AIR INFORMATION REVIEW

Vol 27, No. 1, December 2005 A quarterly newsletter from the IEA Air Infiltration and Ventilation Centre

Reports from the AIVC conference 2005

The 26th AIVC conference was held in September in Brussels and attracted some 250 participants from 27 different countries. With the exception of the opening and closing session, there were the whole time 2 parallel tracks. The first track of the conference dealt with typical ventilation topics whereby 2 sessions focused on whole heat, air and moisture transfer in buildings. Summary reports of this track are available with this newsletter. The second track (8 sessions) was focused on the topic of energy performance regulations in buildings and in particular the implementation of the European Energy Performance of Buildings Directive (EPBD). The first summary reports are also available with this issue of AIR.

See conference reports on page 9

News from the AIVC

Collection, synthesis and dissemination of information is a key mission of AIVC. Among the recent developments, the following information is important:

- *AIRBASE*, the AIVC's publications database with about 17000 references, has now more than 1800 pdf-files attached to the abstracts. It means for example that ALL papers of the 25 past AIVC conferences (1980 to 2004) are available online.
- A new database on building energy simulation tools is now online too. It contains information on more than 300 simulation programmes. This *database* is offered in close collaboration with the US Department of Energy.
- ALL issues of AIR since 1979 are now also available online. Following the request of some readers, all the issues of AIR since 2001 are alternatively available in one bundled pdf-file.
- While the AIVC databases are publicly available through any web browser, many of the hyperlinked PDF publications are accessible only by subscription (access codes). However thanks to the involvement of different organisations within INIVE (operating agent of the AIVC) access codes can be delivered for free in Belgium, France, Germany, Greece, Netherlands, Norway and Switzerland on request. U.S. residents within the U.S. engineering and research community can also request a free access code (see *http://www.aivc.org* for more information).

AIVC Conference 2006

Technologies and Sustainable Policies for a Radical Decrease of the Energy Consumption in Buildings

The deadline for abstracts has been extended to 15 January 2006

More information on page 7

AIR
AIR INFORMATION REVIEW

The newsletter of the AIVC, the Air Infiltration and Ventilation Centre. This newsletter reports on air infiltration and ventilation related aspects of buildings, paying particular attention to energy issues. An important role of the AIVC and of this newsletter and CD is to encourage and increase information exchange among ventilation researchers and practitioners worldwide.

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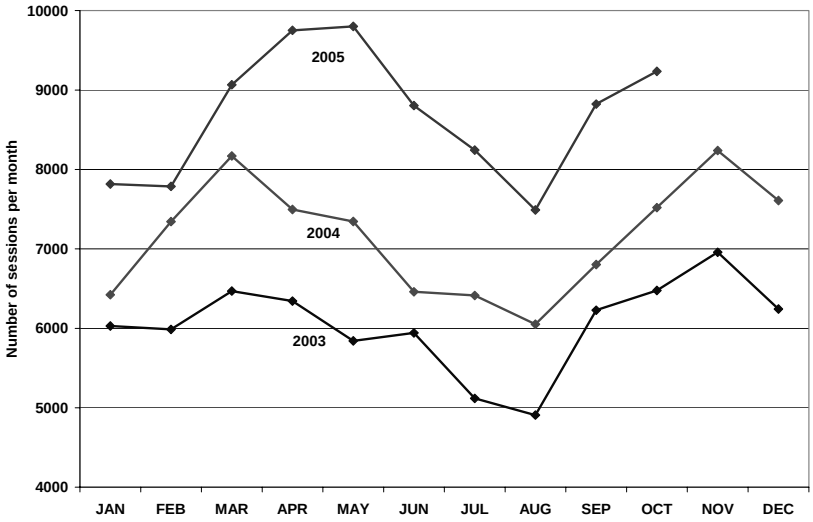
The number of users of the AIVC website is continuously growing. As illustrated in the figure below, we reach 8600 visitors per month on average for 2005 with about 10.000 visitors for the best month. It represents an increase of 25 % compared to 2004.



ASHRAE Releases Proposed Cabin Air Standard for Public Comment

http://www.ashrae.org

A proposed standard that will define air quality and comfort levels on airplanes has moved one step closer to publication.

ASHRAE's proposed standard 161P, Air Quality within Commercial Aircraft, was open for public comment until Nov. 7, 2005. Also open for review until that date was the proposed companion guideline to the standard, Guideline 28P, Air Quality Within Commercial Aircraft. It provides supplemental information on air quality in air-carrier aircraft and on measurement and testing related to aircraft air quality.

The proposed standard would apply to commercial passenger air-carrier aircraft carrying 20 or more passengers. It is intended to apply to all phases of flight operations and to ground operations whenever the aircraft is occupied by passengers or crew members.

