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Summary of the airtightness track

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Over 160 persons attended the joint 34th AIVC, 3rd TightVent, 1st venticool and 2nd Cool Roofs' Conference held in Athens, Greece on 25-26 September, 2013. The conference focused on research, technologies, policies and market transformation to employ in an optimal way proper mitigation and adaptation techniques with the aim to reduce the energy consumption of buildings and improve the urban microclimate. Furthermore, focus was set on the energy impact of ventilation and air infiltration while ensuring good indoor air quality and thermal comfort, as well as converging work on smart materials to reduce the carbon footprint of the building sector.
Building and ductwork airtightness was one of the major themes. The airtightness track of the conference consisted of 4 sessions with 16 presentations covering the following topics:

- Collection and analysis of field data
- Quality of ventilation systems
- Methods for characterizing airtightness – Durability
- Ventilation and airtightness nearly zero-energy buildings

A number of presentations focused on the **collection and analysis of field data.** A discussion on the airtightness quality management scheme in France pointed out that since 2013 that the new EP regulation (RT 2012) requires the building airtightness level to be justified (either through systematic measurement or application of a certified airtightness quality management (QM) approach), the number of requests for airtightness quality management certification has significantly increased proving the process reliable and successful [1], [2]. Moreover, a preliminary analysis of the French buildings airtightness database which counts currently more than 31000 measurements and is predicted to add 100000 measurements per year, revealed an important airtightness data source which can be used to study various important parameters such as the airtightness construction improvement overtime, the impact of construction materials or the flow exponent among many others [3].
A stochastic method has been developed in the UK to predict distributions of mean infiltration rates in winter and total winter heat loss in stock of dwellings. The method highlighted significant health and energy ramifications and underlined the need to improve building stock calculation methods [4].
The '**quality of ventilation systems'** topical session, included an overview of the UK residential ventilation market and initiatives to improve the quality of the installed systems. The work undertaken by the BSRIA (Building Services Research and Information Association) which is involved in the execution of 20000 airtightness and 1000 ventilation tests per year was introduced. Their results showed a significant failure in systems tests (up to 95%) due to the poorly installed ductwork [5]. Meanwhile in France, a detailed dysfunction analysis of regulatory compliance controls for 1287 dwellings ventilation

systems found 68% of the single-family dwellings technical systems analyzed not to comply with the airing regulation [6] (Figure 1).

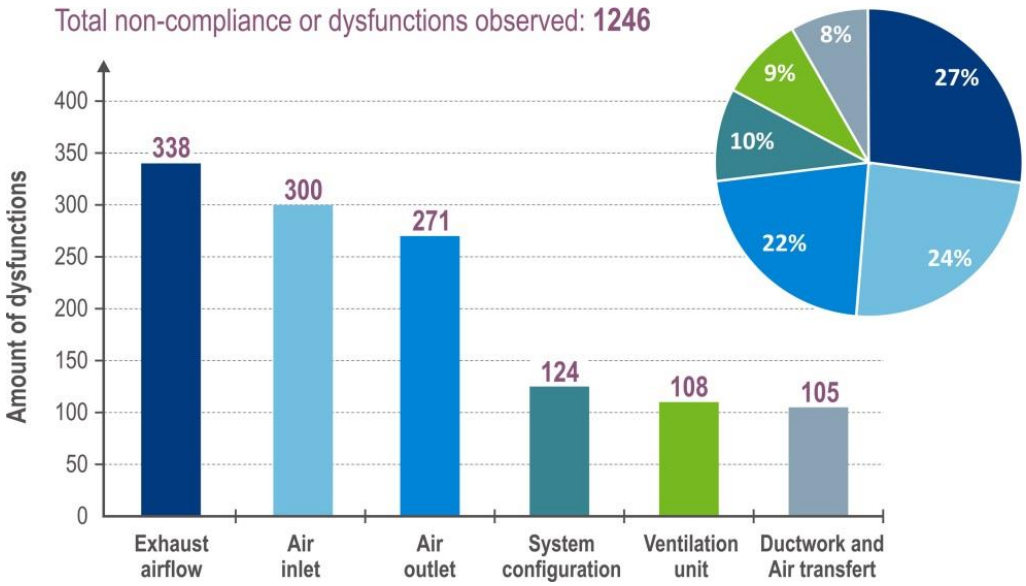

Figure 1: Number of non-compliance or dysfunctions items per category [6]

Several presentations addressed **methods for characterizing airtightness and durability.** A calculation method for the combined standard uncertainty associated with the buildings airtightness measurement done in accordance with the ISO standard 9972:2006 has been developed, making it possible to estimate the uncertainty of results [7] .

In Belgium, a series of leakage tests on extremely airtight dwellings (n50 < 0.6 ach) were performed. The study involved 4 aspects of building leakage: the repeatability and reproducibility of the fan pressurization method; the impact of climate conditions on the measurements; the impact of the age of the construction; and the reproducibility of the airtightness level in repeated construction of virtually identical houses [8] (Figure 2). There needs to be some conclusion of this interesting research included here. Moreover, blower door tests were conducted on identical retrofitted dwellings in Porto, Portugal, so as to provide an indication of workmanship of contractors and study the variability in actual leakage values. Significant differences were observed while user behaviour was found to have a strong effect [9]. Furthermore, airtightness measurements on very large commercial buildings (3500 to 53000 m^3) were performed using a high capacity fan (max air flow rate = 300000 m^3/hr) in order to define airtightness levels and identify frequently observed leakage points. The data was also used to propose legal requirements and provide technical advice [10]. A comparison study on different air tightness and air exchange rate measurements in five very small test buildings of different structures using both blower door test and tracer gas method showed that correlation between those parameters can be found very approximately and underlined the dominant role of mechanical ventilation in the overall air exchange process in these airtight structures [11].

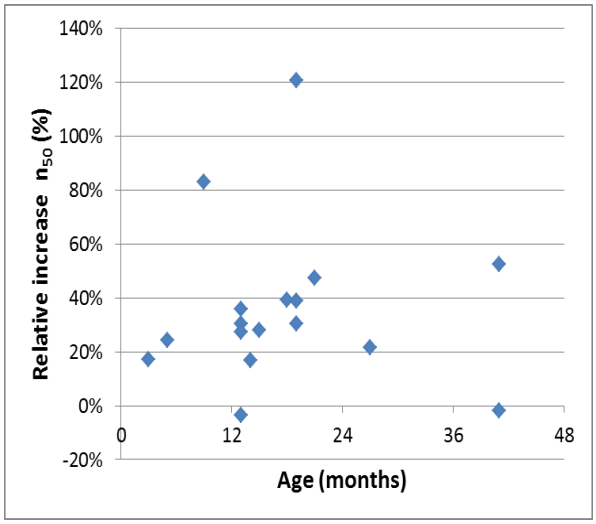

Figure 2: Durability of airtightness: relative increase (17 objects of analysis: 15 inhabited dwellings from passive house estates + 2 show houses) [8]

During a final discussion on **ventilation and airtightness in nearly zero-energy buildings** all speakers highlighted the importance of integrated design approaches which should incorporate airtightness between other design parameters and consider thermal comfort and IAQ besides energy [12] [13] [14].

Overall, in what concerns the successful implementation of effective ventilation in airtight buildings, it is recommended to minimize problems that stem from poor design, installation and commissioning while considering the effect of cold draughts and perceived energy losses which trigger the occupants' interaction. The presentations also pointed out the growing number of airtightness measurements from which the scientific community, policy makers and building professionals can learn and the need for further work on measurement uncertainty estimates. The learning process would be significantly eased with the development of databases.