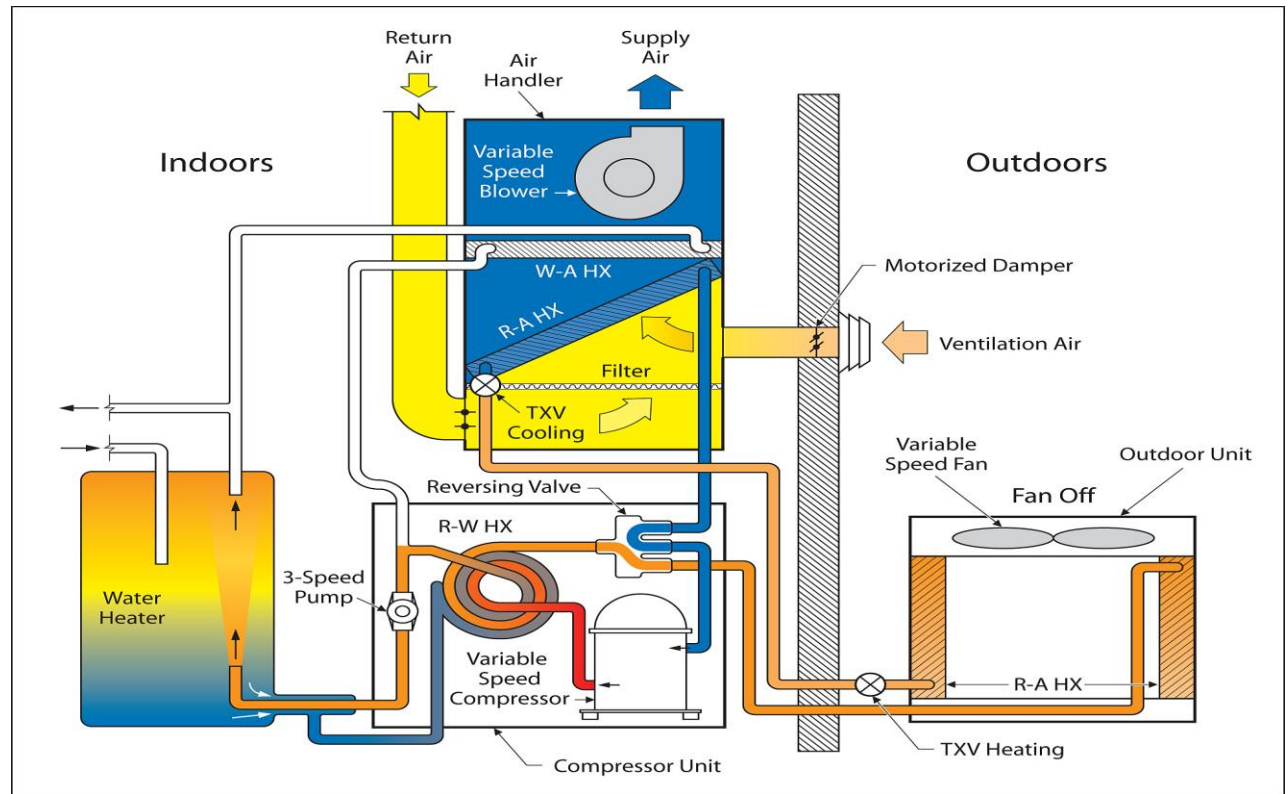


Integrated Heat Pump (IHP)



ORNL 05-G03302/abh

Develop Standard Method of Test (MOT) for IHP

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Problem Statement:

- IHP → $\geq 50\%$ savings in energy used for space conditioning and water heating
 - C. K. Rice, V. D. Baxter, S. A. Hern, T. P. McDowell, J. D. Munk, and B. Shen, 2013. "[Development of a Residential Ground-Source Integrated Heat Pump](#)", 2013 ASHRAE Winter Conference Paper, Dallas, TX., January.
- No generally accepted MOT or rating standard exists
- Until now only partial solutions
 - ASHRAE Standard 137
 - AHRI Standard 470
 - Waivers for specific devices in 90's

Impact of Project: Development of a uniform method-of-test along with performance descriptors understandable by the consumer, followed by establishment of a rating standard, will facilitate market penetration of these energy saving appliances.

The endpoint of the project will be rating standards that will allow consumers to make informed comparisons of the energy performance of integrated appliances to that of a suite of separate-function appliances.

Project Focus:

Because the IHP can reduce energy use $\geq 50\%$, it can make a significant contribution to meeting the BTO goal of reducing building energy use by 50% by 2030.

However, to accomplish this, IHPs must achieve market penetration, and providing an accepted and consumer-friendly testing and rating standard is essential to achieving success in the marketplace.

Government rules for appliance ratings are based on ASHRAE test standards and AHRI rating standards with the rating standard based on the ASHRAE method of test.

In order to achieve an instantly recognizable, authoritative document, a test standard was requested of ASHRAE, who in turn established a Standard Project Committee to develop Standard 206.

The SPC206 Committee is made up of 15 voting members, representing manufactures, testing laboratories, electric utilities, and a university; AHRI is a non-voting member.

