Evaluation and Demonstration of Actual Energy Efficiency of Heat Pump Systems in Buildings (Annex 88)

The State of the Art (Subtask A Report)

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1

IEA Energy in Buildings and Communities TCP
Annex 88 Evaluation and Demonstration of Actual Energy Efficiency of Heat Pump Systems in Buildings

Chapter 1: Testing methodologies and performance rating standards for heat pump systems

Chapter 2: Monitoring methods and database for actual energy efficiency of heat pump systems

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Chapter 3: Energy use calculation methods for heat pump systems

Chapter 4: Design guidelines for heat pump systems in buildings

Technology Collaboration Programme by iea

2

Chapter 1: Testing Methodologies and Performance Rating Standards for Heat Pump Systems

Category A & B Standards

Category A: Steady-state testing, compressor speed fixed

Category B: Load-based testing, accounts for real-world performance

Chapter 2:Monitoring Methods for Heat Pumps

- Monitoring real-world heat pump performance in non-steady-state conditions
- Impact of partial load ratios and current testing standards
- Monitoring Methods for Air and Hydronic Systems
  - Air conditioners: Indoor/outdoor air enthalpy difference, refrigerant enthalpy
  - Hydronic systems: Water-side methods
  - Standards: T/CAS 305-208, ASHRAE 221-2020

Chapter 3: Energy Use Calculation Methods

Energy policies evolved since 1970s oil crisis

Need for reliable methods for calculating heat pump energy consumption

Challenges in Energy Calculation
- Accuracy and comprehensiveness
- Data input challenges
- Impact of operating conditions (e.g., part-load ratio, outdoor temperature)

Reviewed Energy Calculation Methods
- Review of 8 existing methods: EN 15316-4-2, NECB, EnergyPlus, etc
- Variability in heat pump calculation methodologies across countries

Chapter 4: Design Guidelines for Heat Pumps

1. Review of installation and design guidelines
2. Focus on hydronic and air-to-air systems

Standards and Tools for Designers
- EN 15450, ASHP Sizing Toolkit (Canada)
- ACCA Manuals (USA), NEEP guides
- ISO 13153 framework for design

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