

EUROPEAN HEAT PUMP NEWS

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EHPA NEWS

In our April issue, we discussed how changes in climate were being induced by the use of fossil fuels and how electricity would be generated in a carbon constrained world. In this issue we discuss some of the factors behind the continued growth of the heat pump market throughout Europe over the last 15 years. Also discussed is the final agreement and approval by the Member States of the EU regulation for the eco-labelling heat pumps.

Strong growth in 2006

Heat pump sales have averaged a compound growth of 20% per annum between 1992 and 2003 and this rate is now increasing with a 50% increase in sales over 2005. Countries with large sales in 1992 have continued to expand such as Austria, Switzerland, Germany and France and they have been joined by Finland, the Czech Republic and Norway who have succeeded in transforming their markets. Sales are for systems which provide space heating, some of which can also cool, and include those which recover heat from exhaust air; systems only providing tap water are not included

Table 1: Heat pump sales in Europe

EHPA	Statistics		Heat	PUMP	sales
	1992	2003			
Austria	800	3780	5129	8853	
Bulgaria		15	25		
Czech Rep.	20	1200	2400	10000	
Denmark				4800	
Estonia		510	750	2333	
Finland	100	8540	12648	36950	
France	4000	13700	17300	61510	
Germany	2000	15838	20636	51877	
Ireland		1330	1800	2972	
Italy				17165	
Netherlands		1557	1800	2767	
Norway	1000	55081	35390	55500	
Poland				1758	
Portugal				55529	
Slovenia		5	35		
Sweden	15000	68100	100215	122473	
Switzerland	2700	8695	9796	15740	
UK	300			900	
TOTALS	25620	178351	207924	451127	

Scandinavia

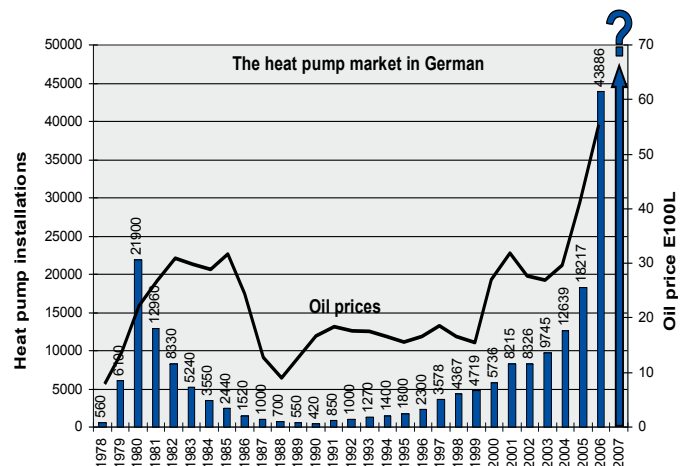
Sweden is still the largest market for heat pumps but its share of European sales has dropped from 60% in 1992 to 27% in 2006. In terms of market penetration per number of households replacing heating systems each year, Sweden is far in advance of any other country. Assuming there are 3 million homes in Sweden with an average lifetime per heating system of 18 years then heat pumps are responsible for 75% of the Swedish heating market.

The Finnish and Norwegian markets are now following the same growth trend as the Swedish market. There is a clear move away from fossil fuels and direct electric heating to heat pumps on the basis of economics and friendliness to the environment. Moreover the impacts of global warming are evident in Scandinavia with warmer summers bringing a longer growing season for agricultural products.

France and Germany

Sales in France are dominated (80%) by the installation of reversible heat pumps which can cool as well as heat. This trend is likely to continue as global warming increases the summer temperatures. In addition, France has a high proportion of direct electrically heated homes so with the rising price of electricity; owners are more likely to switch to heat pumps which only require one unit of electricity to concentrate four units of low grade heat to provide space heating

There is a strong correlation in Germany between the rising price of oil and the growth of heat pump sales



as Allen Griffiths (Dimplex) has described at a recent meeting in Milton Keynes.

As the balance between oil supply and demand has now shifted towards demand exceeding supply, the price of oil is likely to continue to rise and a base level of \$70(€53)/barrel now seems increasingly likely. The price of other fossil fuels such as natural gas is being dragged up by the demand for oil and that of coal is at record levels. So the era of cheap energy has ended and with fossil fuel prices rising to meet increased demand, the switch to renewable energy sources particularly for heating and cooling is inevitable.

As Germany has the largest number of dwellings in Europe that are oil heated, ca 10 million, heat pump sales are likely to rise for many years to maybe 500,000 per annum which would make Germany the leading market for heat pump systems in Europe.

