units and process dryers.

In this and further issues we will have articles covering applications for heat pumps and supplying useful data for specifiers and designers. On each application article you will find the contact details of the HPA member involved, so feel free to contact them directly for more information.

We intend including informative articles giving a background to heat pumps and the energy debate, as well as vital facts to help you with energy/CO<sub>2</sub> calculations.

All specifiers and local authorities now need to be aware of new legislation in the UK and Europe, and it will be our aim to keep you updated with the latest developments.

We hope that this newsletter gives you an insight into the many jobs this excellent technology can do for you.

To request your regular copy of Heat Pump News or to become a member of the HPA, please see back page for details.

**Tony Bowen, President, HPA**



*Heat pumps, helping to sustain environmental conditions for scientists carrying out vital medical research.*

## This Issue

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Powergen enters new era of low-cost, low-carbon heating

UK Abandoned Mines could provide low cost heating

World Energy News

## Heat Pump Association Update

**The UK Heat Pump Association (HPA), which is now an integral part of FETA, was formed by a group of companies that supply practical energy efficient Heat Pump solutions to the growing commercial and domestic markets.**

Through intense liaison with various government agencies the HPA has successfully achieved the awareness of Heat Pump technology, causing the UK government to include heat pumps in the key list of energy efficient products to benefit from the Enhanced Capital Allowances (ECA) scheme. This recently introduced tax incentive scheme allows the capital cost of approved products to be offset against tax in the first year.

The Carbon Trust in London, a recently formed body charged with the long-term policy for the reduction of energy consumption in the UK economy, has already named heat pumps among the renewable technologies that it wishes to foster.

UK government policy is aiming at increasing the amount of 'green' energy made available by the utilities, which in turn will feed strongly into heat pump technologies, providing high efficiency products with lower CO<sub>2</sub> emissions.

The UK HPA has recently widened its membership categories in recognition of the growing interest in heat pumps in the UK. Inclusion of consultants, utilities and specifiers permits the organisation to speak with greater authority on heat pump related installations, services and applications.

The HPA activities are being further enhanced by the Heat Pump Network, funded by DEFRA, who are continuing to promote heat pumps through country wide seminars, together with working committees developing different applications.

# Braeaire Fits Foundry

Braeaire Ltd (ANEX) have considerable expertise in design and manufacture of specialised heat recovery, all forms of heat pumps and industrial drying units.

In July 2001, Braeaire designed, manufactured and installed a mould drying unit in a Foundry at Polycast Ltd in Southampton. This unit is roof mounted and connected to ducting installed into the mould drying room.



The mechanical vapour compression heat pump air drier/heater with controlled supply air temperature was added to an existing high air velocity drying chamber. The products being dried require to be kept at a very constant temperature and humidity. The heat pump drier closely controls the amount of refrigerant reheat to the cooled dry air in order to meet the requirements of  $\pm 0.75^{\circ}\text{C}$  supply air temperature. The air is cooled to  $2^{\circ}\text{C}$  saturated and reheated to maintain  $22.5^{\circ}\text{C}$  in the drier with the surplus heat rejected to atmosphere.

The control of supply air temperature and dryness of the air has significantly reduced high mould wastage and the client has reported the finish of the moulds to be superior to those prior to the unit being installed.

Dependant on the amount of reheat used there is a coefficient of performance (COP) of 3 to 5.8. The unit maintains operation conditions of 40% to 45% humidity at temperatures of  $22^{\circ}\text{C}$  to  $23^{\circ}\text{C}$ .

This form of heat recovery saves considerable running costs and is in line with the Climate Change Levy and the Kyoto Protocol.

**Braeaire Tel: 0238 0556866**



# Powergen enters new era of low-cost, low-carbon heating

Powergen is targeting the UK social housing sector and is to install 1,000 ground source heat pumps in selected locations across the country, with a promise to deliver lower cost heating and lower carbon emissions than any conventional system.

The technology, which extracts heat from the ground, is so efficient that it causes 50% less carbon dioxide emissions than a conventional gas boiler.

