IEA-EBC Annex 78: Substituting Ventilation by Gas Phase Air Cleaning. An industry webinar

Introduction to IEA-EBC Annex 78 and the concept of substituting Ventilation by Gas Phase Air Cleaning

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EBC-IEA ANNEX 78: Operating Agents

- Dr. Bjarne W. Olesen, Technical University of Denmark.
- Dr. Pawel Wargocki, Technical University of Denmark.

- PREPARATION PHASE 01-07-2018 TO 30-06-2019
- WORKING PHASE 01-07-2019 TO 30-06-2023
- REPORTING PHASE 01-07-2023 TO 30-06-2024

ANNEX STRUCTURE

- Subtask A: Energy benefits using gas phase air cleaning
  - Subtask leader: Alireza Afshari, Denmark
  - Co-leader: *Sasan Sadrizadeh* , Sweden
- Subtask B: How to partly substitute ventilation by air cleaning
  - Subtask leader: Pawel Wargocki, Denmark
  - Co-leader: Shin-Ichi Tanabe , Japan
- Subtask C: Selection and testing standards for air cleaners
  - Subtask leader: Paolo Tronville, Italy
  - Co-leader: Jinhan Mo, China
- Subtask D: Performance modelling and long-term field validation of gas phase air cleaning technologies
  - Subtask leader: Karel Kabele, Czech
  - Co-leader: Jensen Chang , USA

ANNEX MEMBERS

- Czech
- China
- Denmark
- Japan
- Singapore
- Sweden
- USA
- Turkey

Planned deliverables

A. A method for predicting the energy performance of gas phase air cleaning technologies and the possible reduction of energy use for ventilation.

B. A validated procedure for supplementing (partly substituting) required ventilation rates with gas phase air cleaning.

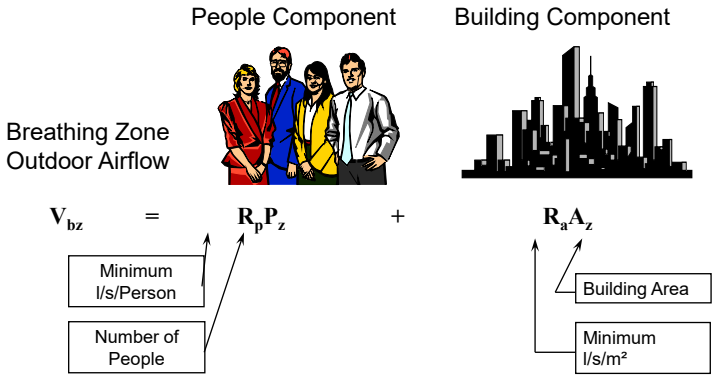
C. A test method for air cleaning technologies that besides chemical measurements include perceived air quality as a measure of performance.

D. A report on the long-term performance of gas phase air cleaning.

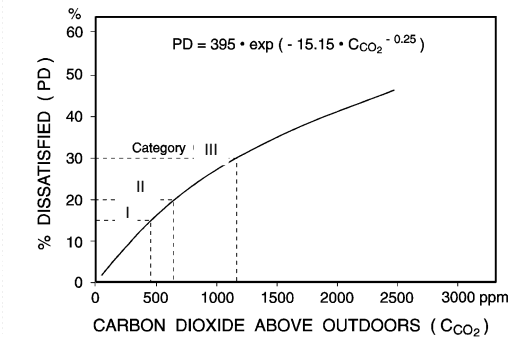
E. Models for predicting the performance of gas phase air cleaning

F. A report on Gas Phase Air Cleaning Technologies

Concept for calculation of design ventilation rate ISO CEN ASHRAE



CO_2 as reference



$$Q_h = \frac{G_h}{C_{h,i} - C_{h,o}} \cdot \frac{1}{\varepsilon v}$$

where

Q_h is the ventilation rate required for dilution, in m^3 per second;
G_h is the generation rate of the substance, in micrograms per second;
$C_{h,i}$ is the guideline value of the substance, in micrograms per m^3;
$C_{h,o}$ is the concentration of the substance of the supply air, in micrograms per m^3;
ε_v is the ventilation effectiveness.

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CONCEPT OF SUPPLEMENTING VENTILATION BY GAS PHASE AIR CLEANING.

- **Clean Air Delivery Rate (CADR)**
  - **$CADR = \varepsilon_{PAQ} \cdot Q_{AP} \cdot (3,6/V)$**
  - where:
  - **ε_{clean}** or **ε_{PAQ}**, is the air cleaning efficiency
  - Q_{AP}, is the air flow through the air cleaner, l/s;
  - V is the volume of the room, m^3.

- **Air Cleaning Efficiency**
  - **$\varepsilon_{clean} = 100(C_U - C_D)/C_D$**

  where:
  - **ε_{clean}** is the air cleaning efficiency
  - C_U is the gas concentration before air cleaner
  - C_D is the gas concentration after air cleaner.