Among the reasons aircraft cabin environments are unique are occupant activity levels range from almost completely sedentary (passengers) to active (flight attendants); passengers and crew make up a wide cross section of the general population; and aircraft must be regarded as both a public place (passengers) and a workplace (crew).

The proposed standard requires a minimum total air supply of 25.5 m³/h (15 cfm) and recommends 34 m³/h (20 cfm) per person.
The requirement may be met with a mixture of outside air and filtered recirculated air or with 100 percent outside air. A minimum of 12.7 m³/h (7.5 cfm) per person of outside air is required.

In addition to ventilation requirements, the proposed standard addresses supply air quality and control and monitoring of contaminants to further ensure satisfactory air quality is maintained. Requirements for comfort factors, such as rate of change of cabin pressure, air temperatures and surface temperatures, and minimum and maximum air velocities, also are included.

An informative appendix supplements the requirements of the standard with background information on a variety of potential air contaminants, methods of measurements, references to standards and guidelines of allowable levels, and data for levels measured on aircraft.

Keys to Improve Indoor Air Quality

The new Quebec website (*http://www.habitation.gouv.qc.ca/qualite_air/*) provides information in French on indoor air quality of homes, for owners or occupants of houses or dwellings.

It has been produced by Quebec Ministry of Health and Social Services, Institut National de Santé Publique du Québec, Société d'Habitation du Québec and Canada Mortgage and Housing Corporation.

A section deals with indoor air quality and health; another contains information to detect poor indoor air quality. Information is also given to owners and occupants to avoid or solve possible disputes about indoor air quality.

Links for towards fifty publications from several Quebec organisations are mentioned. They offer to read on-line or to download didactic documents intended for the general public on topics such as ventilation, mold, moisture, radon, asbestos, ventilation fans for kitchen and bathroom. A list of contacts and experts is also available.

Weather data for simulation programmes

U.S. Department of Energy
Energy Efficiency and Renewable Energy

Weather data are important for energy performance calculations. In order to facilitate the use of the EnergyPlus Energy Simulation Software, the USA Department of Energy (DOE) provides on its website weather data for more than 900 locations in EnergyPlus weather format — 295 locations in the USA, 55 locations in Canada, 230 locations in Europe, and more than 320 locations in 70 other countries throughout the world. The weather data are arranged by World Meteorological Organization region and Country.

Download the data files at *http://www.eere.energy.gov/buildings/energyplus/cfm/weather_data.cfm*

An overview of the 12 sources of information is given in the table hereafter.

Sources of information	More information?
California Climate Zones 2 (CTZ2)	*http://www.energy.ca.gov/title24*
Canadian Weather for Energy Calculations (CWEC)	*http://www.climate.weatheroffice.ec.gc.ca*
Chinese Typical Year Weather (CTYW)	
City University of Hong Kong (CityUHK)	
Indian Weather data (ISHRAE)	*http://www.ishrae.org.in*
International weather data (IWEC)	IWEC CD-ROM is available from ASHRAE (*http://resourcecenter.ashrae.org/store/ashrae*)
Italian Climatic data (IGDG)	
Portuguese synthetic data (INETI)	*http://www.ineti.pt*
Spanish weather data (SWEC)	
Solar and wind Energy Resource Assessment (SWERA)	*http://swera.unep.net/swera*
Typical meteorological year 2 (TMY2)	*http://rredc.nrel.gov/solar/old_data/nsrdb/tmy2*
Typical meteorological year (TMY)	*http://lwf.ncdc.noaa.gov/oa/ncdc.html*

EU Green paper on energy efficiency: are there specific ventilation needs?

In June 2005, the European Commission adopted the Green Paper on energy efficiency. The Green Paper proposes an ambitious programme with the objective of achieving cost effective energy savings for Europe of the order of 20% of the EU's current energy use. This means reducing the amount the European Union is spending on energy, mainly imported hydrocarbons, by 60 € billion per annum or the combined energy consumption of Germany and Finland. Instead, this money would be invested in energy efficient equipment and services.

A public consultation is foreseen till March 2006.

A total of 25 questions are put forward. Some of these questions regard the building sector with a possible link to ventilation, e.g.:

Question 8:

> "Energy efficiency in buildings is an area where important savings can be made. Which practical measures could be taken at EU, national, regional or local level to ensure that the existing Community buildings directive is a success in practice? Should the Community go further than the existing directive, for example extending it to smaller premises? If so, how could the appropriate balance be achieved between the need to generate energy-efficiency gains and the objective of limiting new administrative burdens to the minimum possible?"
>
> At present, the inspection of ventilation systems is not a mandatory measure whereas inspection of boilers (EPBD Article 8) and air conditioning systems (EPBD article 9) is mandatory. Is it necessary to extent the requirements to ventilation systems?

