

FINAL PROGRAMME

39th AIVC Conference

Smart ventilation for buildings

18 - 19 September 2018

7th TightVent Conference

5th venticool Conference

Antibes Juan - les - Pins

Conference Centre, France



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ROOM A / ANTIPOLIS AUDITORIUM

09:00-10:30 Opening - Plenary session

Chairpersons: Peter Wouters, François Durier

Welcome on behalf of AIVC, venticool, TightVent

Peter Wouters, *Manager, INIVE EEIG, Belgium*

Welcome on behalf of CETIAT/ADEME

François Durier, *CETIAT, France* & Pierre Deroubaix, *ADEME, France*

Will the “smart” movement lead to an improved indoor environmental quality?

Bjarne Olesen (Invited speaker), *ASHRAE President–DTU, Denmark*

Advances in European residential ventilation systems

in Nearly Zero Energy Buildings

Jarek Kurnitski (Invited speaker), *REHVA Vice-president–Chair of the Technology and Research Committee, Estonia*

EU support for innovation and market uptake in smart buildings

Philippe Moseley (Invited speaker), *EASME, Belgium*

French energy and indoor air quality policies for buildings and ventilation

Emmanuel Acchiardi, (Invited speaker), *MTEs & MCT, France*

Industry views with respect to smart ventilation as an enabler of indoor air quality

Yves Lambert (Invited speaker), *EVI, Belgium*

10:30-11:00 Coffee break

ROOM A / ANTIPOLIS AUDITORIUM

11:00- 12:30 Parallel Session 1A - Long & Short Oral Presentation

Session: Analysing airtightness measurements

Chairpersons: François Rémi Carrié, Paula Wahlgren

Quality framework for airtightness testing in the Flemish Region of Belgium – feedback after three years of experience (Long Oral Presentation)

Maarten De Strycker, *Belgium*

French database of building airtightness, statistical analyses of about 215,000 measurements: impacts of buildings characteristics and seasonal variations (Long Oral Presentation)

Bassam Moujalled, *France*

Preliminary analysis results of Spanish residential air leakage database (Long Oral Presentation)

Irene Poza-Casado, *Spain*

Assessment of durability of airtightness by means of repeated testing of 4 passive houses (Long Oral Presentation)

Jiri Novak, *Czech Republic*

Onsite evaluation of building airtightness durability: Long- term and mid-term field measurement study of 61 French low energy single family dwellings (Long Oral Presentation)

Bassam Moujalled, *France*

In-situ and laboratory airtightness tests of structural insulated panels (SIPs) assemblies (Short Oral Presentation)

Vitor Cardoso, *Portugal*



Tuesday
18 September 2018

39th AIVC Conference
Smart ventilation for buildings

ROOM B / ELLA FITZGERALD

11:00-12:30 Parallel Session 1B - Topical Session: Commissioning of ventilation systems - Improving quality of installed ventilation systems

Chairpersons: Gaëlle Guyot, Laure Mouradian

Several measurement campaigns in Europe highlighted that the quality of installed ventilation systems is often far from the performance expected at design stage (Boersta, 2012; Caillou, 2012; Jobert, 2012). However, with the generalization of low energy buildings with air-tighter envelopes, ventilation performance becomes a crucial issue to avoid health problems and building damages. In this regard, several projects and initiatives have been conducted in France these past few years to improve the quality of installed ventilation systems, using the commissioning as a driver for change. Area of works proposed in this session are: the commissioning as a key point in the development of quality management schemes, the improvement of the reliability of ventilation performance assessment protocols, in-situ ventilation performance assessment methods for hybrid and natural ventilation, and change management towards a better quality of installed ventilation systems with active participation of stakeholders.

Development and test of quality management approach for ventilation and indoor air quality in single-family buildings

Sandrine Charrier (Invited speaker), *France*

Applications of the Promevent protocol for ventilation systems inspection in French regulation and certification programs

Adeline Bailly Mélois (Invited speaker) & Laure Mouradian, *France*

Presentation of a national consultative body on ventilation issues: actors, working groups and projects overview

Andrés Litvak & Romuald Jobert (Invited speakers), *France*

Assessing the performance of hybrid and natural ventilation systems: a review of existing methods (Short Oral Presentation)

Gabriel Remion, *France*

ROOM C / MILES DAVIS

11:00-12:30 Parallel Session 1C- Long & Short Oral Presentation Session: Indoor Air Quality & Ventilation in non-residential buildings

Chairpersons: William Bahnfleth, Pierre Deroubaix

Thermal Comfort and indoor air quality in Drøbak Montessori School - A case study of Norway's first plus-energy school (Long Oral Presentation)

Maria Myrup, *Norway*

Ventilation Performance of Natural Ventilation Building with Solar Chimney (Long Oral Presentation)

Haruna Yamasawa, *Japan*

Ventilation Performance of Natural Ventilation Building with Solar Void (Short Oral Presentation)

Haruna Yamasawa, *Japan*

Ventilation Performance of Office Building with Natural Ventilation Shaft (Short Oral Presentation)

Toshihiko Sajima, *Japan*

Indoor air quality measurements in 35 schools of South - Western Europe (Short Oral Presentation)

Patrice Blondeau, *France*

ROOM C / MILES DAVIS

Estimation and Analysis of Ventilation Rates in Schools in Indian Context (Short Oral Presentation)

Sandhiya Jayakumar, *India*

Inhalable particle concentration distribution of a typical university canteen in Shenzhen (Short Oral Presentation)