## Environmental Benefits of Heat Pumps

Under the Kyoto Protocol the EU has agreed to reduce the emissions of global warming gases by 8% by 2008 to 2012.

In addition to this, the UK has undertaken to reduce CO<sub>2</sub> emissions by 20% by 2010. In order to achieve this target a number of initiatives have been introduced by Government including the promotion and encouragement of the installation of Combined Heat and Power (CHP), emphasised by the announcement of a demonstration project of 6,000 domestic units, starting later this year.

CHP is widely recognised as environmentally friendly compared with the separate production of heat and power and, on the whole, this is true. The exception is when heat is supplied by a heat pump, and in particular by a ground-source or

geothermal heat pump, which can be 10% to 15% more carbon efficient than a domestic CHP unit, as shown in the table below.

In the non-domestic market the installation of 'good quality' CHP is encouraged by entitling it to enhanced capital allowance, offsetting the whole of the cost against tax in its first year. The fuel it uses is also exempt of Climate Change Levy. The same logic should also be applied to heat pumps, provided they achieve a minimum coefficient of performance, equivalent to the 'good quality' standard of CHP.

In his Budget in April 2002, the Chancellor announced that heat pumps would indeed be added to the list of energy efficient products qualifying for enhanced capital allowance, which is an encouraging first step, because it is official recognition of heat pump technology being energy efficient.

This is the next major challenge for the heat pump industry, through the Heat Pump Association, to achieve.

**Paul Sterlini, May 2002.**

| System                           | Efficiency   | Unit<br>kg CO <sub>2</sub> / kW/h | Average<br>kg CO <sub>2</sub> / kW/h |
|----------------------------------|--------------|-----------------------------------|--------------------------------------|
| CHP                              | 93%          | 0.19                              | 0.204                                |
| Gas Boiler<br>+ Grid Electricity | 78%<br>100%  | 0.19<br>0.43                      | 0.267                                |
| Oil Boiler<br>+ Grid Electricity | 85%<br>100%  | 0.25<br>0.43                      | 0.311                                |
| Heat Pump<br>+ Grid Electricity  | 300%<br>100% | 0.43<br>0.43                      | 0.178                                |

### Notes:

- (i) Boiler efficiency is that required by Building Regulations 2002, Approved Document L1.
- (ii) Heat pump efficiency is from SAP and includes direct electric top-up heat.
- (iii) Unit CO<sub>2</sub> emission rates are from DEFRA.
- (iv) Average CO<sub>2</sub> emissions assume the same delivered quantities of heat and electricity for each system.

Paul Golby, Powergen UK's Chief Executive, said: "Today's announcement marks the beginning of a new era in the way we heat our homes in this country."

"Ground source heat pumps not only offer cheap and reliable heating, they also cut down on greenhouse gases, which are a major cause of global warming."

"This technology is also a major step towards the PIU Energy Review's call for near-zero space heating buildings, as well as making it easier and cheaper for the people who can least afford it to heat their homes to a good standard."

The ground source heat pump is a simple device designed to continually

collect the solar energy stored naturally at a low temperature in the ground around a building.

Powergen commissioned British manufacturer Calorex to produce a specific heat pump for the social housing market. The programme announced today brings together the expertise required to deliver the technology to market.

The system consists of a length of pipe buried in the ground in a loop formation. A mixture of water and antifreeze is pumped through the pipe; the heat pump brings the energy to a useful temperature (maximum 70°C for domestic hot water) and circulates it to a property's central heating.

The technology is particularly suitable for new build, highly insulated, homes.

