Newsletter
Air Infiltration and Ventilation Centre

Foreword

@AIVCnews

2018 has so far been a productive year for the AIVC promoting research & development, dissemination of information and collaborations in the field of ventilation and air infiltration in buildings. Here is a snapshot of this year's achievements:

- *Jan-18*: TightVent Europe & AIVC organize a Webinar on Ductwork Airtightness
- *Feb-18*: China joins the AIVC
- *Mar-18*: AIVC releases Ventilation Information paper °38: What is smart ventilation?
- *Mar-18*: AIVC organizes a Webinar on IAQ sensors for Smart Ventilation of buildings
- *Mar-18*: AIVC & BRANZ organize the Workshop "Towards higher-performing buildings: The role of airtightness and ventilation" in Wellington, New Zealand
- *Mar-18*: AIVC & CRC organize the Workshop "Ventilation for Indoor Air Quality and Cooling" in Sydney Australia
- *Apr-18*: venticool & AIVC organize a Webinar on Ventilative Cooling and Summer Comfort
- *Jun-18*: REHVA releases a special issue with a selection of articles presented at the 2017 AIVC Conference "Ventilating healthy low-energy buildings"
- *Aug-18*: Australia joins the AIVC
- *Sep-18*: AIVC & EBC Annex 68 organize a Webinar on MOS VOC sensors for ventilation control
- *Sep-18*: AIVC organizes its annual conference in France on the topic of Smart Ventilation in buildings

We hope this issue will give you a good overview of most of these activities and we wish you a pleasant reading.

Peter Wouters, Operating Agent AIVC

no 14
September 2018

The Definition of Smart Ventilation

Iain Walker, LBNL, USA

There are lots of ways to control ventilation – but not all of them are smart. The objective of the AIVC creating a definition for smart ventilation was to i) ensure that when we use this term there will be some level of agreement as to what it means, and ii) to restrict systems that are not very smart from calling themselves smart – i.e., providing a level of consumer protection. AIVC has issued a Ventilation Information Paper (VIP) defining Smart Ventilation (Durier, Carrié, & Sherman, 2018) that summarizes the requirements of a smart ventilation system. The key issue is that we want to enable energy (and possible energy grid demand) savings without compromising Indoor Air Quality (IAQ) while also allowing flexibility of operation. Although the definition does not explicitly say how the "desired IAQ benefits" are to be determined, at least one Standard, ASHRAE 62.2-2016, has explicitly stated how to do this using the equivalency principle. This principle requires that the ventilation rate that is varied using a smart system have the same annual average exposure to a continuously generated pollutant as a continually operating (not smart) ventilation system. While this approach is not universally accepted it provides a reasonable basis for ensuring smart systems deliver the same (or better) IAQ than non-smart systems. The definition also includes the capability to reduce ventilation if outdoor air quality is unacceptable and include the use of directly sensing IAQ. Both of these approaches utilize direct measurements of IAQ. Lowering the cost of these measurements, or, at least, understanding the compromises being made to lower costs, is the subject of much ongoing research. As yet, the current state of the art for these low cost devices is not quite good enough to use for ventilation control. However, the smart ventilation definition is looking to the future as much as to the present, and will be useful going forward if sensors become more useful and other information, such as energy grid signals, become more mainstream. These, and other topics will be discussed at this year's AIVC Conference whose theme is Smart Ventilation for Buildings.

Reference: *Durier, F., Carrié, R., & Sherman, M. (2018). VIP 38: What is smart ventilation? AIVC. Retrieved from http://aivc.org/resource/vip-38-what-smart-ventilation*

In this issue

Air Infiltration and Ventilation Centre

Feedback from the 2018 AIVC Workshop in Wellington, New Zealand

Manfred Plagmann, BRANZ, NZ

The 2018 AIVC workshop was held in Wellington, New Zealand on 19-20 March. The theme of the workshop was how airtightness and ventilation can contribute to better buildings. The workshop brought together researchers, policy makers, designers and practitioners.

Historically, NZ homes have had a rudimentary approach to both airtightness and ventilation. In contrast, many European countries have airtightness and ventilation targets entrenched in their codes and regulations – largely driven by EU wide energy directives. The workshop was a chance for the NZ audience to learn from experiences from overseas and discuss what might be a practical way forward for New Zealand.

The following points are a selected summary of the workshop:

• The poor condition of the NZ housing stock was discussed to help put the NZ situation into context for the overseas researchers.

• The health costs associated with indoor air quality are now becoming known and are a stronger argument for improved airtightness and ventilation control..

• If the building code were to include an airtightness requirement, it need not be a step change from current construction practice. However, many older homes would benefit from an airtightness upgrade.

• Ventilation requirements do need a rethink. 100% of the attendees thought the acceptable code solution of relying on openable windows was inadequate.