Jianhua Ding, *China*

A study of running set-points and user IEQ satisfaction perspectives in the Norwegian commercial building stock (Short Oral Presentation)

Niels Lassen, *Norway*

Indoor Environment in Sickroom with Ceiling Induction Diffusers and Measuring Method of Ventilation Effectiveness Using Tracer Gas (Short Oral Presentation)

Peihuan Liu, *Japan*

Development of a zonal model to assess indoor climate and damage risks to art works in church buildings (Short Oral Presentation)

Arnold Janssens, *Belgium*

Effects of meteorological factors on CO2 concentrations (Short Oral Presentation)

Maria Marrero, *Spain*

12:30-13:30 **Coffee break**

ROOM A / ANTIPOLIS AUDITORIUM

13:30-15:00 **Parallel Session 2A – Topical Session: Smart ventilation control strategies**

Chairpersons: Max Sherman, François Durier

Smart ventilation of buildings is a process to continually adjust the ventilation system in time, and optionally by location, to provide the desired IAQ benefits while minimizing energy consumption, utility bills and other non-IAQ costs (such as thermal discomfort or noise). The energy and IAQ performance of smart ventilation relies on a relevant control, based on information received from sensors and provided to actuators, operating with relevant and efficient control algorithms. The control strategy becomes therefore a key element of smart ventilation, building energy performance and IAQ. The objective of this session is to present and illustrate the definition of smart ventilation prepared by AIVC; show examples of the energy savings and IAQ performance of smart ventilation; discuss the various aspects of smart ventilation control strategies from the inputs of a panel of experts.

What is smart ventilation - presentation of the AIVC definition

François Durier, *France*

A review of smart ventilation energy and IAQ performance in residential buildings (Long Oral Presentation)

Gaëlle Guyot, *France*

Smart ventilation control strategies - Panelists' point of view

Wouter Borsboom, *Netherlands*, Iain Walker, *USA*, Pawel Wargocki, *Denmark*

Discussion with the audience

Max Sherman (Moderator), *USA*

ROOM B / ELLA FITZGERALD

13:30-15:00 Parallel Session 2B - Topical Session: Ductwork airtightness: Ongoing works in some European countries

Chairpersons: Valérie Leprince, Lars-Åke Mattsson

On one hand, there is a number of studies that demonstrate significant energy use impacts of ductwork leakages, showing that the total energy use related to ventilation could be reduced by over 30 to 50 % by achieving an airtight ventilation system. On the other hand, a recent study has been performed among the TightVent Airtightness Association Committee (TAAC) to compare ductwork airtightness requirements in Europe. It has shown that ductwork airtightness does not seem to be taken into account (neither in regulation nor in energy performance programmes) in most European countries. Conversely to building airtightness the awareness regarding ductwork airtightness has not grown in most European Countries. Therefore, progress is still needed to better understand the impact of ductwork airtightness on energy use (fan, cooling and heating) and indoor air quality. The objective of this session is to present ongoing work in some European countries which have begun to define requirements either in regulation or in labels regarding ductwork airtightness.

Introduction: Why shall we care about ductwork airtightness?

Valérie Leprince, *France*

Duct leakage testing in Portugal, a consulting engineer's view and experience

Carlos Lisboa (Invited speaker), *Portugal*

Ductwork airtightness in UK: requirements and assessment of the installed performance

Marcus Lightfoot (Invited speaker), *Netherlands*

Statistical analysis of about 1,300 ductwork airtightness measurements in new French buildings: impacts of the type of ducts and ventilation systems (Long Oral Presentation)

Bassam Moujalled, *France*

Ventilation ductwork systems certification for a better air tightness (Long Oral Presentation)

Marie-Clemence Briffaud, *France*

The new air tightness class in ductwork - Aerseal technology to seal leakages in new/retrofit ductwork and duct components - the foundation for highest energy efficiency in ventilation systems"

Jorg Mez (Invited speaker), *Germany*

ROOM C / MILES DAVIS

13:30-15:00 Parallel Session 2C - Long Oral Presentation Session: Ventilative Cooling

Chairpersons: Hilde Breesch, Peter Holzer

Key findings of four years of research on Ventilative Cooling and how it is done

Philipp Stern, *Austria*

Status and recommendations for better implementation of ventilative cooling into Danish standards, building legislation and energy compliance tool

Christoffer Plesner, *Denmark*

The influence of thermal mass on the predicted climate cooling potential in low energy buildings

Paul O' Sullivan, *Ireland*

ROOM C / MILES DAVIS

Validation of Dynamic Model BSim to Predict the Performance of Ventilative Cooling in a Single Sided Ventilated Room

Michal Pomianowski, *Denmark*

Ventilative cooling in a school building: evaluation of the measured performances

Hilde Breesch, *Belgium*

Freevent: ventilative cooling and summer comfort in 9 buildings in France

Andrés Litvak, *France*

15:00- 15:15 **Room change**

ROOM A / ANTIPOLIS AUDITORIUM

15:15- 16:30 Parallel Session 3A – Topical Session: Demand controlled ventilation in French buildings – 35 years of wide scale experience

Chairpersons: Fabrice Lamarre, Laure Mouradian

Demand controlled ventilation systems are representing a large majority of installations in France. They are commonly used for more than 35 years. The strong development of these systems can be explained by the French regulatory framework for air renewal. These demand controlled systems have been developed in order to optimise the energy consumption and at the same time to ensure indoor air quality and building durability. In residential buildings, demand control is based mainly on humidity whereas in commercial buildings it is based on occupancy and/or CO2 levels. Research is still in progress to guarantee that the indoor air quality is ensured at design stage and maintained during the building life. The objectives of this session are to: show an overview of the available demand controlled ventilation systems installed in France in residential and commercial buildings; explain the assessment procedure, used to deliver technical agreements; share French experience of such systems, based on on-site measurements for assessing long-term durability in dwellings.

