

Economical heating and cooling systems for low energy houses



Low energy houses have growing market shares in many countries and are becoming the current building practice. Multifunctional integrated heat pumps can yield performance improvements by covering several building functions simultaneously. Adapted integrated heat pump systems for the use in low energy buildings have been introduced in the market some years ago, but developments are not finished and operational experience is still scarce. IEA HPP Annex 32 was launched to support the further development of systems and characterise the performance of integrated heat pumps in real operation.

The main objectives of IEA HPP Annex 32 were to...

- ... characterise the state-of-the-art of available multifunctional heat pump systems on the market of the different participating countries.
 - ... evaluate the functionality and performance of marketable multifunctional heat pumps by field monitoring and to document best-practice systems
 - ... develop and lab-test new system solutions of integrated heat pumps in the low energy house capacity range including the use of natural refrigerants.
- Details on these topics are presented in the Annex 32 final reports.

Results of the Annex 32 range from lab-tested prototypes to field-proven best practice systems and design recommendations

The results of IEA HPP Annex 32 comprise an overview of integrated heat pump systems on the market for low energy houses as basis for the development of new system concepts. The subsequently developed prototypes cover functions, which were not available on the market at the start of the Annex 32 and are currently increasingly introduced into the market.

Among these the integration of a passive cooling function, which is covered by many prototypes. Also an additional integration of a dehumidification function was investigated. On the other hand extensive field monitoring of marketable heat pumps has been accomplished and selected systems have been documented as Best Practice Sheets.

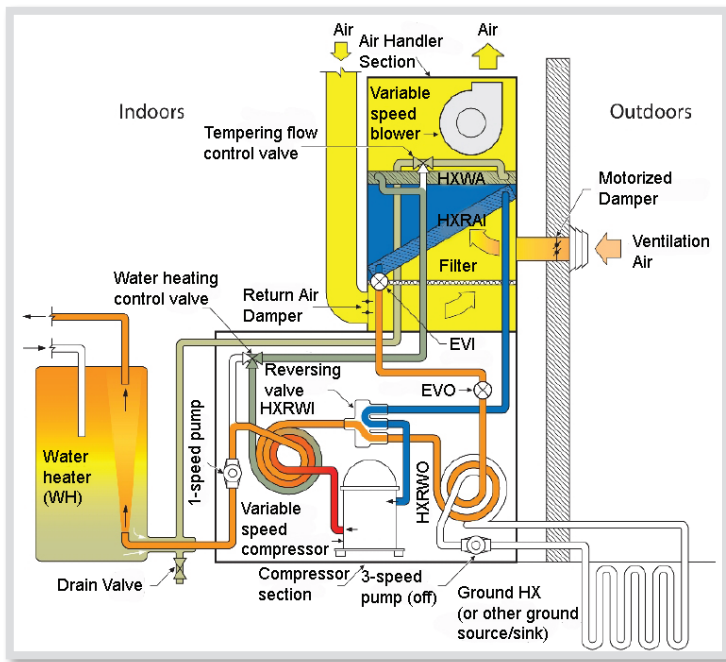


Figure 1. Highly integrated heat pump prototype for covering all building functions including dehumidification. The prototype uses several combined operation modes, e.g. combined dehumidification and water heating (source: ORNL, USA)

Highlights from the conclusions

- 1 Developed multifunctional heat pump prototypes are mainly using natural refrigerants, avoiding the drawback of the global warming potential of the refrigerant.
- 2 System integration has been further developed to highly-integrated systems covering all building functions. Energy savings achieved by system integration reaches up to 50% compared to a benchmark system of current efficiency requirements.
- 3 Virtually all field monitored heat pumps are contributing significantly to CO₂-eq.-emission and primary energy savings. Compared to a condensing gas boiler substantial savings are reached.
- 4 Passive ground-coupled cooling proved to be feasible in residential buildings and reached a high seasonal performance factor around 8, and still has potential for improvement. Moreover, it can be easily integrated in existing system configurations and can cover increasing cooling loads in residential buildings efficiently.

Further information

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- Participating countries:** Austria, Canada, France, Germany, Japan, the Netherlands, Norway, Sweden, Switzerland and the USA
- Publications:** Deliverables (Final report, Executive summary, Best Practice Sheets, System concept sheets etc.) can be found at www.annex32.net and www.heatpumpcentre.org