- **Higher Air Quality Category**

$$\varepsilon_{PAQ} = Q_o / Q_{AP} \cdot (PAQ / PAQ_{AP} - 1) \cdot 100$$

- where:
- ε_{PAQ} is the air cleaning efficiency for perceived air quality;
- Q_o is the ventilation rate without air cleaner, l/s;
- Q_{AP} is the ventilation rate with air cleaner, l/s;
- PAQ is the perceived air quality without the air cleaner, decipol;
- PAQ_{AP} is the perceived air quality without the air cleaner, decipol

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CONCEPT OF SUPPLEMENTING VENTILATION BY GAS PHASE AIR CLEANING.

V entilation
I nformation
P aper
n° 42

April 2021

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International Energy Agency's
Energy in Buildings and Communities
Programme

Air Infiltration and Ventilation Centre

The Concept for Substituting Ventilation by Gas Phase Air Cleaning

Bjarne W. Olesen, DTU, Denmark
Chandra Sekhar, National University of Singapore, Singapore
Pawel Wargocki, DTU, Denmark

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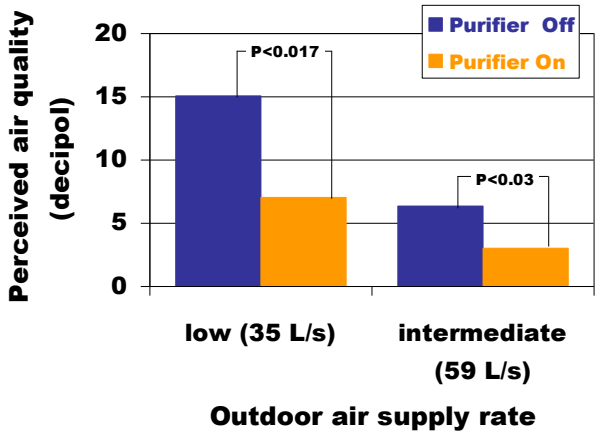
Results: Building materials, PCs, filters



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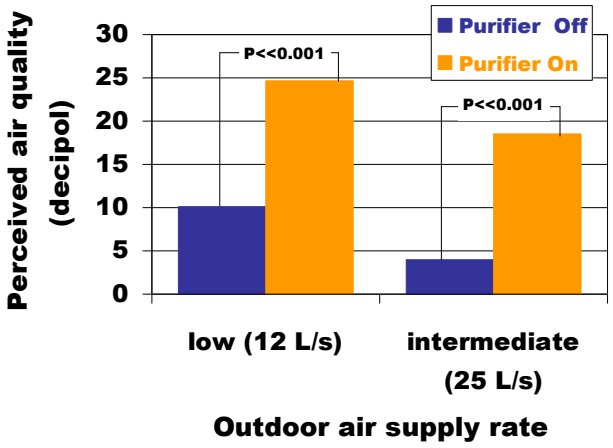
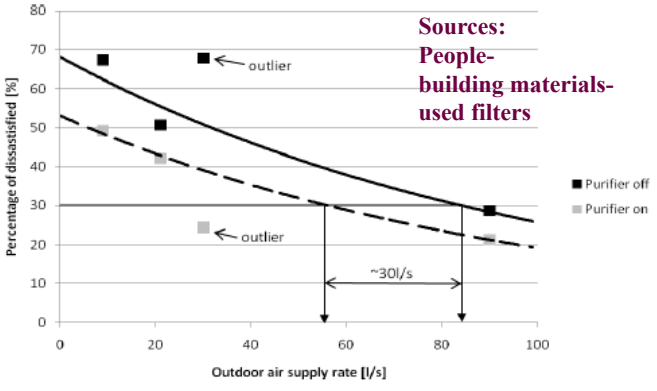
Results: Human bioeffluents

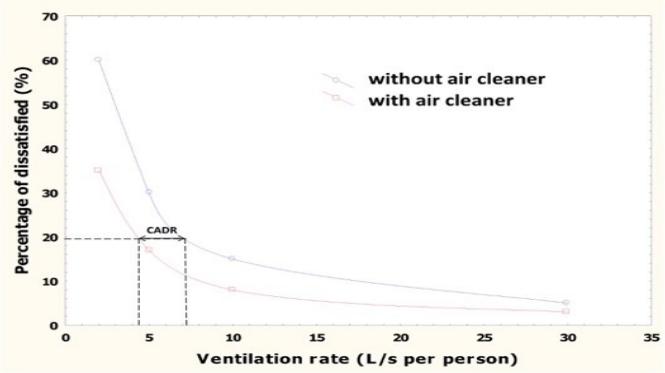


Effect of air cleaning on perceived Air Quality



Sources: People-building materials-used filters

Clean Air Delivery rate per person



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Conclusion

- A concept for substituting part of the required ventilation with gas phase air cleaning technology has been presented
- There is a need for new testing standards that considers perceived air quality and human emissions as a source.

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Questions?
Please put your questions in the chat.

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