Introduction to demand controlled ventilation in France

Fabrice Lamarre & Laure Mouradian, (*France*)

From Technical Appraisal of Demand-Controlled Ventilation Systems to Indoor Air Quality Assessment Using the Thermo-Hygro-Aeraulic code MATHIS

François Demouge (Invited Speaker), *France*

Feedback on installation, maintenance and aging of mechanical humidity-controlled exhaust units (Long Oral Presentation)

Stephane Berthin, *France*

Long-term durability of humidity-based demand-controlled ventilation: results of a 10 years monitoring in residential buildings (Long Oral Presentation)

Elsa Jardinier, *France*

Occupancy controlled ventilation in refurbished office building, combining presence and CO2 detection

Jean-Michel Navarro (Invited Speaker), *France*

ROOM B / ELLA FITZGERALD

15:15- 16:30 **Parallel Session 3B-Topical Session: Integrating uncertainties due to wind and stack effect in declared airtightness results**

Chairpersons: Valérie Leprince, Christophe Delmotte

Building airtightness tests have become very common in several countries, either to comply with minimum requirements of regulations or programmes, or to justify input values in calculation methods. This raises increasing concerns for the reliability of those tests. There are four key sources of uncertainty in airtightness testing: measurement devices (accuracy and precision); calculation assumptions (e.g. reference pressure, regression analysis method); external conditions (wind and stack effect impact); and tester's behaviour. While competent tester schemes and independent checking procedures show potential to contain errors due to the tester's behaviour, there have been extensive yet sterile debates about how the building pressurisation test standard ISO 9972 should address other sources of uncertainties. As a result, no change has been made on these aspects on the new version of the standard which was published in September 2015.

With the present standard, the zero-flow pressure shall not exceed 5 Pa for the test to be valid. Consequently, in moderately windy conditions, it may be impossible to perform a pressurisation test in accordance with the standard, even using precautions with a careful uncertainty analysis.

This is the second topical session on this subject after the first one at AIVC 2017. The objective of this new session is to give a review of the work performed on this subject and to discuss recent work to quantify or contain the uncertainty.

Introduction: Output of the AIVC working group

Valérie Leprince, *France*

Wind speed in building airtightness test protocols: a review

Adeline Mélois (Invited Speaker), *France*

Experimental study of enclosure airtightness of an outdoor chamber using the pulse technique and blower door method under various leakage and wind conditions (Long Oral Presentation)

Xiaofeng Zheng, *United Kingdom*

Experimental Investigation of the Impact of Environmental Conditions on the Measurement of Building Infiltration, and its correlation with Airtightness (Long Oral Presentation)

Alan Vega Pasos, *United Kingdom*

Uncertainties in airtightness measurements: regression methods and pressure sequences (Long Oral Presentation)

Martin Prignon, *Belgium*

Numerical and experimental identification of factors influencing the pressure homogeneity during an airtightness test in a large building (Short Oral Presentation)

Loubna Qabbal, *France*

ROOM C / MILES DAVIS

15:15- 16:30 **Parallel Session 3C - Topical Session: Rationale behind ventilation requirements and regulations**

Chairpersons: Wouter Borsboom, Willem de Gids

Internationally there are many different requirements and regulations for ventilation. Sometimes the variation is more than a factor of five. There are strong drivers to reduce energy consumption for HVAC, and therefore the spread in requirements and regulation is worthwhile to study. To reduce ventilation flows there is a necessity to understand the reasons behind. Demand control to reduce this flows is in many countries growing but the control parameters are quite different, for instance humidity versus CO2 control. If you don't know the reasons for ventilation, you cannot decide when and to what level you can reduce the ventilation flows. Latest studies on contaminants related to health are probably important for demand controlled ventilation. The objective of this session is to: show the differences in ventilation requirements; present the rationale behind the regulation given by the different countries; analyse the reasons for the differences in background and philosophies; present latest research in relation to most important contaminants; discuss the strategies on demand controlled ventilation

Ventilation requirements for different rooms as a result on the inquiries in 20 countries

Willem de Gids, *Netherlands*

IAQ in working environments in Belgium: alternative approaches to CO2 requirement (Long Oral Presentation)

Samuel Caillou, *Belgium*

How should we characterize emissions, transport, and the resulting exposure to SVOCs in the indoor environment? (Long Oral Presentation)

John Little, *USA*

Diagnostic barriers to using PM2.5 concentrations as metrics of indoor air quality (Long Oral Presentation)

Benjamin Jones, *United Kingdom*

Rationale behind ventilation standards and regulations given by 20 countries

Wouter Borsboom, *Netherlands*

16:30- 17:00 **Coffee break**

ROOM A / ANTIPOLIS AUDITORIUM

17:00- 18:00 **Parallel Session 4A - Long & Short Oral Presentation Session: Reducing noise and improving thermal comfort of ventilation**

Chairpersons: Wouter Borsboom, Sonia Garcia Ortega

Noise Radiated by Circular Ventilation Ducts (Long Oral Presentation)

François Bessac, *France*

Improvement of the acoustical performance of mechanical ventilation systems in dwellings: a case study (Long Oral Presentation)

