Mitigating overheating problems with ventilative cooling: potential, barriers, and perspectives

To grasp the potential of ventilative cooling to mitigate overheating problems in practice, venticool partners believe that this technology should be fairly accounted for in building regulations.

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venticool—the international platform for ventilative cooling—was inaugurated in October 2012 to accelerate the uptake of ventilative cooling (i.e., the use of ventilation strategies to cool indoor spaces). The platform focuses on raising awareness, sharing experience and steering research and development in this field. It supports better guidance for the appropriate implementation of ventilative cooling strategies as well as adequate credit for such strategies in building regulations.

In its recent contribution to the consultation on the implementation of the Energy Performance of Buildings Directive, venticool has put forward elements for consideration in the review of the directive. The major points are highlighted below.

1) Overheating has serious socio-economic implications

Overheating is known to affect sleep quality, productivity and learning abilities and to increase mortality and morbidity [4]. For example, the Zero Carbon Hub report [7] on impacts of overheating gives an estimate of increased hospital admissions in the UK due to heat waves of 80 000 patient-days per year. It mentions ventilation, shading[2] and thermal mass as key measures to reduce overheating, but also the potential increase of electricity demand due to increase in the use of air conditioning devices. According to the UK committee on climate change, the use of air-conditioning instead of passive cooling measures in both existing and new homes would cost the UK society an additional £2 billion (existing homes) and £400 million (new homes) respectively over 15 years and it would exacerbate urban heat island effect [1].

2) Overheating has become a key concern in Nearly Zero-Energy Buildings

Article 4 of the EPBD states that minimum energy performance requirements set "shall take account of general indoor climate conditions, in order to avoid possible negative effects such as inadequate ventilation, as well as local conditions and the designated function and the age of the building". Nevertheless, several studies strongly suggest that indoor environmental issues have been neglected in many member states while implementing energy conservation policies. This includes thermal comfort and indoor air quality, as excessive focus on reducing heating energy use often increases the overheating risks in summer and shoulder seasons (due to the increased airtightness, insulation levels and solar gains) [3][4][5][6]or the risk of poorly ventilated buildings.

3) Overheating can be avoided without active cooling

Experience shows that active cooling is often considered to address overheating, while other options should be prioritised in the building design, when relevant. Proper building design strategies can overcome this risk of overheating with little or even no use of active cooling. These strategies include in particular ventilative cooling, adequate solar control (e.g. dynamic shading [2]) and thermal mass utilisation. They give designers a range of options to address the overheating risk and help avoid energy and aesthetics issues associated with the installation of active cooling units in existing buildings.

4) Summer comfort criteria need to be properly implemented in all member states for non-air-conditioned buildings

Although defining summer comfort criteria for free-running non-air-conditioned buildings is a pre-requisite to address the overheating risk, the vast majority of energy performance regulations in Europe do not include such criteria. In these cases, the substantial summer comfort improvements realised with any technology including ventilative cooling are not rewarded. In addition, if mechanical or hybrid ventilation is used for ventilative cooling, the additional fan energy use may be penalised.

5) Despite its potential, the market uptake of ventilative cooling is pre-conditioned to its fair assessment in standards and regulations

De facto, NZEB targets leave less and less room for technologies poorly rewarded in standards and regulations. Designers are more and more reluctant to include such technologies because they must be compensated by other means to meet the regulatory requirements. Therefore, although ventilative cooling proves to be effective to address the overheating risk very few designers implement this strategy in practice.

6) Ventilative cooling can help mitigate peak load issues

Although the EPBD recognizes in its introduction the problems created by the increasing number of air-conditioning systems in Southern countries, the articles in force weakly reflect the concern for peak loads—mostly through the use of renewable energy systems and the energy efficiency of heating and cooling systems, which only implicitly have an impact on peak loads. Ventilative cooling systems are not considered as renewable energy systems; however, because they demand considerably less and sometimes even no electric power, ventilative cooling can surely help mitigate peak load issues.

In summary, there are many challenges to overcome for the uptake of ventilative cooling to better address overheating and summer comfort issues. The good news is that venticool plays a major role to remove barriers through information exchange and awareness raising as well as through its support to research developments (IEA Annex 62, venticool conferences, webinars, publications, etc.).

Note that venticool has just initiated a webinar series where several speakers will explain status and progress needed regarding the assessment of ventilative cooling potential in Energy Performance regulations.

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

References

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