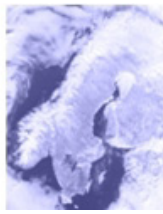


Economical heating and cooling systems for low energy houses



Norway

The Norwegian national team is represented by **SINTEF Energy Research**

National team leader



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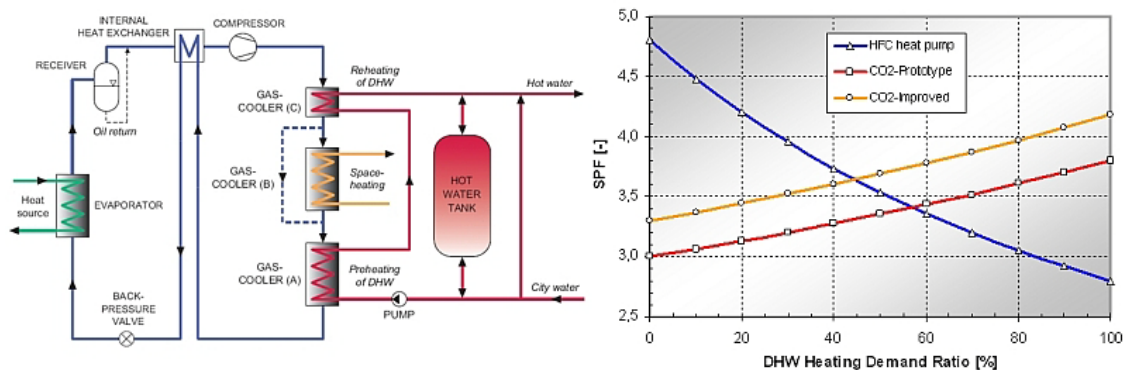
Norwegian national project

Norway has a strong growth in low-energy buildings in the recent years, and about 100'000 low-energy houses are already built, or are in the construction or design phase (state 2007). Adequate technologies for heating, cooling and ventilation are needed for this rapidly emerging market.

Heat pumps are seen as a promising solution for heating and cooling of low-energy buildings due to high energy efficiency, utilisation of renewable energy sources, great flexibility in system design and heating capacities, and the fact that relatively high energy prices and low interest rates are favourable when investing in relatively expensive heating technologies.

The focus of the Norwegian national project are feasibility studies for the application of heat pump systems using natural refrigerants in low-energy houses, prototyping and field monitoring.

A feasibility study of a central CO₂ heat pump water heater for a low energy block of flats has been carried out. Four different system configurations have been simulated in order to identify the system layout with the highest SPF. Simulations results prove that the CO₂ HPWH has a 20% higher seasonal performance factor than conventional HPWH. Thus, the CO₂ HPWHs are seen as promising solution for central water heating of low energy apartment houses. The system concept is depicted in (Fig. 1).



Moreover, CO₂ heat pumps for space heating and DHW for the application in low energy and passive houses have been investigated. A tri-partite gas cooler has been identified as best solutions combined with a low temperature heating system, where the cold water is preheated in a first part of the gas cooler, the space heating system is heated in the middle part of the gas cooler and the DHW is reheat in the third part of the gas cooler where the hot CO₂ vapour enters after the compressor. SPF comparison shows that at a DHW demand of about 50%, which may be reached in passive houses, brine-to-water CO₂ heat pumps will outperform the state-of-the-art B/W heat pumps available on the market. Results are documented in the final report on prototype systems.

Furthermore, a 3 kW integrated propane water-to-water heat pump for space heating and DHW has been developed in co-operation with the NTNU. A prototype has been designed and lab-tested at the NTNU. Presently, the prototype is installed in a passive house of a de-sign heat load of 2.9 kW in Flekkefjord in Southern Norway. The prototype is connected to a floor heating system and monitored for two heating periods 2007/08 and 2008/09. In the first heating period, optimisation potentials have been identified and the prototype has been optimised. Results are documented in a System concept sheet and in the final report on prototype systems.

The Norwegian participation in IEA HPP Annex 32 is supported by Enova SF.

Norwegian links



Norwegian national Annex 32 website

The Norwegian project website of IEA HPP Annex 32 hosted by SINTEF provides information in Norway and in English related to low energy houses and building technology for low energy houses in connection with the Annex 32 project

  <http://www.energy.sintef.no/prosjekt/Annex32>



Enova SF

ENOVA SF is public enterprise owned by the Royal Norwegian Ministry of Petroleum and Energy. Enova SF's main mission is to contribute to environmentally sound and rational use and production of energy, relying on financial instruments and incentives to stimulate market actors and mechanisms to achieve national energy policy goals.

Enova financially supports the national project of Norway.

  <http://www.enova.no>



Website for Norwegian low energy houses by State Housing Bank

The website contains information on low energy buildings in Norway

 <http://www.lavenergiboliger.no>



The Norwegian Heat Pump Association

The Norwegian Heat Pump Association (NOVAP) is an independent organisation which is working for the implementation of heat pumps in the Norwegian energy system. The members of NOVAP are heat pump manufactures, wholesale dealers and suppliers. NOVAP's main activities are to advance high quality heat pump systems, be a centre of expertise, represent the heat pump business sector in national and international fora, and provide high quality heat pump information to different target groups.

 <http://www.novap.no>



The Norwegian Research Centre on Zero Emissions Buildings
EIn February 2009, the Research Council of Norway assigned The Faculty of Architecture and Fine Art at the Norwegian University of Science and Technology (NTNU) to host the Research Centre on Zero Emission Buildings (ZEB), which is one of eight new national Centres for Environment-friendly Energy Research (FME). The main objective of the FME-centres is to contribute to the development of good technologies for environmentally friendly energy and to raise the level of Norwegian expertise in this area.

  <http://www.sintef.no/projectweb/zeb>

IEA HPP Annex 32

IEA HPP Annex 32 is a corporate research project on technical building systems with heat pumps for the application in low energy houses.
The project is accomplished in the Heat Pump Programme (HPP) of the International Energy Agency (IEA).

Internet: <http://www.annex32.net>