Samuel Caillou, *Belgium*

Influence of office layout and ceiling height on vertical temperature gradient in office rooms with displacement ventilation (Long Oral Presentation)

Natalia Lastovets, *Finland*

Ductwork design flaws and poor airtightness: a case study about a ventilation system reconditioning in an underground shelter (Short Oral Presentation)

Fabrice Richieri, *France*

Ductwork noise calculations: main outputs of AcouReVe project (Short Oral Presentation)

François Bessac, *France*



**Tuesday
18 September 2018**

39th AIVC Conference
Smart ventilation for buildings

ROOM B / ELLA FITZGERALD

17:00-18:00 **Parallel Session 4B - Long & Short Oral Presentation Session:
Modeling & energy performance of ventilation system**

Chairpersons: Willem de Gids, Wendy Miller

**Including air-exchange performance in building regulation
(Long Oral Presentation)**

Harm Valk, *Netherlands*

**Performance of a dual core energy recovery ventilation system
for use in Arctic housing (Long Oral Presentation)**

Boualem Ouazia, *Canada*

**Experimental analysis of PCM heat exchanger in ventilated window system
(Short Oral Presentation)**

Yue Hu, *Denmark*

**Development of Psychrometric diagram for the energy efficiency
of Air Handling Units (Short Oral Presentation)**

Kiyan Vadoudi, *France*

**Cooling and Heating performance of Ceiling Radiant Textile Air Conditioning
System with PAC (Short Oral Presentation)**

Mari Kuranaga, *Japan*

**Optimal control strategy of air-conditioning systems of buildings requiring
strict humidity control (Short Oral Presentation)**

Chaoqun Zhuang, *Hong Kong*

Validation of a Digital Twin with Measurement Data (Short Oral Presentation)

Johannes Brozovsky, *Germany*

**CFD analysis of the optimal installation location of adsorption material
in two ventilation conditions in residential buildings: natural convection
and mechanical ventilation (Short Oral Presentation)**

Haneul Choi, *South Korea*

ROOM C / MILES DAVIS

17:00-18:00 **Parallel Session 4C- Short Oral Presentation Session:
Control of indoor pollutants**

Chairpersons: Andy Persily, William Bahnfleth

**Indoor particle concentration related to occupant behavior
of Korean residential buildings**

Hyungkeun Kim, *South Korea*

**Ventilation improvement for make-up air supply system cooking - generated
indoor particles**

Kyungmo Kang, *South Korea*

**The impact on indoor air of bio-based insulation materials:
effect of humidity and potential mould growth**

Ana Maria Tobon Monroy, *France*

**The Assessment of Particulate Matter (PM2.5) Removal Efficiency o
n Air Cleaner Products through Full Scale Test in Korea**

Kichul Kim, *South Korea*

ROOM C / MILES DAVIS

Characteristics of ultrafine particle emission change depending on the placement of ventilation systems in 3D printer working environment
Sang-Chul Kim, *South Korea*

The assessment of surface condensation risk in dwellings. The influence of climate in Spain
Pilar Linares, *Spain*

A Stochastic Approach to Estimate Uncertainty in Pollutant Concentrations in an Archetypal Chilean House
Constanza Molina, *United Kingdom*

Thamesmead Condensation, Damp and Mould Strategy. The use of smart thermostats to assess ventilation interventions with demand controlled ventilation.
Peter Rickaby, *United Kingdom*

Accuracy Improvement for Estimating Indoor Carbon Dioxide Concentration Produced by Occupants
Masaki Tajima, *Japan*

Impact of construction stages on Indoor Air Quality
Charline Dematteo, *France*

Olfactory adaptation model based on change of odor threshold using impulse response function
Toshio Yamanaka, *Japan*

Intairieur: A label for the indoor air quality in new homes in France
Janice Orero, *France*

18:30- 20:30 Poster presentations – Industry stands – Cocktail reception

ROOM A / ANTIPOLIS AUDITORIUM

08:30–10:00 Parallel Session 5A- Topical Session: Assessing performance of ventilation systems

Chairpersons: Max Sherman, Pawel Wargocki

The old paradigm of a ventilation system providing constant airflow was relatively easy to assess. One could check a single flow rate, one could simulate energy impacts. Indoor air quality impacts were assumed. That paradigm is changing as we consider smarter ventilation systems, and multiple objectives for our ventilation system; performance means much more than simple airflow. The way we assess ventilation systems must evolve at the same time. This session has presentations look at different themes for assessing performance and looks at approaches used in a variety of countries. After the presentations there will be discussions about the approaches followed by some voting to see the opinion of the audience.

A review of performance-based approaches to residential smart ventilation (Long Oral Presentation)

Gaëlle Guyot, France

Rethinking Occupancy-based ventilation controls (Long Oral Presentation)

Ian Walker, United States

Demand controlled ventilation: relevance of humidity based detection systems for the control of ventilation in the spaces occupied by persons (Long Oral Presentation)

Sébastien Pecceu, Belgium

A review of the performance indicators of night-time ventilation (Short Oral Presentation)

Rui Guo, Denmark

Assessing the energy use and IAQ of various HVAC systems during the early design stage (Short Oral Presentation)

Marwan Abugabbara, Sweden

ROOM B / ELLA FITZGERALD

08:30–10:00 Parallel Session 5B- Long & Short Oral Presentation Session: Demand controlled ventilation

Chairpersons: Arnold Janssens, Kari Thunshelle

Measured and Simulated Energy Savings and Comfort Improvement of a Smart Residential Ventilation Control Strategy: Preliminary Results for North America and Europe (Long Oral Presentation)

