Where are we today with ventilation and infiltration in buildings?

A summary of the presentation of Peter Wouters, operating agent of AIVC, at the 34th AIVC Conference in Athens

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During the opening session of the joint 34th AIVC conference in Athens, **Peter Wouters**, the operating agent of AIVC, presented a historic perspective of ventilation and air infiltration in buildings starting from 1973 and moving up to today with a time step of 10 years and looking ahead in the future.

The beginning of the presentation highlighted the foundation of two organizations - cornerstones in the progress of the knowledge on ventilation and related issues; ASHRAE (1894) and REHVA (1963).

The overview started with the first oil crisis in 1973. At that time most countries had a limited interest and almost no knowledge on ventilation, air infiltration and indoor air quality with the exception of a few countries that were ahead. In 1977, the International Energy Agency (IEA) decided to set up the implementing agreement ECBCS (Energy conservation in Buildings and Community Systems), which has been a major driver for international collaboration around the topic of energy conservation in buildings including ventilation and air infiltration. The first Air Infiltration and Ventilation Centre (AIVC) conference was held in 1980, a little after the Indoor Air conferences which started in 1978.

Thirty years ago, in 1983, the Annex 5- AIC - Air Infiltration Centre was already running with the goal to improve the knowledge on air infiltration and buildings. Airtightness had become a policy in a few countries as a measure to reduce energy consumption. In the middle of the eighties, there was growing concern about the IAQ aspects and it was decided to change the name to AI**V**C – Air Infiltration **and Ventilation** Centre.
Interesting projects were undertaken in the context of IEA focusing on occupant's behavior in regard to ventilation (IEA Annex 8) and Demand Controlled Ventilation (IEA Annex 18). Relevant publications (AIVC TN10, AIVC TN23, AIVC TN26 and activities (startup of Healthy Building conferences, IBPSA conferences etc.) of that period were underlined. In 1988, the Intergovernmental Panel on Climate Change (IPCC) was formed by UNEP and the World Meteorological Organization (WMO).

From 1993 to 2003 several projects took place like Pascool, NATVENT, Annex 35 Hybvent with focus summer comfort issues, smart natural ventilation strategies and hybrid ventilation. ISIAQ was founded in 1992 and the (Energy Performance and Indoor Climate) EPIC conferences started in Lyon in 1994.The Kyoto protocol adopted in 1997 was setting clear targets to reduce greenhouse gas (GHG) emissions and comforted the relevance of these initiatives given the contribution of the building sector those emissions.

During the last decade, issues such as the availability and cost of natural resources, the CO_2 reduction and global warming challenges, the outdoor pollution and the poor indoor climate

etc. have become much more evident since knowledge has grown substantially. Actions can now build on better foundations. In terms of political decisions the EPBD (European Energy Performance and Buildings Directive) (2003) as well as the renewable energies and energy services directives reveal an overall much broader and political support for firm actions.

Today, the major driver for energy efficiency in the building sector in Europe is the EPBD recast, 2010, which is now under implementation and has the objective to realize nearly zero-energy buildings – with good thermal comfort and indoor air quality by 2020. With respect to airtightness and given the significant impact of infiltration and duct leaks on the overall building energy performance, there is a steeply increasing number of measurements and it is likely that buildings and/or ductwork will be systematically tested in several countries even if there are no specific minimum requirements. There are also activities to improve the quality in the building process and workmanship as the techniques evolve and the room for errors and approximations becomes much narrower. Also, due to the very challenging requirements there is a need for looking at the interaction of functions and technologies and thus better integrated systems which is a major driver for innovation. The building sector is looking for well-balanced solutions, not just products, to reach the nearly zero energy targets. There is a strong focus on sustainable development where the fine-tuning of different measures together to achieve the energy and indoor climate targets and thus teamwork are becoming more important. In this context, a major boundary condition is the economics since these stringent requirements demand a higher initial investment.

In the future, less than 10 years from now, all new buildings in Europe should be nZEB (nearly zero energy buildings) and an interesting question that rises is: 'To what extent will there be a difference between theory and practice?' In any case, this movement is a strong driver for energy efficiency and energy efficient ventilation in particular, keeping in mind that substantial effort should be put on the existing building stock.
As an example of the speed of change occurring in most EU member states, Figure 1 shows the timeline adopted by the Flemish government regarding the evolution of the maximum E-level (energy performance level in terms of the EPBD).

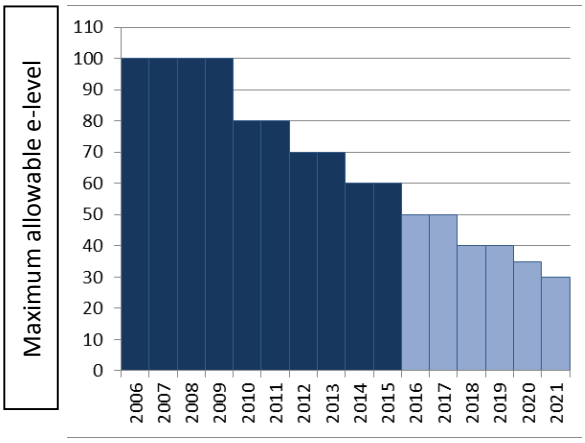

Figure 1: Energy performance level timeline (Source: Peter Wouters, AIVC 2013 Conference, Athens)

With these rapid developments and changes in the building sector, it is crucial that attention is paid to good quality (energetic quality, quality of the system, quality of execution). To achieve these targets, the building sector needs guidance in terms of training, good legislation, smart incentives, accelerated knowledge gathering from international collaboration etc.