Question 9:

> "Giving incentives to improve the energy efficiency of rented accommodation is a difficult task because the owner of the building does not normally pay the energy bill and thus has no economic interest in investing in energy-efficiency improvements such as insulation or double glazing. How could this challenge be best addressed?"
>
> Many existing buildings has no or very poor ventilation systems resulting in bad indoor climate conditions and/or high energy bills. Moreover, it may have a major impact on the productivity of employees. Which measures can be taken to improve this situation?

For more information:
http://europa.eu.int/comm/energy/efficiency/index_en.htm

User's Manual Provides Better Understanding of ASHRAE 62.1

http://www.ashrae.org

A new user's manual provides users with a better understanding of the design, installation and operation requirements in ASHRAE's ventilation standard.

The Standard 62.1 User's Manual explains the requirements of ANSI/ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality, and contains numerous examples of their application in an easy-to-follow question and answer format.

"Because the standard is written in code-intended language, such material could not be included in the standard itself, so the manual helps users better understand the intent and apply it to their work," Dennis Stanke, chair of the Standard 62.1 committee, said. "It helps users understand what Standard 62.1 requires and how those requirements can be met. It's a document that designers have needed for many years and will find useful for many years to come."

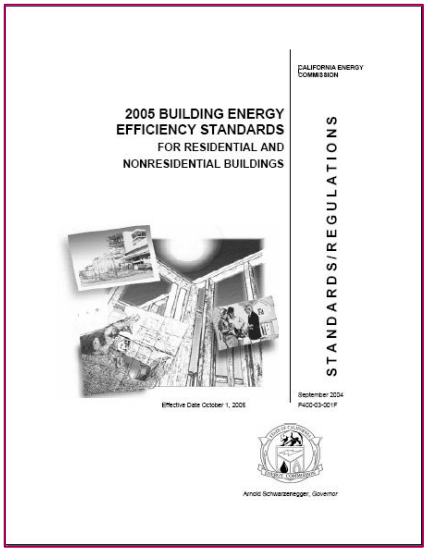
The manual includes a CD containing a spreadsheet to assist in the standard's new ventilation rate procedure calculations.

The manual was developed through ASHRAE research and partially funded by the National Institute of Standards and Technology, the Air-Conditioning and Refrigeration Institute and the U.S. Green Building Council.

Visit the ASHRAE.org Bookstore at *http://www.ashrae.org* for more information.

New Building regulations in California have major impact on ventilation systems

The Energy Commission adopted the 2005 changes to the Building Energy Efficiency Standards. These new Standards are in effect since of 1 October 2005.



The new requirements have major impacts on ventilation systems. For example:

- Air Distribution System Duct Leakage Sealing [§144(k)]. Duct systems with more than 25 percent duct surface area in unconditioned or indirectly conditioned spaces will be required to be sealed with leakage not greater than 6 percent of fan flow, confirmed through diagnostic testing and field verification.

- Outdoor Air and Demand Control Ventilation [§121(c)1, 3, 4, and 5]. Demand control ventilation will not be allowed as an alternative to continuous ventilation when operations or processes are present that generate specified pollutants and exhaust ventilation is not provided. With the exception of the above situation, the current requirements for demand control ventilation will be expanded to include specific occupancies with moderate to high occupant densities, which have an outdoor air economizer. Demand control ventilation devices will have new performance requirements. Acceptance requirements will be established to insure demand control ventilation systems are tested before occupancy to determine that they meet Standards requirements. Minimum ventilation rates will be changed for bars, cocktail lounges, and casinos. Acceptance requirements also will be established to insure ventilation systems are tested before occupancy to determine that they meet Standards requirements.

The new standards as well as summaries of the 2005 changes are available on the AIVC-CD.

Detailed information can be found online at *http://www.energy.ca.gov/title24/2005standards/index.html*

Natural Ventilation in the Urban Environment

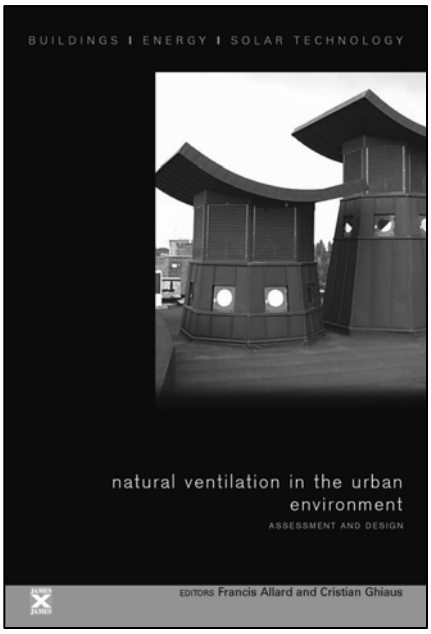
Assessment and Design

Edited by Francis Allard and Cristian Ghiaus

Throughout the world, there is an increasing interest in ecological design of buildings, and natural ventilation has proved to be an efficient low-energy cooling technique. Its practical application, however, is hindered by the lack of information on the complex relationship between the building and its urban environment. In this book, a team of experts provide first-hand information and tools on the efficient use of natural ventilation in urban buildings. Key design principles are explained, enabling readers to decide on the best solution for natural ventilation of buildings, taking into account climate and urban context.