ORNL provided the committee chairman, secretary, and the manpower to convert the committee's thoughts into text.

Standard 206 is an extension of and consistent with:

ANSI/ASHRAE Standard 37

ANSI/ASHRAE Standard 116 AHRI Standard 210/240

ANSI/AHRI/ASHRAE ISO Standard 13256-1

AHRI Standard 870

ANSI/ASHRAE Standard 118.2

Standard 206 should replace:

ANSI/ASHRAE Standard 137

and various waivers from DOE's Central Air Conditioner and
Central Air Conditioning Heat Pump Test Procedure

Standard 206 addresses air-source, water-source, ground water-source, ground-source closed loop, and direct geexchange units for single-capacity, dual-capacity, and variable-capacity equipment.

Provides for up to 7 modes of equipment operation

Space conditioning only

Dedicated water heating

Dehumidification+space

Dehumidification

Space conditioning+water heating

Dehumidification+space conditioning+water heating

Dehumidification+water heating

The draft standard method of test supports metrics for integrated appliances that allow easy comparison to metrics for individual appliances:

For Air Source Equipment:

$SEER_{ca}$; $HSPF_{ca}$; EF_{ca}

For Ground Source Equipment:

EER_{ca} ; COP_{ca} ; EF_{ca}

“ca” = combined appliance, referring to values for the integrated appliance, rather than the comparable metric for a standard appliance

Accomplishments:

- Comprehensive review conducted and documented of all existing standards for water heating and space conditioning, national and international. [[ORNL/TM-2010/321](#)]
- Draft test standard completed and approved for public review by the committee in December, 2012
- ASHRAE approved release for public review in January, 2013.
- Currently available for public review.
- Review Period: 3/15 – 4/29/2013

Progress on Goals:

- Project on-schedule in FY13
- Early in deliberations, ASHRAE committee decided that standard should address all reasonable possible configurations, and not just those appliances currently under development, which added considerable complexity. This, plus getting consensus among all committee members, caused ~ 6 month delay in milestones for FY12.
- Despite this, the ASHRAE Standards Committee has stated that no test standard has ever been completed this quickly (SPC206 had its first meeting in June, 2011).

Project Plan & Schedule

Project Initiation: Nov, 2009. Planned Completion: Sep, 2014

Slippage of milestones in 2012 due to difficulty in getting consensus on issues related to the wide range of possible configurations for integrated devices.

Go/No-Go decision point at end of CY2013, prior to initiation of AHRI effort.

Summary					Legend											
WBS Number BT0302000					Work completed											
Project Number 18810					Active Task											
Agreement Number 6800					Milestones & Deliverables (Original Plan)											
					Milestones & Deliverables (Actual)											
	FY2012				FY2013				FY2014							
Task / Event	Q1 (Octt-Dec)	Q2 (Jan-Mar)	Q3 (Apr-Jun)	Q4 (Jul-Sep)	Q1 (Octt-Dec)	Q2 (Jan-Mar)	Q3 (Apr-Jun)	Q4 (Jul-Sep)	Q1 (Octt-Dec)	Q2 (Jan-Mar)	Q3 (Apr-Jun)	Q4 (Jul-Sep)	Q1 (Octt-Dec)			
Project Name: Develop Standard Method of Test (MOT) for IHP																
Q2 Milestone: Complete initial draft of test procedure																
Q3 Milestone: Draft test standard approved for release for public review																
Current work and future research																
Q2 Milestone: Respond to public review comments and produce final version of standard																
AHRI Rating Standard Based on ASHRAE Test Standard																

Project Budget: Total Expected DOE Budget = \$1.18M
(includes \$150k/y for FY13 & FY14; cost share of ~\$150k/y expected)

Variances: None

Cost to Date: \$0.84M of DOE Funds (71%)

Additional Funding: Cost share reflects estimated in-kind contribution from ASHRAE/AHRI committee members & staff

Budget History (\$k)

FY2010		FY2011		FY2012	
DOE	Cost-share	DOE	Cost-share	DOE	Cost-share
289.4	0	339.8	27	250.0	177

Partners, Subcontractors, and Collaborators:

ASHRAE Special Project Committee 206 is made up of 15 voting members, representing manufactures, testing laboratories, electric utilities, and a university; AHRI is a non-voting member.



Technology Transfer, Deployment, Market Impact:

The project's objective is to enhance market penetration of the IHP by providing a rating standard, based upon a sanctioned test standard, which will be easy for the consumer to understand and which will facilitate comparison of the energy performance of integrated devices compared to a suite of standard, individual components.

Communications:

All meetings of SPC 206, whether held electronically (each month in between ASHRAE conferences) or in-person during conferences are open to the public. The proposed test standard is now available for public comment through the ASHRAE web site.

Next Steps and Future Plans:

The ASHRAE committee is required to respond to every comment submitted on the draft test standard. Once all comments are resolved, the final version of the standard will be submitted to ASHRAE for approval and publishing.

Effort in the latter part of FY13 and FY14 will then be made to encourage/prompt AHRI to generate a rating standard based on the test standard.