Central Europe

Switzerland and Austria have always had a strong tradition of installing heat pumps and there has been steady growth for many years. This has resulted in the design and production of heat pumps in these countries many of which are now sold on the European market. These two countries have now been joined by their near neighbour, the Czech Republic, where fuel costs now reflect market prices.

Transforming the markets in other countries

In 2001 Bengt Sandstrom analysed the key factors for market growth – they apply in general to any new technology that is energy efficient and is characterised by a high initial cost and low operating cost such as heat pumps. The three factors essential to initiate growth are:-

- availability of suitable technology;
- economic viability in terms of life time costs; and
- presence of trained 'actors'.

Whilst a further three factors are important to sustain growth:-

- consumer awareness;
- presence of proven and certified systems; and
- suitable financing systems.

In turn these factors require:-

- some form of subsidy or grant to promote initial sales;
- education and training for installers, architects and builders;
- information and marketing; and
- demonstration sites accessible to the public to raise awareness of the technology.

Some of these factors will at least initiate growth and where all these factors are met, there is self-sustaining growth. In Estonia and Ireland some of these factors are now present because there is a steady market growth and sales are increasing in Poland though at a much lower rate than in the Czech Republic.

United Kingdom

The UK market is one of the largest countries in Europe by population yet with the slowest growth rate in heat pump sales of any European country (compare 1992 and 2006 sales in Table 1). There are now three new factors that could initiate growth in the UK:-

- a grant for micro-generation which for heat pumps is limited to a maximum value of £1,200 for residential dwellings
- formation of a UK Ground Source Heat Pump Association (UKGSA) whose members are primarily installers
- a proposed new requirement within the building regulations for new buildings to derive at least 10% of their energy needs from renewables.

At the second annual meeting of the UKGSA held on 4 July in Milton Keynes, it was clear that there was great enthusiasm amongst its members to develop the market. There was also a strong feeling that Government could and should be more proactive in overcoming barriers to install micro-renewables: these barriers include -

- the lack of suitably trained installers and the GSHPA have now agreed a set of principal criteria for approving training courses; the initial criteria only cover under floor heating as applied to new buildings and a new set of criteria will have to be developed to cover the Energy Performance in Building Directive requirements for existing buildings
- the low carbon building subsidy for micro generation is only available for a short time period and the UK Government regards this as a one off incentive and has given no thought to providing a longer term incentive which will allow long term growth
- buildings in the UK are rated by a software program called Standard Assessment Procedure (SAP) in which it is assumed that ground source heat pumps have a COP of 3.2 which disadvantages heat pumps with respect other heat sources.

The UK market is however receptive to large heat pump systems. The National Health Service in the UK has just approved a new hospital at Mansfield near Nottingham and this hospital will have a 5.5 MW heat pump system for providing space heating and hot water.

Approval of eco-label regulation

The final draft of this regulation was discussed at a meeting of the EU eco-labelling board on 25 April 2007 involving all the member states. The principal changes to the earlier drafts included-

- extension to gas absorption heat pumps
- test norm changed from EN 255 to EN 14511
- acceptance of heat pumps certified by the DACH and Eurovent certification schemes
- a concession for heat pumps using refrigerants with global warming potential less than 150 which are primarily natural refrigerants such as ammonia, propane and carbon dioxide; the threshold values for heating and cooling energy consumption can be reduced by 15%
- a clear summary of the threshold requirements for heating and cooling efficiencies in terms of industry standard in let and outlet temperatures.

The final draft of the regulation was approved the following day at a meeting of the EUEB regulating board with four members voting against and two members abstaining. The text is currently being translated into all the official EU languages and will be published in September following a meeting of the Environmental Ministers of the Member States. This brings to a conclusion an action initiated by the EHPA some five years ago

Threshold values for eco labelling

There was considerable discussion over setting the threshold requirements for various types of heat pump systems such as air/air, air/water, brine/water. Some values are now higher than those of the current DACH values and those proposed for 2008. For example brine/water 0/35C requires a coefficient of performance (COP) of 4.3 (heat out/energy in) whilst DACH is 4.0 and for water/water 10/30C a COP of 5.1 whilst DACH is 4.5.

One way of obtaining these higher efficiencies would be to increase the efficiency of the motor within the compressor unit. Now that there is strong market growth in Europe, one can hope that the industry will respond with compressors that will help heat pump manufacturers meet the eco-label thresholds. A second option is to improve the design of the heat exchangers and within the Sherpha project, new designs are being evaluated including spiral and mini channels.

