

# IEA EBC Annex 87

## Energy and Indoor Environmental Quality Performance of Personalised Environmental Control Systems (PECS)

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## AGENDA

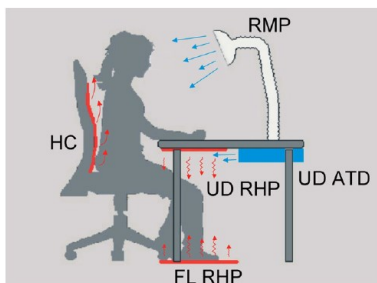
- 16:30 | Introduction to IEA-EBC Annex 87, **Bjarne W. Olesen**, ICIEE/DTU, Denmark
- 16:40 | Desk mounted Personalized ventilation systems, **Ongun Berk Kazanci**, ICIEE/DTU, Denmark
- 16:55 | Footwarmers providing efficient heating, **Hui Zhang**, UC-Berkeley, USA
- 17:10 | Questions and answers
- 17:20 | Heated and cooled chairs, **Sabine Hoffmann**, Technical University of Kaiserslautern, Germany
- 17:35 | Wearable heating and cooling technology, **Joon-Ho Choi**, University of Southern California, USA
- 17:50 | Questions and answers
- 18:00 | End of webinar

## WHAT IS PECS?

- Personal Environmental Control System (PECS) with the functions of heating, cooling, ventilation, lighting and acoustic has advantages of controlling the localized environment at occupant's workstation by their preference instead of conditioning an entire room.
- This improves personal comfort, health and energy efficiency of the entire heating, ventilation and air-conditioning (HVAC) system substantially.
- Personalized ventilation will also protect against cross contaminations, which are critical in open plan offices and work places with close distance.



Source: Melikov 2010



Source: Watanabe et al. 2010



Source: Zhang et al. 2010

## OBJECTIVES

- Establish design criteria and operation guidelines for PECS
- Quantify the benefits regarding health, comfort and energy performance.
- Control concepts and guidelines for operating PECS in spaces with general ambient systems for heating, cooling, ventilation and lighting.

## SCOPE

- Includes all types of PECS for local heating, cooling, ventilation, air cleaning, lighting and acoustic.
- Includes desktop systems, which are mounted on desks or integrated in a furniture
- Chairs with heating/cooling and ventilation.
- Wearables, where heating/cooling and ventilation are included in garments or devices attached to occupants' body.
- [Not including cars](#)

## TARGET AUDIENCE

- Manufacturers (who need design guidelines)
- Building owners and consultants (who need information on performance, advantages, problems, operation, how PECS is operated together with other building systems)
- Users (need same info as building owners and for home workplaces)
- Standardisation Bodies (revision of standards for indoor environmental quality).

## Schedule

- January 2022-December 2022: Preparation phase
- January 2023-December 2025: Working phase
- January 2025-December 2026: Reporting phase

## Subtask A: Fundamentals

- **Leader**
  - **Mariya P. Bivolarova, Technical University of Denmark, Denmark**
- **Co-leader:**
  - **Dolaana Khovalyg, EPFL, Switzerland**
- **Activity A1:** Definition and identification of the requirements of PECS in terms of localized and background Indoor Environmental Quality (IEQ) i.e., thermal, air quality, lighting, and acoustics.
- **Activity A2:** Outline the benefits of PECS regarding comfort, health and productivity based on literature and new research.
- **Activity A3:** Outline the minimum energy cost requirements for PECS.

## Subtask B: Applications and Technologies

- **Leader:**
  - **Kai Rewitz, RWTH Aachen University, Germany**
- **Co-leader**
  - **Joyce Kim, University of Waterloo, Canada**
- **Activity B1:** Summarize the working principles, capabilities and limitations of existing PECS, based on literature.
- **Activity B2:** Identify future development and improvement suggestions for PECS for optimal energy, IEQ and cost performance.

## Subtask C: Control, operation and system integration

- **Leader:**
  - **Joon-Ho Choi, University of Southern California, USA**
- **Co-leader**
  - **Bin Yang, Tianjin Chengjian University, Tianjin, China**
- **Activity C1:** Identify and summarize existing methods for controlling PECS (including sensors used for control).
- **Activity C2:** Develop guidelines on integrating PECS with ambient conditioning systems in buildings.

## Subtask D: IEQ and Energy Performance evaluation

- **Leader:**
  - **Douaa Al-Assad, KU-Leuven, Belgium**
- **Co-leader**
  - **Marco Perino, Politecnico di Torino, Italy**
- **Activity D1:** Collection of existing methods of studying and testing PECS.
- **Activity D2:** Identification of generic power requirements for PECS to achieve energy savings compared to ambient conditioning systems.
- **Activity D3:** Development of universal and standardized ways of evaluating and reporting performance of PECS.

## Subtask E: Policy and advisory actions

- **Leader:**
  - **Rajan Rawal, CRABSE, CEPT University, India????**
- **Co-leader:TBD**
- **Activity E1:** Summary of national and international building codes and standards regarding PECS.
- **Activity E2:** Develop ways of overcoming current barriers for a wide implementation of PECS in buildings.
- **Activity E3:** Provide input to existing national and international standards about requirements, characteristics, and performance of PECS.

## DELIVERABLES

1. Guidebook on requirements for PECS
2. State-of-the-art report on PECS
3. Guidebook on PECS design, operation and implementation in buildings (including integration of PECS with ambient conditioning systems)
4. Report on test methods for performance evaluation of PECS
5. Universal criteria about requirements, characteristics, and performance of PECS to be used in national and international standards