

High Temperature Cooling and Low Temperature Heating in Buildings

ANNEX 59

It is important to minimise temperature differences in heating, ventilation and air conditioning (HVAC) systems, because high differences result in reduced efficiencies and therefore increased energy use. This project is thus starting from a new perspective and from this is developing a novel concept for analysing HVAC systems in buildings.

The project is focusing on temperature differences throughout HVAC systems, as well as within the indoor spaces that they serve, and on how these can be minimized in highly energy efficient buildings. Temperature differences within HVAC systems can be classified into three types, arising from:

- heat and moisture exchange,
- heat transmission through fluid media, and
- thermal mixing losses in indoor spaces due to different types of indoor terminal devices.

High temperature cooling and low temperature heating would be achieved by reducing temperature differences in heat transfer and energy transportation processes. The beneficiaries of the outcomes and deliverables will be designers and industry, such as manufacturers of chillers, radiant panels and supply air terminals. The outcomes will contribute to the further improvement of new HVAC terminal devices.

PROJECT OBJECTIVES

- 1 establish a methodology for analysing HVAC systems from the perspective of reducing mixing and transfer losses,
- 2 propose novel designs for indoor terminals and novel flow paths for outdoor air handling equipment, and
- 3 develop high temperature cooling and low temperature heating systems in buildings with fully utilized heat and cold sources, high efficiency transportation and appropriate indoor terminals.



*A case study building with a large enclosure.
 Source: Tsinghua University*

INTERNATIONAL ENERGY AGENCY

The International Energy Agency (IEA) was established as an autonomous body within the Organisation for Economic Co-operation and Development (OECD) in 1974, with the purpose of strengthening co-operation in the vital area of energy policy. As one element of this programme, member countries take part in various energy research, development and demonstration activities. The Energy in Buildings and Communities Programme has co-ordinated various research projects associated with energy prediction, monitoring and energy efficiency measures in both new and existing buildings. The results have provided much valuable information about the state of the art of building analysis and have led to further IEA co-ordinated research.

EBC VISION

By 2030, near-zero primary energy use and carbon dioxide emissions solutions have been adopted in new buildings and communities, and a wide range of reliable technical solutions have been made available for the existing building stock.

EBC MISSION

To accelerate the transformation of the built environment towards more energy efficient and sustainable buildings and communities, by the development and dissemination of knowledge and technologies through international collaborative research and innovation.

ACHIEVEMENTS

- Guide book on a new analysis method for HVAC systems,
- Report on demand and novel design of indoor terminals in high temperature cooling and low temperature heating systems,
- Report on novel flow paths of outdoor air handling equipment and their application in high temperature cooling and low temperature heating systems,
- Design guide for high temperature cooling and low temperature heating systems,
- Report on applications and real-time tests of high temperature cooling and low temperature heating systems in typical office buildings with different climate conditions,
- Project summary report.

Project duration

Completed (2012 - 2016)

Operating Agent

Prof Yi Jiang
Building Energy Research Center
Tsinghua University
Beijing
P.R. CHINA
jiangyi@tsinghua.edu.cn

Participating countries

Belgium, P.R. China, Denmark, Italy, Japan, R. Korea

Further information

www.iea-ebc.org