Setting the benchmark

The heat pump ecolabel regulation is remarkable for several reasons –

- the first heating/cooling source to receive an EU label

- requires both the unit and the system to be correctly specified so that the benefits of the unit are carried over into the system
- requires installers to be able to calculate the heat loss of the building in which the system is to be installed and advise on cost effective measures to increase the level of insulation or solar shading
- requires manufacturers to train installers so that they can select the heat pump to match the reduced heat loss of the dwelling and then to correctly install the heat pump

So it is likely that the same set of requirements will also be prescribed for any other heating/cooling system so that heat pump regulation will become the bench mark for labelling other heating/cooling systems.

The information fiche which the installer has to complete when designing and selecting a heat pump system will conform with the requirements of the Energy Performance in Building Directive.

Eco design studies

Apart from the user's behaviour, there are two complementary ways of reducing the energy consumed by products: labelling to raise awareness of consumers of the real energy use in order to influence their buying decisions (such as labelling schemes for domestic appliances), and energy efficiency requirements imposed to products from the early stage on the design phase.

Eco-design aims to improve the environmental performance of products throughout the life-cycle by systematic integration of environmental aspects at a very early stage in the product design

The Council and the European Parliament therefore adopted a Commission proposal for a Directive on establishing a framework for setting Eco-design requirements (such as energy efficiency requirements) for all energy using products in the residential, tertiary and industrial sectors (directive 2005/32/EC).

The two studies in which heat pumps are being considered is that of boilers for producing space heating and hot water. The contractor, Van Holsteijn and Kemna, have completed a large number of reports, which can be viewed at the following web addresses www.ecoboiler.org and www.ecohotwater.org. The next step are consultation meetings with Member States and Stakeholders and these are scheduled for 10/11 September in Bruxelles.

Reducing greenhouse gas emissions

The EHPA Strategy committee has just completed a study on the potential contribution of heat pumps to reducing greenhouse gas (GHG) emissions. The underlying calculation was based on the question What percentage

of GHG emission reductions could be achieved if all new and renovated one-family houses in Europe were equipped with heat pumps from 2008 to 2020?

As a result, the potential contribution is impressive: a widespread installation of heat pumps for heating would result in nearly 70 million installed heat pumps until 2020. All installed units would contribute circa 20% of the EUs-GHG reduction goal for 2012 and 21% to this goal for 2020. In 2020, heat pumps would produce more than 770 TWh (approx. 30% of the EUs target) of renewable energy and would save more than 900 TWh of primary energy.

You can find the complete vision 2020 at www.ehpa.org/vision

General assembly in Paris

The EHPA general assembly took place on May 4/5. The first day was used for Association events concerned with meetings of the strategy and education committees with the general assembly taking place in the afternoon. The main topic were the presentations on past activities, the planned move of the Association to Brussels and a new fee structure to increase the Association's potential for future activities. All decisions were voted for unanimously.



Karl Ochser opening the EHPA heat pump conference

On the second day interested members and invited guests participated at the conference entitled The EU heat pump market: current status and development. The conference provided an overview on recent developments in the heat pump market in Europe. Representatives from eight countries presented recent developments of their national markets with key focus on sales figures, quality assurance programmes and institutional support schemes. This market overview was complemented by presentations on the effects of online-marketing, the EU energy policy in Europe, the contribution potential of widespread heat pump use to the EU's energy goals and EHPA participation in European funded projects like SHERHPA, Ground Reach and EU-CERT. All presentations are available on the EHPA website.

SHERHPA progress

This project which the EHPA helps coordinate is now entering its final phase with the evaluation of 11 types of heat pump systems using natural refrigerants like carbon dioxide, ammonia or propane. These refrigerants have significant advantages over man made refrigerants in that they have both low ozone depletion and low global warming potential; by a strange coincidence, carbon dioxide is both a natural refrigerant and a major source of greenhouse gases.

The demonstrations vary in size, type of heat pump and in the way in which the heating is distributed. Some systems are reversible and so provide cooling as well as heating. In designing these new systems, not only have new types of heat exchanger been incorporated such as mini channel and spiral tube, but also the flow rates have been re-optimised to obtain the optimum coefficient of performance for both heating and cooling.

In addition a number of short courses have been organised around Europe to present the basis of designing and maintaining these new heat pump systems.

On November 12/13 the final Workshop of the project will be held in Bruxelles and persons interested in finding out more about these new systems are invited to participate. Further details will be given in the next EHPA newsletter and on the EHPA website. A special issue of the newsletter will also be printed to accompany the final workshop.

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Next issue: **Economics of heat pump systems**