Danny Parker, United States

Control of Distributed Cooling and Ventilation Systems in Hot and Humid Climates (Long Oral Presentation)

Markus Gwerder, Switzerland

Simulation of control strategies for ventilation systems in commercial buildings (Long Oral Presentation)

Bart Merema, Belgium

Smart monitoring of ventilation system performance with IEQ sensor networks (Long Oral Presentation)

Atze Boerstra, The Netherlands

ROOM B / ELLA FITZGERALD

Short-term mechanical ventilation of air-conditioned residential buildings: case study and general design framework (Short Oral Presentation)

Zhengtao Ai, *Denmark*

Hybrid ventilation systems enslaved by IAQ sensors (Short Oral Presentation)

Alexandre Lucet, *France*

Resilient demand control ventilation system for dwellings

(Short Oral Presentation)

Xavier Faure, *France*

Numerical Assessment of the Influence of Heat Loads on the Performance of Temperature-Controlled Airflow in an Operating Room

(Short Oral Presentation)

Cong Wang, *Sweden*

ROOM C / MILES DAVIS

08:30–10:00 Parallel Session 5C - Long & Short Oral Presentation Session: Improving the efficiency of ventilative cooling

Chairpersons: Manfred Plagmann, Pilar Linares Alemparte

Ventilative cooling and improved indoor air quality through the application of engineered Earth Tube systems, in a Canadian climate (Long Oral Presentation)

Trevor Butler, *Canada*

Free cooling of low energy buildings with ground source heat pump system and bidirectional ventilation (Long Oral Presentation)

Huijuan Chen, *Sweden*

Energy analysis for balanced ventilation units from field studies (Long Oral Presentation)

Bart Cremers, *Netherlands*

Characterising window opening behaviour of occupants using machine learning models (Short Oral Presentation)

Junseok Park, *South Korea*

Ventilative cooling effectiveness in office buildings: a parametrical simulation (Short Oral Presentation)

Mario Grosso, *Italy*

Experimental and numerical study of a building retrofitting solution combining Phase Change Material wallboards and night ventilation (Short Oral Presentation)

Timea Bejat, *France*

Potential of mechanical ventilation for reducing overheating risks in retrofitted Danish apartment buildings from the period 1850-1890 – A simulation-based study (Short Oral Presentation)

Daria Zukowska, *Denmark*

10:00-10:30 Coffee break





ROOM A / ANTIPOLIS AUDITORIUM

10:30-11:30 Parallel Session 6A-Topical Session: Development of Indoor Air Quality Metric

Chairpersons: Pawel Wargocki, Max Sherman

We all know IAQ is important, but traditionally the determination of it has been either through surrogates (like ventilation) and the use of engineering judgment. For most physical factors of concern, we prefer to have objective, quantifiable factors to optimize. A measurable and quantifiable factor is called a "metric" and developing a good one for IAQ is a key step forward in building physics. In this session we shall look at five different approaches at metrics for indoor air quality from ones that are relatively well know such as carbon dioxide concentrations, to others that are just being proposed.

Development of an Indoor Carbon Dioxide Metric (Long Oral Presentation)

Andrew Persily, *USA*

Economics of Indoor Air Quality (Long Oral Presentation)

Max Sherman, *USA*

A use case of data analysis for assessing Indoor Air Quality indicators (Short Oral Presentation)

Xavier Boulanger, *France*

Subjective Evaluation for Perceived Air Pollution Caused by Human Bioeffluents (Short Oral Presentation)

Lisa Yoshimoto, *Japan*

ROOM B / ELLA FITZGERALD

10:30-11:30 Parallel Session 6B- Topical Session: Performance of heat recovery ventilation systems in practice

Chairpersons: Arnold Janssens, Jelle Laverge

In new houses in Europe the share of mechanical ventilation with heat recovery is increasing as a result of more severe energy performance requirements and of energy labelling for residential ventilation units. The presentations in this session provide information about the performance of heat recovery ventilation systems in practice, in terms of energy performance and indoor air quality.

Improving the usability and performance of heat recovery ventilation systems in practice (Long Oral Presentation)

Wouter Borsboom, *Netherlands*

Energy performance of demand controlled mechanical extract ventilation systems vs mechanical ventilation systems with heat recovery in operational conditions : Results of 12 months in situ-measurements at Kortrijk ECO-Life community (Long Oral Presentation)

Jelle Laverge, *Belgium*

Temperature, draft and ventilation efficiency of room based decentralised heat recovery ventilation systems (Long Oral Presentation)

Jelle Laverge, *Belgium*

ROOM C / MILES DAVIS

10:30-11:30 **Parallel Session 6C-Topical Session: Presentation and Discussion of the recently adopted IEA EBC Annex 80 on Resilient Cooling**

Chairpersons: Peter Holzer, Hilde Breesch

The inexorable increase in energy consumption for the cooling of buildings, and the increase in overheating of buildings has become one of the major topics for sustainable development in the building sector. To tackle these challenges a new Annex has been approved by the IEA EBC Executive Committee in June 2018 and which is currently in its Preparation Phase. The Annex 80 will assess and further develop Resilient Cooling for Residential and Small Commercial Buildings across all participating countries enabling multilateral transfer of knowledge. The Annex is open for the participation of scientific institutions as well industrial partners. The next preparation meeting will be held on 20th September 2018 in Juan-les-Pins at the Palais des Congrès.

