

Heat pumps and low energy buildings win the palm



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In many countries, the building sector accounts for up to 40 % of the country's total energy consumption and CO₂ emissions. Building regulations have therefore increasingly been tightened up since the middle of the 1990s, in order to reduce the space-heating energy requirements of buildings.

To construct a low-energy house requires good thermal insulation, a compact, thermal bridge-free and airtight building envelope, and high-quality double or triple glazing. The use of passive solar gains and a mechanical ventilation system with heat recovery further reduce the energy requirement. Typical advantages of low-energy houses are high building quality, lower energy consumption and better indoor comfort with limited additional investment costs.

The proportion of low-energy houses is increasing in many countries. In Switzerland, about 30 % of new buildings comply with the Swiss MINERGIE label, defining a good low-energy house. Germany, meanwhile, has about 5000 passive houses with a space heating energy requirement of less than 15 kWh/(m²a), and about 68000 energy-saving houses with a primary energy requirement of 40 or 60 kWh/(m²a), which are supported by subsidies of the government. In Austria, about 1700 passive houses have been built by 2006, and in Norway, the number of low-energy houses being designed or built increased from 2000 in 2006 to 10000 in 2007.

Summarising, low-energy buildings have growing markets and are considered as a major strategy to reach Kyoto targets, in particular by retrofitting the existing large building stock to low-energy standard.

However, to gain full benefits from low-energy buildings, building technology must also be adapted to the specific needs. Heat pumps have particular advantages in terms of energy-efficiency, environmentally sound operation, independence of fossil fuels and market-available capacity range, and have already considerable market shares in low-energy buildings.

Heat pumps specifically designed for low-energy houses have already been introduced in the market, and development continues. Annex 32 of the IEA Heat Pump Programme is dedicated to evaluation of systems on the market and further development of heat pump systems for application in residential low-energy buildings. Some of the national contributions are presented in this issue of the HPC Newsletter.

One part of the work of IEA HPP Annex 32 is concerned with new system concepts and layouts in combination with a prototyping of the units and laboratory testing, while the other is concerned with field testing of marketable units and new systems. Development is concentrated on heat pumps in the 3-5 kW capacity range, and include the use of natural refrigerants.

System integration to multifunctional heat pumps seems a particular promising solution, since ventilation and (increasingly) space cooling function are often requested by the occupants. A compact integrated design could cover the different building needs with the benefit of internal heat recovery and a minimum of installation costs and space. The integration of further functions is therefore a further issue, and one project is dedicated to a highly integrated unit covering all building services, including humidification and de-humidification.

The results to be expected from Annex 32 are lab-tested new system concepts as well as field-tested best practice systems. In due course, an evaluation of system design will be carried out, resulting in design recommendations for a robust and reliable system of this type. Information on monitoring techniques and energy balancing are further results of the field testing. Interim results and information can be found on the Annex 32 website at <http://www.annex32.net>.

Building and heat pump markets both show the same tendencies: Heat pumps in low-energy buildings are one step towards future sustainable energy use in the built environment.

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