In the initial sketches, architects need answers to open problems such as "what kind of solution to adopt" and "how to modify existing strategies to exploit the potential of the site". This book formalizes the multi-criteria analysis of candidate solutions based on quantitative and qualitative estimation of the driving forces (wind and buoyancy), as well as of the barriers induced by the urban environment (wind speed reduction, noise and pollution) and gives a methodology for optimal design of openings.

The book is accompanied by a CD-Rom, containing software for assessing the potential of a given site, estimating wind speed and dimensioning the openings for natural ventilation. The methodologies and tools are tested, self-contained and user friendly.



The editors, **Cristian Ghiaus** and **Francis Allard**, are affiliated with the University of La Rochelle, France. The book is a major outcome of the European URBVENT project. The authors and reviewers combine expertise from universities, research institutions and industry in Belgium, France, Great Britain, Greece, Portugal and Switzerland.

The book is available from Earthscan / James & James:
http://shop.earthscan.co.uk/ProductDetails/mcs/ProductID/317/GroupID/3/CategoryID/4/v/

The URBVENT project has been summarised in a 16 pages brochure which is available on the AIVC-CD.

A guide from Quebec: Indoor air quality in health and social services buildings

The Ministry of Health and Social Services of Quebec has published in April 2005 a new guide about indoor air quality in health and social services buildings.

This guide in French language has been written by a working group of experts involved in construction or technical management of such buildings.

Chapters concern design, construction and renovation of buildings and their HVAC systems, operation and maintenance of HVAC systems for good indoor air quality, procedures for monitoring indoor air quality.

The guide is available on the AIVC CD and can also be downloaded at the following address:
http://www.msss.gouv.qc.ca/documentation/publications.html
(Guide - La qualité de l'air intérieur dans les établissements de santé et des services sociaux).

European BlowerDoor-Symposium Building airtightness and dwelling ventilation

23-24 June 2006
Freiburg - Germany

The 1st European BlowerDoor-Symposium dedicated to building airtightness and ventilation continues the German BlowerDoor-Symposium, of which the tenth took place in June 2005 in Hanover/Germany.

"Dwelling ventilation" is added to the central subject of the conference "airtightness of buildings" because both themes are particulary important for the field of energy efficient buildings and they are tightly bounded to each other.

Read the first announcement and call for papers on the AIVC CD.

More information:
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Healthy Buildings Conference 2006

4-8 June 2006
Lisboa - Portugal
http://www.hb2006.org

HB 2006 healthy buildings
Creating a healthy indoor environment for people
Lisboa, 4-8 June 2006

HB 2006 is the 8th in a series of Healthy Buildings Conferences that started in 1988 at Stockholm and since then have taken place in Washington DC (1991), Budapest (1994), Milan (1995), Washington DC (1997), Helsinki (2000) and Singapore (2003). The issues addressed relate to indoor air quality and its impact on health. The main focus is on buildings as confined spaces where we spend around 90% of our life.

HB 2006, aims primarily at establishing the state-of-the-art of these health related topics in scientific and technical terms, mainly at the level of the causes and their prevention by means of adequate technological intervention.

But it also aims to contribute for results of social character, in the form of legislation and normative methods and processes, for a better public health and, therefore, for a better quality of life through an adequate intervention along the several phases of building life: design, construction and maintenance. Both the buildings themselves, according to the needs of their users, and their mechanical systems will be addressed, through a better characterization of the situation in the field and the criteria to adopt in the evaluations.

See second announcement on the AIVC CD.

7th International Conference on System Simulation in Buildings

11-13 December 2006
Liège - Belgium
http://www.ulg.ac.be/labothap/annssb.htm

This conference is organized in very close cooperation with the "Energy Conservation in Building and Community Systems" implementing agreement of the International Energy Agency (IEA-ECBCS) and with the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).

This conference will be, among others, the occasion to present some last results coming from the IEA-ECBCS Annex 40 "Commissioning of Building HVAC Systems for Improved Building Performance" and to deal with some aspects of the new Annexes 43 "Testing and Validation of Building Energy Simulation Tools", 47 "Cost Effective Commissioning of Existing and Low-Energy Buildings" and 48 "Heat Pumping and Reversible Air Conditioning".

