venticool
the platform for resilient ventilative cooling

Position Paper

Developing resilient ventilative cooling for better comfort and energy savings in buildings

This position paper gives a brief overview of opportunities and challenges for ventilative cooling solutions both:

- To contribute to the 2050 objectives of the EU for a decarbonized building sector.
- To anticipate future heat waves and other shocks and thus limit the overheating risk, which is an increasing concern in low-energy buildings.

venticool partners believe policy makers and standard bodies should take steps together with the implementation of the EPBD recast to accelerate the uptake of this technology.

Context and concern for overheating risk in nearly Zero-Energy Buildings

One key concern regards provisions taken in practice to ensure or improve acceptable indoor environmental quality (including thermal, visual, acoustical comfort and indoor air quality) while taking measures to reduce buildings' energy use. In general, and particularly in nearly Zero-Energy Buildings, there is a very strong tendency to drastically reduce the heating demand. One adverse side effect is that in doing so, it often increases the risk of overheating both in summer and shoulder seasons due to the increased airtightness, insulation levels and solar gains of these high-performance building structures. According to the International Energy Agency's report "The Future of Cooling" (2018)[1], global energy demand for cooling is expected to triple by 2050.

Within the context of the European Green Deal, the building sector deserves specific attention to meet the ambitious 2050 objectives of the EU for a decarbonised building stock. It is evident to assume that an increased use of active cooling without improvements of the building itself (insulation, shading, …) and its operation (ventilative cooling, …) will substantially increase the energy consumption for cooling and the environmental impact of buildings.

Ventilative cooling as part of a resilient cooling strategy

Ventilative cooling can be in many circumstances a key element in a sustainable strategy for thermal comfort during periods of cooling demand. However, its potential can be very low if not combined with a good overall building design and solar control strategy. Furthermore, studies on the performance of existing low energy cooling systems (like ventilative cooling) concluded that even with current satisfactory performance, these technologies fail to function adequately in the extraordinary scenarios or shocks (e.g. high occupancy, power failure, high humidity production, pandemics etc.). A generally agreed definition of 'resilient cooling' is not yet available but the

[1] IEA (2018), The Future of Cooling, IEA, Paris https://www.iea.org/reports/the-future-of-cooling

following description gives a good indication of the resilience of a building as an "ability of the building to withstand disruptions caused by extreme weather events, man-made disasters, power failure, change in use and atypical conditions; and to maintain capacity to adapt, learn and transform".

In line with the scope of IEA EBC annex 80 *Resilient Cooling of Buildings*, the venticool platform has broadened its field of attention to resilient ventilative cooling strategies.

Ventilative cooling in standards, legislation and energy performance calculations

Because of their increasing impact on building design options, energy performance regulations are undoubtedly key market drivers. This is a specific concern for ventilative cooling strategies as they require rather mature assessment methods for thermal comfort and ventilation losses to be correctly accounted for. More specifically, standards, legislations and compliance tools need to include:

- Assessment of overheating, e.g.:
  - Utilizing thermal comfort indicators, including adaptive temperature sensation
  - Utilizing energy performance indicators
- Assessment of resilient natural and mechanical ventilative cooling
- Design calculation methods that fairly treat resilient natural ventilative cooling for determination of air flow rates including e.g. the dynamics of varying ventilation and the effects of location, area and control of openings

IEA ABC Annex 62 Ventilative Cooling has pointed out limitations regarding the design of ventilative cooling systems in CEN, ISO and national standards as well as national regulations as e.g. used in energy performance regulations which are detrimental to ventilative cooling.

These include the poor handling of usage profiles and control strategies, in other words, assumptions on by how much and when the airflow rates are increased to meet acceptable thermal comfort conditions. Furthermore an evaluation of the "ventilative cooling potential" is needed for the designer to make the right decisions in the early design phase, showing for how long throughout a year pure ventilative cooling solutions are possible and when supplementary systems could be used. Actually, a design tool by the IEA EBC Annex 62 was developed called "ventilative cooling potential tool" to help with this.

In fact, adequate credit for ventilative cooling should account for thermal comfort criteria as well as ideally, indoor air quality, visual comfort, and noise. It should reflect the effective cooling potential which greatly varies within a single day, calling for rather sophisticated calculations seldom used in regulations. The good news is that CEN and ISO have ongoing activities for a better assessment of ventilative cooling through new work items expected to be published around 2023.

The regulatory implementation of ventilative cooling strategies differs from country to country and therefore attention to the national approaches also falls within the scope of venticool.

venticool's involvement

Since its inauguration in 2012, venticool has invested considerable effort to bridge the gap between scientific and regulatory approaches in this area. venticool's dissemination strategies such as the organization of conferences, workshops and webinars (jointly organized with AIVC) as well as its support to the development & working phases of the IEA Annex 62 & IEA Annex 80- as dissemination partner- has triggered interest from scientists, standard developers and policy makers around the world.

venticool's position

venticool asserts that ventilative cooling can significantly reduce the need for active cooling, which is the first step of the trias energetica. In case measures to minimize the energy demand for cooling are not sufficient, active measures can be taken by making use of **renewable energy**. As a matter of fact, ventilative cooling is a type of renewable energy as the outdoor air is a renewable source for cooling.

However, very few designers implement ventilative cooling in practice because it is poorly rewarded in regulatory energy calculation procedures. To overcome this problem, venticool appeals to writers of standards and legislators to provide fair and easy evaluation of the performance of ventilative cooling systems in standards and regulations. In parallel, providing knowledge and tools for designers and builders to assess the potential and limitations of resilient ventilative cooling is important.

In essence, a focus on resilient cooling strategies can stimulate the uptake of ventilative cooling, which justifies the widening of the scope of venticool beyond purely ventilation aspects.

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

You can also contact venticool partners: Agoria-Naventa, Velux and WindowMaster directly through their websites