11:30-11:45 **Room change**

ROOM A / ANTIPOLIS AUDITORIUM

11:45- 12:45 **Parallel Session 7A – Topical Session: Indoor Environmental Quality Global Alliance (IEQ-GA)**

Chairpersons: Max Sherman, Donald Weekes

The AIVC is one of the founding members of the new Indoor Environmental Quality Global Alliance (IEQ-GA). The Alliance is expected to be an independent international NGO whose members are public or non-profit entities that are involved with advancing knowledge on common indoor environmental quality issues. In its formative phases, the Alliance is being hosted by ASHRAE. The current Alliance president is Don Weekes. The current ASHRAE representative to the Alliance is Bill Bahnfleth and the current AIVC representative is Peter Wouters. These members of the Alliance Board will summarize the activities and aspirations of the Alliance and be available for an interactive discussion with the audience.

Indoor Environmental Quality – Global Alliance: History

William P. Bahnfleth, *USA*

Indoor Environmental Quality – Global Alliance & the AIVC

Peter Wouters, *Belgium*

Indoor Environmental Quality – Global Alliance: The Next Decade

Donald Weekes, *Canada*





ROOM B / ELLA FITZGERALD

11:45-12:45 Parallel Session 7B - Topical Session: Supplementing Ventilation with Gas-phase Air Cleaning, Implementation and Energy Implications. The new IEA-EBC Annex 78

Chairpersons: Bjarne Olesen, Pawel Wargocki

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 supplying outdoor air to the buildings. In such cases, the alternative to use ventilation is to substitute supply of outdoor air 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 outdoor 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 (perceived air quality and health) 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 air cleaning devices.

Background and Objective of IEA-EBC Annex 78

Bjarne Olesen, Denmark

Measurements of perceived indoor air quality

Pawel Wargocki, Denmark

Discussion

ROOM C / MILES DAVIS

11:45-12:45 Parallel Session 7C - Topical Session: Measurement accuracy of air flow and pressure difference

Chairpersons: Isabelle Caré

The construction, function and maintenance of ventilation installations are of great importance for the perception of the interior climate of a building by those who work or live there and for its annual running costs. To check that the installation is functioning as intended, it is essential to use measurement methods, which are reliable and have known measurement uncertainties. Several project research have shown the issues related to the measurement of air flow at air terminal devices because of the induced disturbance of the flow pattern. Standards have been written in the past years, to describe measurement methods approved for on-site measurements. However, difficulties to reach the required measurement uncertainty still exist as the measuring instruments are probably not well characterized. The objective of this session is to: present and illustrate the issues related to flow measurement at air terminal devices; discuss the various aspects of air flow measurement from the inputs of experts.

Introduction - Presentation of the objectives of the session

Isabelle Care, France

A review of European standards related to measurement at air terminal devices

Carl Welinder (Invited Speaker), Sweden

Measurement issues of air flow at air terminal devices and perspectives

Samuel Caillou (Invited Speaker), Belgium

Discussion with the audience

12:45-13:30 Lunch Break

ROOM A / ANTIPOLIS AUDITORIUM

13:30-15:00 Session 8A - Topical Session: Sensors for smart ventilation

Chairpersons: Francois Durier, Iain Walker

Smart ventilation of buildings means continual adjustment of ventilation rates in response to parameters such as: occupancy, outdoor conditions, electricity grid needs, indoor contaminants, operation of other systems. Smart ventilation can provide information to building owners, occupants, and managers on operational energy consumption and indoor air quality. Many smart ventilation strategies require sensors to measure air conditions inside (and sometimes outside) a dwelling. Recent developments in low-cost sensors have opened up the opportunity to sense indoor contaminants and use these measurements to control ventilation, filtration and air cleaning systems. Using low-cost computers together with low-cost sensors and implementing wireless sensor networks in buildings are also interesting perspectives to be investigated. The objective of this session is to: to show an overview of the available low cost sensors for indoor air measurements (particulates, VOCs, CO2) and results of their evaluation; assess their applicability to ventilation system control; show examples of the implementation of low-cost sensors in low cost computers or wireless sensor networks.

Use of low-IAQ sensors

Laure Mouradian (Invited Speaker), *France*

Are low-cost sensors good enough for IAQ controls? (Long Oral Presentation)

Ian Walker, *USA*

Indoor air quality investigation in a ventilated demonstrator building via a smart sensor (Long Oral Presentation)

Loubna Qabbal, *France*

A cost-effective and versatile sensor data platform for monitoring and analysis of building services (Long Oral Presentation)

Christian Hviid, *Denmark*

Discussion with the audience

ROOM B / ELLA FITZGERALD

13:30-15:00 Parallel Session 8B - Long & Short Oral Presentation Session: New methodologies and improvements for airtightness & air flow rates measurements

Chairpersons: Paula Wahlgren, François Rémi Carrié

Individual unit and guard-zone air tightness tests of apartment buildings (Long Oral Presentation)

Angela Rohr, *Germany*

An extended pressure range comparison of the blower door and novel pulse methods for measuring the airtightness of two outdoor chambers with different levels of air tightness (Long Oral Presentation)

Christopher Wood, *United Kingdom*

Non-intrusive experimental assessment of air renovations in buildings and comparison to tracer gas measurements (Long Oral Presentation)

Maria Jose Jimenez Taboada, *Spain*

Airflow measurements at supply air terminal devices on residential balanced ventilation systems (Short Oral Presentation)

Valérie Leprince, *France*

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The future of passive techniques for air change rate measurement (Short Oral Presentation)

Sarah Lima Paralovo, *Belgium*

Airtightness measurement of large buildings by using multi-zonal techniques: a case study (Short Oral Presentation)