The following topics will be considered in priority:

- modeling of HVAC components
- system simulation methods and tools
- application to commissioning
- application to energy management and to maintenance
- application to audit and retrofit

Read the first announcement and call for papers on the AIVC CD.

Report from the first World Sustainable Buildings Conference

Max Sherman

"Action for Sustainability" was the theme for the first World Sustainable Buildings Conference held in Asia, known as SB05. SB05 attracted over 1700 participants from 70 countries to Tokyo where they spent 3 days discussing the action required in various fields related to built environments in order to bridge gpas between environment, stakeholder concerns and regional concerns.

The conference had up to ten simultaneous sessions on these various aspects but also highlighted some exceptional plenary speakers. Ernst Ulrich von Weizsacker, member of the German Bundestag was the first one and spoke on "Buildings Technology in the Vanguard of Ecoefficiency." Ryoichi Yamamote of the University of Tokyo followed the theme the next day with "Eco design and Eco Efficiency as an Environmental-performance indicator". James Lerner, president of the International Union of Architects, spoke about "The Sustainable City." On the last day of the conference two well-known architects, Tadao Ando of Japan and Richard Rogers of the UK, made concluding plenary speeches: "The Earth is Crying" and "Towards an Urban Renaissance" respectively.

The slogan of "Action for Sustainability" represents that now is the time to move into action towards the common goal of providing buildings and an urban context that support sustainable ways of livings. Rather than being simply a one-way presentation of ideas, SB05 attempted to be a venue for constructive debates among the participants which included architects, engineers, clients and users. Many of the attendees committed themselves to this slogan by signing a resolution at the conference.

The IEA was well represented as there was a session focussing on energy use and climate--IEA and sustainable buildings & communities, featuring work from the ECBCS Implementing Agreement. ECBCS Chairman, Morad Atif led off the session looking at "Energy vs. sustainability: Building research trend".

He was followed by Markku Virtanen, the ECBCS representative from Finland who spoke on "increased energy and efficiency and improved comfort." Max Sherman, the chairman of the AIVC Steering Group next presented "the AIVC: International efforts on ventilation" and was followed by Per Heiselberg from Denmark speaking on "Hybrid ventilation-Results of the International research project IEA-ECBCS annex 35"--for which he was operating agent. Jean Christophe Visier of France could not attend to present his paper, but "Commissioning tools: A way to manage growing complexity of energy systems in buildings" was well received nonetheless. The final presentation was on "Advanced local energy planning (ALEP)--A modern approach to sustainable community systems," presented by Reinhard Jank of Germany.

Papers are including in the proceedings. More information about the conference can be found at their website *http://www.sb05.com*.

Energy efficient technologies for government buildings - new and retrofits

Organized by US Army Corps of Engineers ERDC-CERL, Chicago, USA
19-20 January 2006

The workshop will focus on Government energy conservation models which can influence a society's values. Government buildings can exemplify the intelligent application of energy-efficient technologies.

Private sector individuals are more likely to adopt energy-saving technologies when they can see how Government authorities have constructively addressed energy problems. It is particularly important for Government buildings to demonstrate exemplary solutions and showcase them to the public. In other words, it is not only important to do something positive, but also to take the necessary steps to promote it.

Government buildings can potentially change public opinion, and thereby help increase the market penetration of energy-saving technologies.

See announcement and preliminary program on the AIVC-CD.
More information:
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27th AIVC Conference in conjunction with 4th EPIC Conference, Lyon – 29 November - 1 December 2006