For a three-bed (100m<sup>2</sup>) well-insulated property, the annual energy, carbon dioxide and fuel cost comparisons are as follows:

|                           | Conventional Boiler  | Ground Source Heat Pumps    |
|---------------------------|----------------------|-----------------------------|
| Energy                    | 17,000 kW/h pa (Gas) | 3,500 kW/h pa (Electricity) |
| CO <sub>2</sub> Emissions | 3,400 kg pa          | 1,700 kg pa                 |
| Running Cost              | £335 pa              | £225 pa                     |
| Life                      | 15 years             | 20 years                    |

## UK Abandoned Mines could provide low cost heating

**Dr. C. A. Nuttall and Dr. J. G. M. Lee of the Department of Civil Engineering at Newcastle-upon-Tyne University are seeking collaboration for a UK feasibility study into using water in abandoned mine shafts as a potential energy source.**

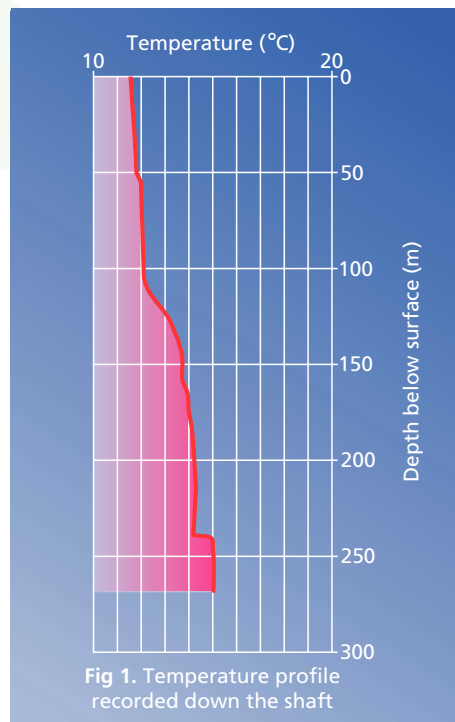
The Abandonment of the major coalfields in the UK has led to many of these sites being sold off for housing/industrial developments. The sites commonly include mine shafts which provide an opportunity to access vast quantities of warm groundwater at depth.

The fact that many of the sites are now entering a development phase means that if they were deemed suitable for this process, heat pump technology could be incorporated into the design phase, which has many advantages over adding this technology at a later stage.

Mine waters have previously been used as heat pump energy sources in Canada. Jessop *et al.*, 1995 successfully used mine water at 18°C directly from the flooded former coal mines of Springhill, Nova Scotia to provide hot water and heating for a nearby industrial building. We would aim to seek funding to carry out feasibility studies for mine shafts in the UK with a view to developing this technology in collaboration with heat pump manufacturers.

Mine shafts in the UK would merit exploration because the size and high degree of interconnection of many collieries provides vast reserves of water from which heat energy can be extracted. Inflows through submerged roadways should ensure that a constant temperature will be maintained within the mine as heat is extracted.

A temperature profile taken at a shaft in the UK showed temperatures of 16°C existing at the bottom of the shaft ( Figure 1). The limited data obtained to date also shows that similar temperatures exist within other coalfields.



Mine waters pumped and sampled at surface throughout the UK have also given temperatures of 16°C to 18°C. To avoid the need for abstraction licences/discharge consents and potential mine water quality problems at some sites we would propose to use a closed system which would involve circulating a refrigerant rather than use mine water directly.

The aims are as follows:

- Carry out a feasibility study to assess potential sites.
- Calculate the physical and economic viability of each site (i.e. shaft access, temperature, type of proposed development and its proximity to the water source, costs of making an installation).
- Incorporate heat pump technology into future developments at these sites.

These aims would be achieved by:

- Collaborating with heat pump manufacturers to test the technology.
- Carrying out targeted sampling of shafts for temperature and inflows at as many sites as possible.