Sylvain Berthault, *France*

A new method to measure building airtightness (Short Oral Presentation)

Timothy Lanooy, *Netherlands*

Comparison of experimental methodologies to estimate the air infiltration rate in a residential case study for calibration purposes (Short Oral Presentation)

Paolo Taddeo, *Spain*

Experimental study on the measurement of Building Infiltration and Air Leakage rates (at 4 and 50 Pa) by means of Tracer Gas methods, Blower Door and the novel Pulse technique in a Detached UK Home (Short Oral Presentation)

Alan Vega Pasos, *United Kingdom*

Measuring infiltration rates & leakage in residential buildings of Ahmedabad using blower door method (Short Oral Presentation)

Nikhilesh Singh Bist, *India*

ROOM C / MILES DAVIS

13:30-15:00 Parallel Session 8C - Long & Short Oral Presentation Session: Evaluation of the effectiveness of the ventilation system

Chairpersons: Samuel Caillou, Pierre Deroubaix

An experimental investigation into the ventilation effectiveness of diffuse ceiling ventilation (Long Oral Presentation)

Chen Zhang, *Denmark*

A holistic evaluation method for decentralized ventilation systems (Long Oral Presentation)

Sven Auerswald, *Germany*

Influence of multizone airleakage on IAQ performance in residential buildings (Long Oral Presentation)

Gaëlle Guyot, *France*

Residential balanced ventilation and its tested impacts on indoor pressure and air quality (Long Oral Presentation)

Boualem Ouazia, *Canada*

Case study : comparison between a central and a decentral ventilation unit in a school building from the 80's (Short Oral Presentation)

Paul De Schepper, *Belgium*

Isolation Rooms - CFD Simulations of Airborne Contamination Through Doors During Passage (Short Oral Presentation)

Trond Thorgeir Harsem, *Norway*

ROOM C / MILES DAVIS

Investigation of contamination level in a cleanroom with weakened aerodynamic barrier (Short Oral Presentation)

Lasse Lind Knudsen, *Denmark*

Thermal comfort, IAQ and Energy use in Bedrooms (Short Oral Presentation)

Regina Bokel, *Netherlands*

15:00-15:15 **Room change**

ROOM A / ANTIPOLIS AUDITORIUM

15:15-16:15 **Parallel Session 9A – Topical Session: Air Quality in Domestic Kitchens**

Chairpersons: Benjamin Jones, Max Sherman

Cooking has been identified as a key pollutant source in houses. Occupants are at risk of exposure to elevated pollutant concentrations emitted by cooking if they are not controlled. Ideally pollutants should be removed at their source before they are allowed to mix in the air. A common method of removal is the cooker/range hood whose performance, indicated by a capture efficiency, is not yet regulated by a standard or norm. Accordingly, this session will consider measurements of harmful pollutants made in kitchens, the effectiveness of mitigation measures, such as cooker/range hoods, and the ventilation rates and cooker/range hood capture efficiencies required to control pollutant concentrations. The objectives of this session are to: Consider measurements of pollutants made in domestic kitchens; evaluate cooker/range hoods and other methods of exposure mitigation; identify appropriate health-based regulations.

An intervention study of PM2.5 concentrations measured in domestic kitchens (Long Oral Presentation)

Catherine O'Leary, *United Kingdom*

Measured pollutant removal performance of island overhead kitchen exhaust (Long Oral Presentation)

Ian Walker, *USA*

Assessment of range hoods based on exposure (Long Oral Presentation)

Wouter Borsboom, *Netherlands*

Estimated distributions of PM2.5 concentrations in the kitchens of the English housing stock for infiltration and mechanical ventilation scenarios (Short Oral Presentation)

Catherine O'Leary, *United Kingdom*

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ROOM B / ELLA FITZGERALD

15:15-16:15 Parallel Session 9B – Topical Session: BIM and Construction 4.0 opportunities in relation to ventilation and airtightness

Chairpersons: Philippe Moseley, Peter Wouters

The market uptake of BIM (Building Information Modelling) is rapidly growing in nearly all countries and one can assume that this trend will continue and even accelerate in the coming years. In practice, there was until recently little to no attention for BIM in relation to ventilation related aspects. This session will give an overview of BIM activities at European level and 2 practical applications of BIM.

Overview of what the EU is doing in relation to BIM

Philippe Moseley (Invited Speaker), *Belgium*

BIM-integrated Design tool for in-line recommended ventilation rates with Demand Controlled Ventilation strategy (Long Oral Presentation)

Kari Thunshelle, *Norway*

Ventilation Planning for Mid-sized Japanese Commercial Kitchens and Calculation Method of Ventilation Rate Using Building Information Modeling (Short Oral Presentation)

Osamu Nagase, *Japan*

ROOM C / MILES DAVIS

15:15-16:15 Parallel Session 9C – Topical Session: French initiatives: An update on the French indoor air quality observatory recent results: focus on ventilation and perspectives

Chairpersons: Corinne Mandin, John Little

The French indoor air quality observatory (OQAI) was set up by the French authorities in 2001 with the objective to collect data on indoor pollutants in various indoor environments to be used for public policies. Funded exclusively by public funding, the OQAI is coordinated by the scientific and technical center for building (CSTB) and involved an extensive network of partners across France in charge of the field campaigns and the laboratory analyses. To date, nationwide surveys were carried out in dwellings (2003-2005), schools (2013-2017), and office buildings (2013-2017). The next survey to be started early 2019 will focus on age care facilities. A specific attention is given to ventilation in all of these surveys. An air stuffiness index has been developed to facilitate the communication around air exchange in buildings. Lastly, the OQAI has been coordinating since 2012 a permanent data collection on indoor air quality and ventilation in energy-efficient buildings. The aim of the session is to share with the participants the last OQAI results, with a dedicated focus on ventilation. The objectives of this session are: to present the last results of the OQAI surveys with a focus on ventilation; to put these results into perspective in a European context; to discuss about needs for the future surveys and gaps to be filled

OQAI last results:

- Indoor air quality and ventilation in energy-efficient dwellings
- Indoor air quality and ventilation in schools: first results of the nationwide survey
- Indoor air quality in office buildings: first results of the nationwide survey

Corinne Mandin, *France*

Ventilation, energy transition, indoor air quality and health, REHVA-EU perspective

Atze Boerstra (Invited Speaker), *The Netherlands*

Discussion with the audience

16:15-16:45 Coffee break

16:45-18:15 Closing session

Chairpersons: Andy Persily, Peter Wouters

Best paper & poster award

Max Sherman, *USA*

Summing up of the “Ventilative cooling – Resilient cooling” track

Peter Holzer, *Institute of Building Research & Innovation, Austria*

Summing up of the “Smart ventilation, IAQ & Health” track

Benjamin Jones, *University of Nottingham, United Kingdom*

Summing up of the “Airtightness” track

Arnold Janssens, *University of Ghent, Belgium*

French R&D activities in relation to conference topics by ADEME

Nicolas Doré (Invited Speaker), *ADEME, France*

Modern History of Indoor Air Quality (1973-Present)

Donald Weekes (Invited Speaker), *President, IEQ-GA, Canada*

Announcement of 2019 conference

Arnold Janssens, *University of Ghent, Belgium* & Samuel Caillou, *BBRI, Belgium*

18:15 End of conference

20:00 Conference Dinner

[Admission to the Conference Dinner is by voucher only]

General Information

Secretariat Hours

Secretariat will be open during the following dates and times:

- Monday 17 September, 2018 / 17.30 – 19.00
- Tuesday 18 September, 2018 / 08.00 – 18.30
- Wednesday 19 September, 2018 / 08.00 – 18.00

Poster display information:

- Posters should be set up on Tuesday 18 September, 2018 from 08.30 – 10.30
- Dismantling of posters should be finished by Wednesday 19 September, 2018 at 17.00

Secretariat and Organizers have no liability for posters left behind.

Poster dimensions

(A0) size, 120CM Height X 80CM Width

Poster presentation session

Authors are expected to be in front of their poster in order to reply to any questions as per schedule below:

Tuesday 18 September, at 18:30 – 20:30

- 18:30 - 19:15: poster boards with odd numbers
- 19:15 - 20:00: poster boards with even numbers

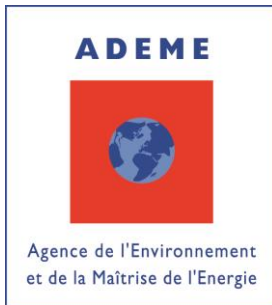
Long & Short Oral Presentations information:

- Long Oral Presentations (indicated within the programme) are expected to last 12 minutes; another 3 minutes are foreseen for questions and answers (15 minutes in total).
- Short Oral Presentations (indicated within the programme) are expected to last 3 minutes; another 2 minutes are foreseen for questions and answers (5 minutes in total).

Notes

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French Environment & Energy Management Agency

Climate change - ecological, energy transition



ADEME is active in the implementation of public policy in the areas of the environment, energy and sustainable development. ADEME provides expertise and advisory services to businesses, local authorities and communities, government bodies and the public at large, to enable them to establish and consolidate their environmental action. As part of this work the agency helps finance projects, from research to implementation, in its areas of action.

Four vocations:

- developing knowledge: ADEME organizes and contributes to the financing of research and innovation and to establishing and coordinating observation systems to better understand how industries are changing;
- convincing and mobilising: Because public information and awareness are essential to the success of environmental policies, ADEME implements communication campaigns to change mindsets, behaviours and purchasing and investment practices;
- advising: ADEME acts in an advisory capacity to direct the decisions of actors in society and the economy, establishing tools and methods that suit their needs. Direct dissemination via expert advisers is a major way in which it provides its expertise;
- assisting with implementation: ADEME provides graduated financial support and promotes the implementation of regional and national references.

Organisation

With its head office in Angers, ADEME has over 1,000 employees split between:

- 3 central departments sites in Angers, Paris and Valbonne;
- 17 regional divisions, 13 in metropolitan France and 4 in overseas France, which linked 26 implantations across the country;
- 3 representative bodies in overseas territories;
- 1 office in Brussels.

Synergy between head office and regional divisions

With staff based in 26 implantations and 3 representative bodies in overseas territories, ADEME focuses its actions on individuals, public authorities and businesses as part of a local service. Some 400 agents (almost half of its staff) based in 26 regional divisions (including overseas) and 3 representative bodies in overseas territories (French Polynesia, New Caledonia and Saint-Pierre and Miquelon) work in the field on behalf of ADEME to promote sustainable development, the fight to mitigate climate change, energy management, renewable energies and, more generally, energy and ecological transition. ADEME's regional teams implement two major energy and ecological transition policies on behalf of the French State in the areas of support for renewable heat (Heat Fund) and waste prevention and management (Waste Fund).

Areas of interventions

Waste, land and polluted soils, climate and energy, air and noise, cross-functional action (sustainable production and consumption, sustainable cities and territories)