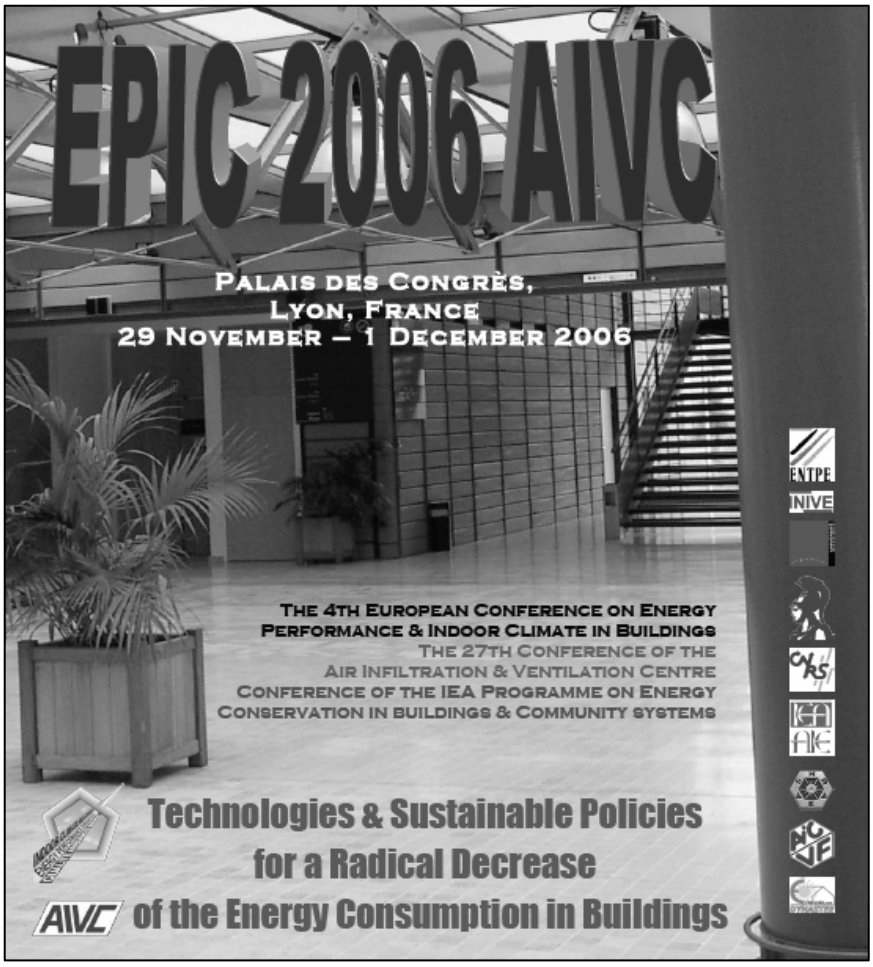
As announced in the September issue of AIR, the 27th AIVC conference will be held in Lyon from 29 November till 1 December 2006 in collaboration with the 4th EPIC conference.

The concept is quite similar to the 23rd AIVC conference held in 2002 in Lyon.
However, there are several important differences:

- The conference will also be an official conference of the Implementing Agreement on Buildings and Community Systems (ECBCS – *http://www.ecbcs.org*) of the International Energy Agency (IEA – *http://www.iea.org*). In practice, it means that there will be 8 sessions dealing with topics closely linked to the projects ("Annexes") of ECBCS.
- Given the importance of the European Energy Performance of Buildings Directive on the building and ventilation market, there will also be a track focusing on various EPBD issues. Up-to-date information from the SAVE projects and of related European and national activities will be reported.
- During the last 2 days of the conference, there will be on a different floor of the Congress Centre the CLIMAMED conference. The CLIMAMED conferences are an annual event organised by the four HVAC engineer associations, REHVA members, in France, Italy, Portugal and Spain. The 2006 conference is organised by the French association AICVF. Participants of the EPIC-AIVC conference can also participate at the CLIMAMED conference (*http://www.climamed2006.org*) at a reduced registration fee.
- Finally, the conference will be held in the new Congress Centre of Lyon.

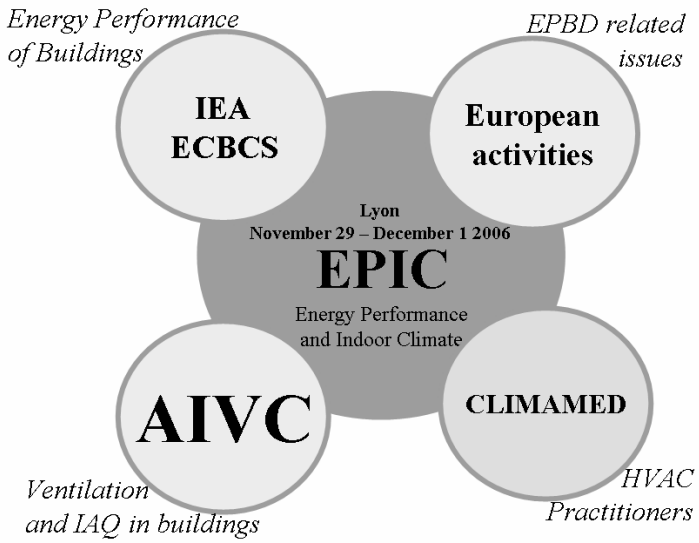
Of course a full track of the conference will be dedicated to ventilation and IAQ in buildings.

More information can be found on-line at *http://epic.entpe.org/*.