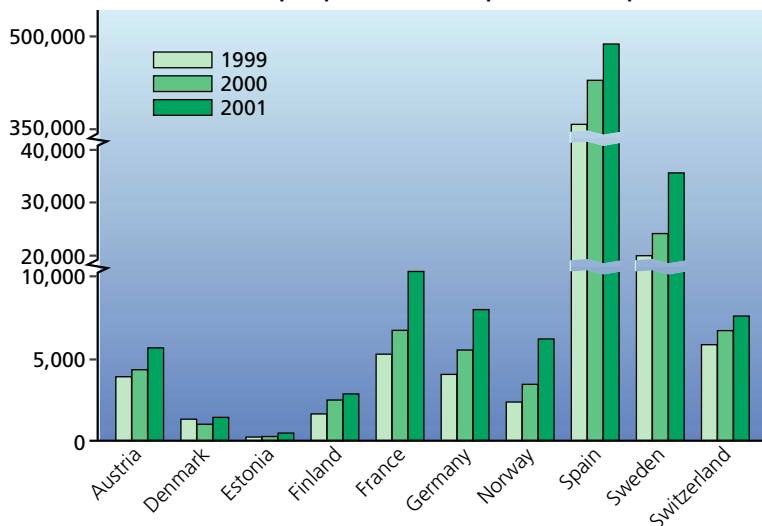
**Keith Sutton, ARC Today, July 2002.**

# World Energy News

- Kyoto may come into force in the next few months (as reported September 4th, 2002) due to the surprise at the Earth Summit of both Russia and Canada stating that their countries would ratify the Kyoto treaty to combat global warming. The announcement paved the way for the deal to take effect possibly before the end of 2002.
- BP Solar has won its largest contract to provide 90,000 photovoltaic cells for what is reported as the largest solar electricity scheme of its type in Europe. The scheme will provide 10% of the electricity required at a new European Headquarters under construction in Ipswich, Suffolk.
- Austria. The Heat pump market grew by 21% in 2001 taking the installed capacity up to 66.2GW/h of renewable energy — a huge saving of fossil fuels and an important contribution to the reduction of CO<sub>2</sub> emissions. They are used for domestic and commercial water heating and space heating.
- The renewable energy lobby gained ground when the UK government's renewable's policy, which forces electricity companies to supply 3% of electricity sales from green energy sources in 2002 rising to 10.4% in 2011, or pay a penalty.
- Japan. Engineers in Japan have developed a heat pump that uses CO<sub>2</sub> as the refrigerant. A COP of 3 has been achieved.
- Sweden. More than 90% of all new homes in Sweden are equipped with a heat pump. 36,000 units were installed in 2001.
- The news came as a blow to President George Bush, who did not attend the summit and had set out since his election last year, to try and kill the treaty. With the Chinese Premier, Zhu Rongji, having announced China's ratification of the treaty to the delight of the delegates, this further endorsed the treaty being brought into force.

These decisions leave America and Australia isolated in rejecting the Kyoto treaty.

Residential heat pump market development in Europe 1999-2001



- Heat pump market development in Europe has been steady and prosperous (especially in Sweden, Switzerland and Spain). In recent years, new markets have begun to develop, for example in Finland, Czech Republic and Estonia. The chart above shows market growth over the past three years in most countries. Outstanding growth can be found in Sweden, France and Norway. On a per capita base, Sweden leads Europe and is followed by Austria.

## Association Members:

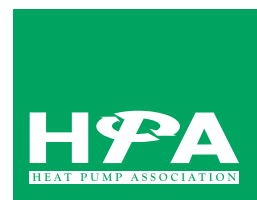
Calorex Heat Pumps  
 Airedale International  
 Air Conditioning  
 Daikin Europe  
 Braeaire  
 Eaton-Williams Group  
 Clivet UK  
 Earth Energy Engineering  
 Powergen Energy Efficiency Services  
 Fujitsu  
 Mitsubishi  
 Pillinger Air  
 Veissmann UK  
 Toshiba Carrier UK  
 ACR Today  
 DTI  
 BRE  
 Electricity Association

## How to Join:

The Heat Pump Association is dedicated to the implementation of applying the available technology of heat pumps and will achieve this goal with the aid of new members joining the already committed companies.

Therefore any company that would like to receive information on how to join the HPA and share in the continuing benefits of all our members, please contact the HPA secretary Howard Roberts:

*E-mail:* howardr@feta.co.uk.  
*Telephone:* 01491 578674  
 or by fax back form below.



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**Attention of  
 Howard Roberts HPA Secretary**

Please send me information on, tick box(es) below:

Joining the HPA  Receiving HPA News

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 Company: \_\_\_\_\_  
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