

Indirect Evaporative Cooling

EBC ANNEX 85

Indirect evaporative cooling (IEC) is a process of cooling air by the evaporation of water that is not in contact with air, and therefore the cooled air's moisture content does not increase. Although, IEC air coolers and IEC water chillers have been developed and used, they are not widely applied in dry climates. The main reasons are a lack of feasibility analysis of using IEC technologies for different types of buildings in different dry climates, absence of fundamental studies of heat and mass transfer processes with various IEC systems and components, and optimized structure design of IEC air coolers and IEC water chillers. In addition, there is a need for analysis of water consumption and methods to consider both water and electricity consumption together. This project aim is better understanding IEC processes and investigating real operation of IEC technologies.

The project consists of the following project tasks:

- Definition and field study
- Feasibility study of IEC technologies
- Fundamental study
- Simulation tool and guideline

PROJECT OBJECTIVES

- 1 investigating indirect evaporative cooling systems to find out the main reasons why indirect evaporative cooling technologies have not been widely used
- 2 carrying out field testing of existing indirect evaporative cooling systems applied in different climates to obtain real-world operation data
- 3 developing a general theoretical analysis method for indirect evaporative cooling processes to guide the design of various indirect evaporative cooling systems used in different dry climates
- 4 evaluating the water and electricity use of indirect evaporative cooling processes
- 5 developing a guideline for designing indirect evaporative cooling systems for different types of buildings under various dry climates and water resource conditions

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.

The planned project deliverable will be a publication that will include the project outputs such as:

- theoretical analysis results for the general performance of indirect evaporative cooling technologies,
- fundamental analysis results through thermal analysis and optimization,
- simulation tools for indirect evaporative cooling technologies,
- design guideline for indirect evaporative cooling technologies, and
- feasibility analysis of indirect evaporative cooling technologies.

Project duration

Ongoing (2020 - 2025)

Operating Agents

Dr Xiaoyun Xie
Associate Professor
Tsinghua University
Building Energy Research Center, Department of Building
Science
School of Architecture
100084 Beijing
CHINA

Participating countries (provisional)

Australia, Belgium, China, Denmark, Egypt, France, Turkey,
USA

Further information

www.iea-ebc.org