The deadline for abstracts has been extended to 15 January 2006

	Congres Hall	Room 1	Room 2	Room 3	Room 4	Other floor
9:30 Wednesday morning	**Opening session**					
13:00	Lunch					
14:00 Wednesday afternoon 1	EPIC	**AIVC**	ECBCS	EPBD		
16:15 Wednesday afternoon 2	EPIC	**AIVC**	ECBCS	EPBD		
9:00 Thursday morning 1	EPIC	**AIVC**	ECBCS	EPBD		
11:15 Thursday morning 2	EPIC	**AIVC**	ECBCS	EPBD		
13:00	Lunch					
14:00 Thursday afternoon 1	Opening CLIMAMED	**AIVC**	ECBCS	EPBD	EPIC	
16:15 Thursday afternoon 2	CLIMAMED	**AIVC**	ECBCS	EPBD	EPIC	CLIMAMED 3 rooms
18:30	Wine tasting and Conference dinner					
9:00 Friday morning 1	EPIC	**AIVC**	ECBCS	European projects		CLIMAMED 4 rooms
11:15 Friday morning 2	EPIC	**AIVC**	ECBCS	European projects		CLIMAMED 4 rooms
13:00	Lunch					
14:00 Friday afternoon 1	**Closing Session**					CLIMAMED 4 rooms
16:15 Friday afternoon 2	Closing CLIMAMED					



Air infiltration and ventilation in buildings

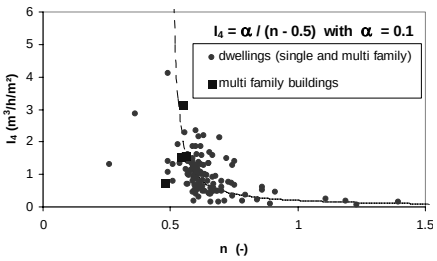
Willem de Gids

The conference offered a lot of interesting papers and posters varying from airtightness of building to development of innovative ventilation systems. Energy was in almost all papers and posters the leading item.

The sessions were devoted to the following topics:

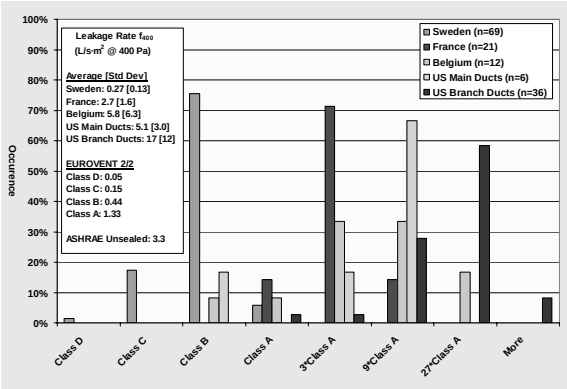
- Airtightness
- Energy performance
- Measurements / Diagnostic
- Modeling
- Strategies
- Ventilation systems

On the topic airtightness and energy performance there were papers and posters from the USA, Germany and France. One of the results of the USA study on commercial buildings showed clearly the impact of infiltration due to air leakage of buildings of about 20% of the energy use by buildings. A study from France showed that airtightness of dwellings counts for about 25% of the energy use. So after two decades of research, airtightness is still an important phenomenon. A number of measurements of airtightness on French dwellings were presented, showing a relation between the airtightness level itself and the flow exponent (Figure).



Relation between the flow exponent value and the infiltration rate. The dotted line represents the hyperbolic fit (Litvak et al., 2005)

The paper on air tightness of ductwork form the USA made it quite clear that on this aspect a lot of progress can be made in the USA compared to Europe (Figure).



Duct pressurization results (Wray et al., 2005)

Measurement techniques on air tightness had also some attention by Germany and France. Advanced and simpler techniques were demonstrated. The simple technique used the existing exhaust system to quantify in a rough way the air tightness of dwellings. A number of diagnostic methods were presented.

Studies on schools were related to energy performance and indoor air quality and comfort. Overheating and bad IAQ was reported from schools in Greece.

Modeling is a topic that is presented in almost all AIVC conferences. There was less attention to CFD modeling during this conference compared to earlier conferences. Some examples of full scale physical modeling were presented. The focus in modeling was on combined heat and airflow modeling. Papers presented from studies in USA and Belgium showed the combined application of these models.

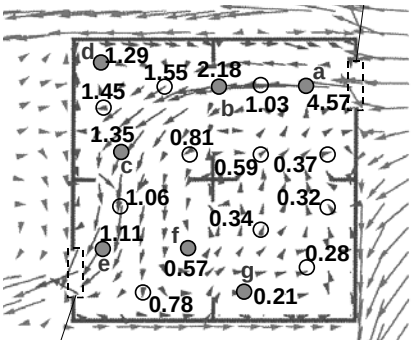


Illustration of modelling results (Nishizawa et al., 2005)

Most of the modeling studies paid attention on the probabilistic approach in relation to comfort (Belgium) for the prediction of windspeed in canyons (Greece) and for the evaluation of the performance of ventilation systems (Sweden). An old discussion came along about the relation between windspeed and terrain roughness. The application field of the power law of logarithmic law was discussed because of the use of it in a Portuguese study.