To read the complete article please visit: http://aivc.org/news/feedback-2018-aivc-workshop-wellington

23 March 2018, Workshop, Sydney, Australia - Ventilation for Indoor Air Quality and Cooling

Mat Santamouris, UNSW, AU

The AIVC and the CRC (Cooperative Research Centre) for Low Carbon Living, in collaboration with the Australian Government Department of Energy and the Environment ASHRAE, AIRAH, venticool and UNSW Sydney, presented on March 23 a one day workshop in Sydney on 'Ventilation for Indoor Air Quality and Cooling'.

The seminar aimed to inform Australian researchers, engineers and scientists about recent developments in the field of ventilation, cooling and air quality technologies.

Senior researchers and engineers from Australia presented their latest scientific research while international experts visiting Australia had the opportunity to present global research to their local counterparts. The workshop showcased research that determines optimum ventilation levels and the development of advanced ventilation technologies to promote comfort, energy conservation and better indoor environmental quality in buildings, while also providing a forum for international and local experts to discuss the future of ventilation technologies for the building sector.

The workshop was attended by almost 100 policy makers, regulators, researchers, developers, sustainability experts, consultants and contractors. The results of a participant survey taken during the workshop concluded that:

• The expansion of mandatory energy disclosures for buildings could highly contribute to further boosting energy conservation in Australia.

• Indoor air quality is an important problem in several types of buildings like schools, and further technological and regulatory actions must be undertaken.

• Energy and environmental certification of buildings is an important tool that can help to improve the energy and environmental quality of buildings and protect residents.

• Energy efficient ventilation technologies can replace air conditioning, and provide indoor comfort especially in mild climatic zones.

• There is a strong need to develop more efficient cooling and ventilation technologies to counterbalance and compensate the expected increase in energy consumption induced by population increase and local and global climate change.

15-16 October, 2019 - 40th AIVC conference in Ghent, Belgium

The 1st AIVC conference was held in October 1980 in Windsor, UK. The 12 papers as presented at this conference can be found on the AIVC website. Next year, the 40th AIVC conference will be held in the historic centre of the city of Ghent, Belgium on October 15 and 16. Whereas the overall conference concept will be quite similar to the last editions, it is foreseen to pay specific attention to the evolutions over this 40 years period, with specific presentations and topical sessions. For practical information: www.aivc2019conference.org.

Recordings and slides of "Using MOS sensors to measure VOC for ventilation control" webinar now available

The recordings and the slides of our latest webinar "Using Metal Oxide Semiconductor (MOS) sensors to measure Volatile Organic Compounds (VOC) for ventilation control" held on 4 September, 2018 and jointly organised with the IEA EBC Annex 68 "Indoor Air Quality Design and Control in Low Energy Residential Buildings" are now available online at:

http://aivc.org/event/4-september-2018-webinar-using-metal-oxide-semiconductor-mos-sensors-measure-volatile-organic

A collection of past events' recordings and slides can also be found at: http://aivc.org/resources/collection-publications/events-recordings Check them out and subscribe to our YouTube channel to receive our latest video updates!

AIVC Air Infiltration and Ventilation Centre

The recently adopted IEA EBC Annex 80 on Resilient Cooling

Peter Holzer, Operating Agent EBC Annex 80

An inexorable increase in energy consumption for the cooling of buildings, and the increase in overheating of buildings is caused by urbanisation and densification, climate change, elevated comfort expectations, and inappropriate architectural design practices. Meeting this challenge requires further development and application of low energy and low carbon cooling solutions on a large scale. In order to expedite the transition of our new-build and existing building stock to nearly zero energy building (nZEB) and nearly zero carbon building (nZCB) status we have to take immediate action.

To work on this important matter a new Annex has been approved by the IEA EBC Executive Committee at the Stockholm meeting in June and the Annex 80 Preparation Phase has officially been launched. During this one-year period we will gather scientists from participating countries to further develop the research programme for the upcoming three-year Working Phase. The main topic is Resilient Cooling for Residential and Small Commercial Buildings. Research efforts will be structured in four subtasks: Subtask A "Impact Assessment", Subtask B "Solutions", Subtask C "Case studies" and Subtask D "Regulatory Initiatives.The annex will yield instructions for the improvement of existing systems and their control strategies as well as for the implementation of new resilient cooling solutions for residential buildings and small commercial buildings. It will generate guidelines for resilient cooling solutions allowing for the reduction of overheating risks as well as the cost-effective, energy-efficient and low-carbon coverage of cooling demands. It will also produce recommendations for the integration of resilient cooling in legislation, standards on national, European and international levels as well as in design briefs and in energy performance calculation and verification methods.

The Annex 80 is open to all interested scientific and industrial researchers as well as governmental stake holders of countries within the IEA EBC programme. For further information please visit the website http://annex80.iea-ebc.org/meetings or contact Peter Holzer, operating agent of EBC Annex 80 at: peter.holzer@building-research.at

Highlights of the AIVC 2017 Conference at the REHVA Journal

The June 2018 edition of the REHVA Journal includes a selection of articles presented at the 38th AIVC Conference, 2017 "Ventilating healthy low-energy buildings" held on 13-14 September 2017 in Nottingham, UK.

Specific articles include:

- Ventilative Cooling on the test bench – Learnings and conclusions from practical design and performance evaluation; P. Holzer, P. Stern & T. Psomas
- Ventilative Cooling in International Case Studies – Lessons Learned; P. D. O'Sullivan, A. O'Donovan, G. C. da Graca & G. Zhang
- Study shows that unhealthy homes lead to reduced health; J. Ashok, A. Hermelink, N. Galiotto, P. Foldbjerg, K. B. M. Eriksen & J. Christoffersen
- Analyses of 1,000 ductwork airtightness measurements in France; A. Bailly Mélois & B. Moujalled
- Building and ductwork airtightness requirements in Europe; Valérie Leprince, F. R. Carrié & M. Kapsalaki
- Affordable and replicable renovation of social housing fulfilling indoor climate and energy targets thanks to seven replicable renovation elements; N. Galiotto, P. Foldbjerg, J. Christoffersen, T. F. Asmussen & S. Pauquay
- Reintroduction of Natural Ventilation to a Historic Opera House; J. Thompson, M. Donn & G. Baird
- Development of a compact Counterflow Heat Recovery Fan; C. Speer & R. Pfluger
- Uncertainties due to steady wind in building pressurisation tests; V. Leprince & F. R. Carrié

To download the full journal please visit: https://www.rehva.eu/publications-and-resources/rehva-journal/2018/032018.html

EBC-Annex 78. Supplementing Ventilation with Gas-phase Air Cleaning, Implementation and Energy Implications

Bjarne Olesen, Pawel Wargocki, Operating Agents EBC Annex 78

Ventilation accounts for approximately 20% of the global energy use for providing an acceptable indoor environment. The requirements for ventilation in the most standards and guidelines assume acceptable quality of (clean) outdoor air. In many locations in the world, the outdoor air quality is so bad that it is better to avoid ventilation. In such cases, the alternative to use ventilation is to substitute it with air cleaning so that the indoor air can be kept at high quality. Even when outdoor air is of a good quality, the use of air cleaning substituting ventilation air could reduce the rate of outside air supplied indoors and thereby energy for heating/cooling the ventilation air and for transporting the air (fan energy) can be saved. Since it is expected that air cleaning may in parallel improve the indoor air quality and reduce energy use for ventilation, it should be considered as a very interesting technology that can be used in the future. There is however a need for better evaluation of its potential to improve indoor air quality (and substitute ventilation rates) and the energy implication of using gas phase air cleaning. There is also a need to develop standard test methods of the performance of gas phase air cleaning devices related to typical indoor sources like bio effluents from occupants and emission from materials and indoor activities.

The proposed Annex should bring researchers and industry together to investigate the possible energy benefits by using gas phase air cleaners (partial substitute for ventilation) and establish procedures for improving indoor air quality or reduced amount of ventilation by gas phase air cleaning. The project shall also establish a test method for air cleaners that considers the influence on the perceived air quality and substances in the indoor air.

Air Infiltration and Ventilation Centre

Australia joins the AIVC

Wendy Miller, QUT, AU

The AIVC is very pleased to welcome Australia as new participating country. Australia's representatives on the AIVC Board will be Professor Mat Santamouris (University of New South Wales) and Dr Wendy Miller (Queensland University of Technology). Summer cooling, in particular in relation to the increased intensity, duration and frequency of heat waves, is a major challenge to both human health and building and energy infrastructure in Australia. Arguably Australia's biggest need is for a 'whole systems' approach that incorporates diverse disciplines such as architecture, science, engineering, health and humanities / social sciences. Some specific challenges yet to be resolved include: (i) determining and regulating appropriate levels of airtightness (and hence ventilation rates) for different building types for different climate zones, to balance the need for energy efficiency and a healthy indoor environment; (ii) advanced hybrid ventilation and cooling strategies that lessen the contribution to peak demand on the electricity network and provide building occupants with a level of resilience and self-management; (iii) improving the skill level and level of compliance within the construction industry; (iv) incorporating occupant health and safety (e.g. heat wave ratings) into the National Construction Code; and (v) better understanding IAQ metrics, measurement and control devices and user interactions, with regard to specific demographics and building types (e.g. in schools; in housing for the elderly). Active 'teams' in these areas include government (e.g. Australian Building Codes Board, Department of Environment and Energy, National Energy Efficient Building Project), industry (e.g. AIRAH, ASBEC) and research organisations (e.g. CSIRO, QUT, RMIT, UniSA, UNSW, USYD, UoW).

AIVC • List of board members