Enhancing thermal comfort and reducing cooling energy through resilient ventilative cooling

venticool's position

venticool asserts that ventilative cooling holds the key to significantly diminishing the need for active cooling, which is the first element of the trias energetica or energy efficiency first principle. Ventilative cooling enhances thermal comfort and mitigates heat stress in buildings. Despite these benefits, the practical adoption of ventilative cooling remains limited among designers, primarily due to its underappreciation in regulatory energy performance calculations.

venticool advocates for a paradigm shift, urging standard writers and legislators to facilitate a fair and straightforward assessment of ventilative cooling systems within energy performance standards and regulations. Simultaneously, venticool is committed to empowering designers and builders with the requisite knowledge and tools to evaluate the potential and constraints of ventilative cooling. Recognizing the need for designing and assessing cooling strategies under extreme conditions, in line with IEA EBC annex 80 *Resilient Cooling of Buildings*, venticool has widened its scope to resilient ventilative cooling.

Context

The recent unprecedented heatwaves have resulted in record-breaking temperatures worldwide. Consequently, there is a need to determine whether and how cooling systems can effectively anticipate and respond to these heatwaves. "Resilience" of a cooling system refers to its ability to endure or bounce back from disruptions, like heatwaves or power outages. It involves adopting suitable strategies post-failure to restore the building performance, including indoor environmental quality and thermal comfort.

Furthermore, these record temperatures are driving the demand for active cooling, potentially creating a harmful cycle of elevated CO_2 emissions, thereby contributing to a warmer planet. The risk associated with increased cooling energy demands warrants particular attention in order to align with the ambitious 2050 objectives of the EU for a decarbonized building stock and the global transition away from fossil fuels.

Resilient ventilative cooling as part of an effective cooling strategy

Ventilative cooling emerges to be a key element in the strategy to meet the cooling demand while cutting the CO_2 emissions, in both standard weather conditions and extreme scenarios such as heat waves and power outages:

1. The initial phase of our comprehensive strategy involves minimizing heat gains through thorough **building design** and solar control strategy.

2. Following this, **ventilative cooling** constitutes the second step, wherein openable windows, louvres, and doors become integral components of a natural ventilative cooling system.

3. If the measures from the first two steps fall short in ensuring thermal comfort, a third step is implemented by integrating **additional passive cooling strategies** (e.g., evaporative cooling, PCM).

4. In cases where further intervention is necessary, a fourth step may be needed, involving a **combination** of passive strategies **with active cooling**.

Resilient ventilative cooling in standards, legislation and energy performance regulations

Venticool commends recent European and international initiatives in energy performance regulations and standards. The proposed 3rd recast of the European EPBD emphasizes the importance of measures to prevent overheating, such as shading and the development and application of passive cooling techniques. Notably, ventilative cooling is recognized as a form of renewable energy, considering outdoor air as a sustainable source for cooling. The Renewable Energy Directive (REDIII) incorporates ventilative cooling in calculating renewable energy used for cooling in EU countries. Additionally, ongoing efforts at both the European (CEN) and international standard (ISO) levels aim to enhance the assessment of ventilative cooling, with new technical documents expected to be published in 2026.

Resilient ventilative cooling faces limited recognition and rewards within the frameworks of most national standards, legislations, and energy performance calculations. IEA ABC Annex 62 *Ventilative Cooling* has highlighted constraints in the design of ventilative cooling systems. Additionally, there is a crucial need for evaluating the "ventilative cooling potential". This evaluation empowers designers to make informed decisions during the early design phase, offering insights into the duration throughout the year when pure ventilative cooling solutions are viable and when supplementary systems might be necessary.

Consequently, venticool urges that standards, legislations, and energy performance regulations incorporate:

- Assessment of overheating and resilience to overheating, applicable to both natural and mechanical ventilative cooling
- Design calculation methods tailored for the determination of airflow rates in resilient natural ventilative cooling systems.

venticool's involvement

Since its establishment in 2012, venticool has captivated the attention of scientists, manufacturers, designers, standard developers and policymakers globally. venticool has been actively working to bridge the gap between scientific and regulatory approaches. venticool employs effective dissemination strategies, exemplified by the organization of conferences, workshops, and webinars, often conducted in collaboration with AIVC. Additionally, venticool plays a role in supporting IEA EBC Annex 62, IEA Annex 80, and IEA Annex 87 as a valued dissemination partner.

For more information, visit our website at: https://venticool.eu/ or contact us at: info@venticool.eu.

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