A number of studies on innovative ventilation systems were presented. From hybrid systems in livestock buildings (Denmark) and in dwellings (Japan and Greece) to humidity controlled ventilation of dwellings. (France). Night cooling strategies (Belgium) and pre-cooling and pre-heating through ground coupled heat exchangers also got some attention. Even the results of the application of full natural ventilation systems in dwellings in China were presented.

The trends observed during the conference are the following:

- More natural/passive and hybrid ventilation systems including.
  - pre heating / night ventilation / demand control
  - mostly for research purposes
- More emphasis on IAQ and health than on energy.
- Infiltration still needs attention in relation to energy.
- Special attention on IAQ and comfort in schools.
- Ventilation IAQ/comfort studies carried with combined modelling.
- Probabilistic modelling is popular under researchers (but when and how to use it for industry to assess correctly innovative ventilation systems?).

Whole building heat, air and moisture transfer (Annex 41)

Hugo Hens

Divided over two sessions, eight papers were presented. In a first paper the annex history, topic, objectives, subtasks and intended products were presented. A second paper highlighted subtask 1 on the basics and modeling principles in more detail, with a summary of the common exercise 0 and 1 results gained so far. These exercises learned that modeling moisture buffering is not as easy as could be assumed, the main reason being the large inertia linked to moisture movement and storage. As a consequence, only thin surface layer participate actively in the moisture exchange with the interior environment. The third paper focused on measuring the moisture buffering capacity of different materials. Main questions to be answered are how and what combined property can be seen as a usable material characterization. Paper four discussed a typical whole building application: what effects has attic ventilation in a cool climate when the ceiling below is extremely well insulated but not necessarily air-tight. The conclusions underline that in terms of moisture tolerance, air-tightness of the ceiling is more important than ventilating the attic.

The fifth paper documented experimental work on moisture buffering in a small test room under well controlled conditions. Paper six discussed modeling results, looking to the effect of simplified buffering models on predicted relative humidity indoors. Quite important in thermally transient conditions was the fact if the simplified model accounted for the thermal effect on buffering or not. The calculations also showed that buffering helps in diminishing energy consumption for latent heat effects, but has no impact on the power needed to handle latent heat effects. Finally, paper seven and eight again looked to application. Questions tackled were the energy performance of a ventilation system controlled by the relative humidity in the rooms and the indoor climate design for a monumental building with a new function and periodically high moisture loads. The conclusions were quite interesting. A relative humidity controlled ventilation system has hardly any impact on energy consumption but performs quite well in reducing the relative humidity peaks indoors.

In the monumental building, however, buffering only, without a correctly designed HVAC-system, could not guarantee a good indoor climate.

Main conclusion was that, although we just started with the annex 18 months ago, some interesting results already came out, proving the just in time necessity of expanding the heat, air moisture approach to the whole building level.

EP standards and calculation procedures

Jean-Robert Millet

Jaap Hogeling gave an overview of implementation of the CEN mandate. He pointed out the reasons and interest of them. Standards will increase the accessibility, transparency and objectivity of the energy performance assessment. The use of CEN standards for calculating energy performance, including energy performance certification and the inspection of boilers and air-conditioning systems will also reduce costs compared to developing and maintaining separate standards at national level. Nevertheless, Standards should be flexible enough to allow for necessary national and regional differentiation.

The final results will be:

- A clear method for determining the overall energy performance of new and existing buildings, using standard performance calculation methods for building products, buildings, installations and systems, including heating, cooling, ventilation, infiltration and lighting.
- Methods of assessment suitable to certify buildings including their installations.
- General guidelines for the inspection of boilers, heating systems and air-conditioning systems required by Article 8 and 9.

Hans Erhorn made a point on Status of work in EPBD CA (Concerted Action) regarding procedures. Intended use of CEN differs quite a lot between the Member States: some countries will use at least some parts of the standards, but not the whole standard. A comment arises that detail of input is too high for practical use, especially in existing buildings.

One important question is how much simplifications are acceptable/needed? Some requests have to be taken into account as simplifications for building geometry, default values for constructions and service systems, comparable procedures for residential and non-residential buildings.

Dick Van Dijk presented the calculation procedures, focus of standards prEN15203 and prEN-ISO13790 “Calculation of energy use for space heating and cooling “ He distinguished different levels in the calculation : energy performance certificate and ways to express the energy performance , calculation of overall energy use in buildings, calculation of delivered energy, calculation of net energy for heating and cooling.

The important requirements to calculation methods, in the context of building regulations are: transparency (in particular in case of minimum energy requirements), robustness, reproducibility, affordability, and efficiency. