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Madrid, Spain

36th AIVC Conference
5th TightVent Conference
3rd venticool Conference

Effective ventilation in high performance buildings

Summary of the ventilative cooling track of the 36th AIVC conference in Madrid, September 2015

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The joint 36th AIVC, 5th TightVent and 3rd venticool Conference on 'Effective ventilation in high performance buildings' was held in Madrid, Spain 23-24 September 2015. The programme consisted of plenary sessions and 3 parallel tracks on Airtightness, IAQ & Health, and Ventilative Cooling with more than 120 presentations from 27 countries and international organisations.

In the plenary session of the conference, Per Heiselberg presented a mapping of active ventilation projects within the IEA EBC programme (Figure 1) and focused on those addressing specifically ventilative cooling; he highlighted that:

- Few projects on specific technology as we focus on whole systems/ building performance;
- Most on-going IEA-EBC projects provide new knowledge relevant and valuable for the ventilation industry;
- There is a need for cooperation to harvest synergies between the projects;
- There is a need for coordination and dissemination of this knowledge;
- AIVC can (and should) play a key role in realizing the potential in cooperation with the projects.

No.	Annex title	Ventilation Strategies	IAQ	Ventilative Cooling	Airtightness	Energy Legislation	Peak Power Demand	Occupancy
69	Strategy and Practice of Adaptive Thermal Comfort in Low Energy Buildings			X		X	X	X
68	Design and Operational Strategies for High IAQ in Low Energy Buildings	X	X			X	X	X
67	Energy Flexible Buildings		X	X		X	X	X
66	Definition and Simulation of Occupant Behavior in Buildings	X		X		X		X
62	Ventilative Cooling	X		X		X	X	X
61	Business and Technical Concepts for Deep Energy Retrofit of Public Buildings	X		X	X			X
60	New Generation Computational Tools for Building & Community Energy Systems	X	X	X	X	X	X	X
59	High Temperature Cooling & Low Temperature Heating in Buildings			X				
5	AIVC	X	X	X	X	X	X	X

Figure 1: Active IEA EBC Annexes relating to ventilation

The ventilative cooling track of the conference consisted of five sessions with 20 papers and one poster session with 15 papers. This article summarizes the presentations and attempts to group them according to Technology Readiness Levels (TRL) - Figure 2.

1. Low TRL papers: 11 papers were presented on performance assessment of concept and design of strategy/component through simulation. The papers presented focus on schools, residential buildings and offices in a variety of climates and examine the impact of ventilation strategies on energy use and thermal comfort as well as IAQ. A common thread is that each design is different indicating that we might need standardised strategies although many will argue that this is not possible or even desired. Standardised assessment tools is another option since in many cases only boundary conditions are different – i.e. external conditions (weather data) and internal conditions (use of space).
2. Mid TRL papers: 10 papers presented performance assessment of prototype through laboratory experiments and/or simulation. These papers presented testing with plans for installations for a variety of components such as thermal mass and phase change materials combined with ventilation, trigeneration systems, electrothermal actuators, heat pumps and solar systems in combination with ventilation strategies.
3. High TRL papers: 10 papers presented performance verification with data from operational buildings. Case-studies included a variety of buildings types such as residential buildings, offices, schools/lecture rooms, large spaces and supermarkets. A common thread was that currently measurements do not usually include ventilation/air flow but parameters related to environmental and thermal comfort performance (temperature, humidity, CO₂, energy use, occupants' assessment, costs – capital and operational).

In addition, four papers focussed on Policy and feasibility studies for the application of ventilative cooling. These papers highlighted that intensive work is required towards more explicit reference to cooling using ventilation within the building energy performance regulations. Such recommendations is one of the focus of IEA EBC Annex 62.

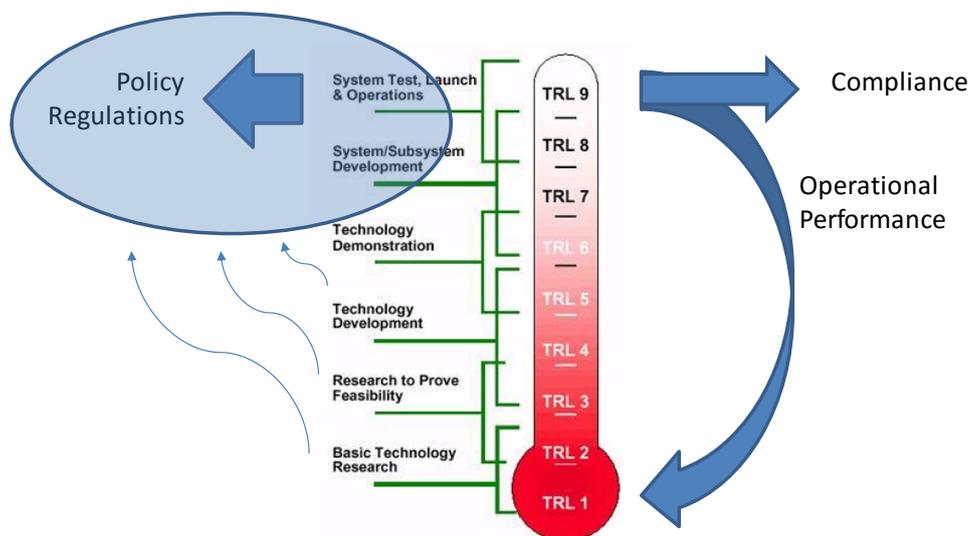


Figure 2: Technology Readiness Levels; adapted from: NASA Technology Readiness Levels - https://en.wikipedia.org/wiki/Technology_readiness_level

Low TRL papers

1. Nuno M. Mateus, Guilherme Carrilho da Graça (2015). Stack driven ventilative cooling for schools in mild climates: analysis of two case studies. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 78-88). Madrid: AIVC.
2. Alberto Meiss, Jesús Feijó-Muñoz, Miguel Ángel Padilla-Marcos (2015). Optimization of indoor air quality through controlled cross ventilation in the retrofitting of residential buildings. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 167-178). Madrid: AIVC.
3. Stéphane Sanquer, Guillaume Caniot (2015). Wind-induced pressure coefficients on buildings dedicated to air change rate assessment with CFD tool in complex urban areas. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 179-187). Madrid: AIVC.
4. Joana Ortiz, Verdiana Russo, Jaume Salom (2015). Impact of natural ventilation in energy demand and thermal comfort of residential buildings in Catalonia. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 320-330). Madrid: AIVC.
5. Maria del Carmen Bocanegra-Yanez, Paul Strachan, Paul Tuohy, Jon Hand, Tim Sharpe (2015). Assessment of spatial and temporal distribution of thermal comfort and IAQ in low energy houses. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 358-368). Madrid: AIVC.
6. Guido Raffaele Dell'Osso, Francesco Iannone, Alessandra Pierucci, Alessandro Rinaldi (2015). Control strategies of the natural ventilation for passive cooling for an existing residential building in Mediterranean climate. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 396-405). Madrid: AIVC.
7. Graziano Addante, Francesco Iannone, Alessandro Rinaldi (2015). Evaporative cooling and ventilation control strategies for a kindergarten in Mediterranean climate. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 406-415). Madrid: AIVC.
8. Sasan Sadrizadeh, Sture Holmberg (2015). How safe is it to neglect thermal radiation in indoor environment modeling with high ventilation rates? Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 436-440). Madrid: AIVC.
9. Maria Justo Alonso, Cathrine Kirkøen, Hans Martin Mathisen (2015). Energy use consequences of ventilative cooling in a ZEB residential building. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 624-632). Madrid: AIVC.
10. Sara Ticci, Brennan Less, Iain Walker, Max Sherman (2015). Development of a seasonal smart ventilation controller to reduce indoor humidity in hot-humid climate homes. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 851-861). Madrid: AIVC.
11. Víctor Moreno, Amalia Roca (2015). Thermodynamic analysis of buildings with natural ventilation and indoor air quality. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 862-871). Madrid: AIVC.

Mid TRL papers

1. Eleftherios Bourdakis, Bjarne W. Olesen, Fabio Grossule. Night time cooling by ventilation or night sky radiation combined with in-room radiant cooling panels including phase change materials. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 67-77). Madrid: AIVC.
2. Parantapa Sawant, Jens Pfafferott (2015). Experimental analysis of microscale trigeneration systems to achieve thermal comfort in smart buildings. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 309-319). Madrid: AIVC.
3. Kamil Szkarlat, Andrzej Górka (2015). Electrothermal actuators with PWM control. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 352-357). Madrid: AIVC.
4. Jesús Arce, María José Jiménez, Ricardo Enríquez, Jesús Xamán, Sergio Castaño, Gabriela Álvarez, María del Rosario Heras (2015). Thermal performance analysis of a solar chimney, based on the experimental study of the main driving variables in a physical prototype. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 385-395). Madrid: AIVC.
5. M. Nuria Sánchez, Cristina Sanjuan, M. Rosario Heras (2015). 3D fluid dynamic analyses of open joint ventilated facades applying experimental stereo-PIV techniques. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 441-449). Madrid: AIVC.
6. Youngjin Choi, Kozo Takase, Masayuki Mae, and Hyunwoo Roh (2015). A study on the reduction effect of ventilation and heating load by installing air-based solar system in the detached houses. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 450-459). Madrid: AIVC.
7. Frédéric Ransy, Samuel Gendebien, Vincent Lemort (2015). Performances of a simple exhaust mechanical ventilation coupled to a mini heat pump: modeling and experimental investigations. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 872-884). Madrid: AIVC.
8. Servando Álvarez, César Bartolomé (2015). Concrete in ventilated facades for natural cooling of buildings. SINHOR project. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 750-751). Madrid: AIVC.
9. Anna Laura Pisello, Luisa F. Cabeza, Franco Cotana (2015). How cool roofs interact with PCMs: investigating thermal-energy behavior of a cool roof membrane with paraffin based PCM inclusion. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 753-755). Madrid: AIVC.
10. Lidia Navarro, Alvaro de Gracia, Luisa F. Cabeza (2015). PCMs as a tool for increasing thermal inertia in buildings. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 1002-1005). Madrid: AIVC.

High TRL papers

1. Zoi Mylona, Maria Kolokotroni, Savvas Tassou (2015). Ventilative cooling and energy use in supermarkets. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 89-100). Madrid: AIVC.
2. Peter Foldbjerg, Thorbjørn Færing Asmussen, Christoffer Plesner, Jens Christoffersen (2015). Model home 2020 –full-year measurements of daylight, energy and indoor climate in five single-family houses occupied by typical families: what has been learned. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 158-166). Madrid: AIVC.
3. David K.W. Cheong, Samantha C.H. Khor (2015). Field application of enhanced displacement ventilation system in an office of a zero energy building in the tropics. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 188-193). Madrid: AIVC.
4. Silvia Soutullo, M^a Nuria Sanchez, Ricardo Enriquez, M^a Jose Jimenez, M^a Rosario Heras (2015). Thermal comfort assessment in a sustainable designed office building. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 331-341). Madrid: AIVC.
5. José Manuel Salmerón Lissén, José Sánchez Ramos, Pablo Aparicio Ruiz, Javier García Ramos, Servando Álvarez Domínguez José Luis Molina Félix, Elena Barbadilla Martín (2015). Improvement of comfort and energy efficiency in existing buildings using adaptive thermal comfort algorithm. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 342-351). Madrid: AIVC.
6. Tom Soendergaard Pedersen, Palle Andersen, Christian Drivsholm, Niels Boel (2015). Model predictive control (MPC) of hybrid ventilation systems in office buildings with dynamic glass facades. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 369-384). Madrid: AIVC.
7. Ando Ludovic Andriamamonjy, Ralf Klein (2015). A modular, open system for testing ventilation and cooling strategies in extremely low energy lecture rooms. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 416-425). Madrid: AIVC.
8. Juan María Hidalgo, Theofanis Psomas, Carlos García-Gáfaró, Per Heiselberg, Jose Antonio Millán (2015). Overheating assessment of a passive house case study in Spain. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 645-655). Madrid: AIVC.
9. Gaëlle Guyot, Adeline Bailly, Anne-Marie Bernard, Gabrielle Perez, Claire-Sophie Coeudevez, Suzanne Déoux, Sandra Berlin, Enora Parent, Alexis Huet, Sylvain Berthault, Romuald Jobert, Damien Labaume, Guillaume Ferrier, Sandrine Justet (2015). Ventilation performance and indoor air pollutants diagnosis in 21 French low energy homes. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 885-894). Madrid: AIVC.
10. Flourentzos Flourentzou, Samue Pantet, Katia Ritz (2015). Automatic natural ventilation in large spaces: a passive ventilation technology for passive buildings. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 656-665). Madrid: AIVC.

Policy and feasibility studies

1. Annamaria Belleri, Theofanis Psomas, Per Heiselberg (2015). Evaluation tool of climate potential for ventilative cooling. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 53-66). Madrid: AIVC.
2. Javier García Ramos, José Manuel Salmerón Lissén, Laura Romero Rodríguez, Servando Álvarez Domínguez, José Luis Molina Félix, Álvaro Ruiz Pardo (2015). Implementation of multi-zone ventilation methodology in the Spanish energy performance certification tool. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 460-473). Madrid: AIVC.
3. Marta Avantaggiat², Annamaria Belleri, Michele De Carli, Roberto Lollini (2015). Ventilative cooling strategies to reduce cooling and ventilation needs in shopping centres. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 633-643). Madrid: AIVC.
4. Nolwenn Hurel, Max Sherman, Iain Walker (2015). Simplified methods for combining natural and mechanical ventilation. Proceedings of the 36th AIVC-5th TightVent-3rd venticool Conference, 23-24 September (pp. 840-850). Madrid: AIVC.