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IEA HPP Annex 28

«Test procedure and seasonal performance calculation of residential heat pumps with combined space and domestic hot water production»

Participants

There are nominal ten countries participating in Annex 28. However, official declaration of participation to the IEA is given only from eight countries (AT, CA, CH, DE, FR, JP, NO, UK) up to now.

Third working meeting in Yokohama, Japan

The third working meeting of the Annex 28 was held in Yokohama, Japan in the beginning of June 2004. The 1.5-day meeting was embedded in a three-day program organised by the Heat Pump and Thermal Storage Centre of Japan (HPTCJ) and comprised besides the working meeting a technical tour to the manufacturer Sanyo and a workshop. On the workshop, the participants of the Annex 28 and Japanese manufacturers could present their work in connection with the Annex 28. Focus of the working meeting was the presentation and discussion of interim results of the Task 2, the development of the test procedure and the Task 3, dedicated to the calculation method. According to the actual state of the national projects the time schedule for the remaining time of the Annex was adapted in the following way:

15 November 2004	Country reports on Task 2 and Task 3 to operating agent
7/8 March 2005	4 th working meeting to discuss a draft version of final report
30 April 2005	Closure of the IEA HPP Annex 28, final report to ExCo

The 4th working meeting will be held 7/8 March 2005 at Arsenal Research, Vienna.

The final results are to be presented on a workshop, which is most likely held in connection with the 8th International Heat Pump Conference in Las Vegas in the end of May 2005.

Overview of the state of the national projects (according to status reports of the countries)Austria

Austria has tested four heat pumps with direct expansion and combined domestic hot water production according to EN 255-3. Since October 2003, three systems with direct expansion and domestic hot water production are monitored. Results will be used to elaborate a test procedure for direct expansion systems with combined domestic hot water (DHW) production and the calculation method. CEN/TC 113 will treat this working item in a new established working group.

Canada

Hydro-Quebec's energy research laboratory (LTE) has developed a multi-functional ground source heat pump prototype including radiant floor or air space heating with DHW in winter operation and air conditioning with DHW production in summer operation. Measurements on the laboratory test rig

and first energy analysis have begun in June 2004. More than ten tests for combined mode have been performed so far.

France

CETIAT has performed testing of a B/W heat pump with DHW production by desuperheating based on the EN 255-2 and EN 255-3 using tapping profiles from EU mandate M 324. An approach of allocating the total electrical energy input to space heating and DHW has been developed. Another objective is to simplify the present testing method acc. to EN 255-3 with regard to the time consuming stand-by power measurement. EdF has performed testing of an A/W heat pump in part load operation for two different heat pumps. Both results will be implemented in the French proposal for a test procedure and calculation method.

Germany

Germany has proposed model based approach of dynamic component testing for heat pump testing. Model based testing is already introduced in the standardisation in the field of solar collectors. This testing is meant to reduce the testing time of EN 255-3.

The dynamic approach will be evaluated by test rig measurements of a compact unit for the application in ultra low energy houses (consisting of a ventilation system with heat recovery, a heat pump, an integrated hot water storage and, as an option, a solar system). Test rig measurements of a compact unit have already been performed at Fraunhofer Institute for Solar Energy Systems in Freiburg (DE). Field measurements of three systems are in progress and partly evaluated.

Japan

Japan performs test rig measurements on a CO₂-system for combined floor heating/DHW production including inverter drives according to different standards (JRA 4050, EN 255)

Norway

Norway has extensively tested a B/W heat pump using CO₂ as refrigerant with combined space and DHW heating. Preliminary estimations of the SPF have shown, that under certain conditions (e.g. 25%-30% annual DHW energy demand, return temperature of space heating 30°C and lower) the CO₂ – system reaches at least the performance of the presently most efficient B/W systems on the market. Moreover a test rig for propane heat pump systems with combined space heating and DHW production by desuperheating with propane (R-290) refrigerant has been constructed and testing has been performed.

Sweden

Sweden has performed testing of a B/W heat pump for heating mode according to EN 255-2 and EN 14511, for domestic hot water mode according to EN 255-3, alternate operation according to a test scheme based on EN 255-2 and EN 255-3 and domestic hot water testing according to the EU mandate M 324. Moreover measurements of an exhaust air heat pump were evaluated with regard to a test procedure.

Switzerland

Switzerland is extending a testing and calculation approach for a combined cascade heat pump using condensate subcooling to the requirements of compact units for heating, DHW production and ventilation.

Field monitoring of a compact unit designed for hydronic distribution, which has started in spring 2004, are currently evaluated for the summer operation. A second system is operated with activated thermal mass of the building. The system that is designed for ultra low energy houses and field monitoring is in progress.

Moreover a test rig at the project partner HTA Lucerne has been mounted and is currently set into operation.

UK

The UK was dedicated to a calculation of the seasonal performance factor with a new type of A/W heat pump based on simulation studies. Due to the financial situation and a possible withdrawal of the Annex 28 participation no actual information on the state of the national project was received.

USA

The USA promised a project description for the beginning of this year. Actually no contribution from USA to IEA HPP Annex 28 has been received.

Annex related developments in standardisation

EU Mandate M 324

Mandate M 324 on the elaboration of test procedures for DHW systems for household appliances, which is to derive comparable test results for different domestic hot water appliances, was rejected by CEN Management Centre in spring 2004. In a second enquiry, it has now been accepted. The mandate contains the tapping profile, which different CEN working groups already use for their testing activities. However, feedback from the testing activities performed in the framework of IEA HPP Annex 28 is not positive, as the tapping profiles are considered too complex and not well suited for a practical application during standard testing.

CEN/TC 113/WG 10

The Working Group 10 of the Technical Committee 113, which deals with test procedures of heat pumps, should cover the work item of a revision of the EN 255-3 on testing of heat pumps for domestic hot water production. Due to the lack of a Convenor the CEN/TC 113/WG 10 was postponed indefinitely. Thus, it the working item might be withdrawn from the work programme of CEN/TC 113, unless a Convenor will be nominated in the next time. The CEN/TC 113/WG 10 would be the working group to implement the results on the test procedure for DHW operation worked out by IEA HPP Annex 28 on the level of European standardisation.

Administrative Issues

The formal participation letters of SE and the USA to the IEA were still missing in May. At the time of writing this report, the actual state was not finally inquired. However, the Swedish NT is actively working in the IEA HPP Annex 28.

The DOE has mandated the work to Oak Ridge National Laboratory (ORNL).

Due to misunderstandings concerning the payment of the Annex fee, the UK might have to withdraw their participation in IEA HPP Annex 28. A final decision has not yet been made, since the situation is not entirely clear.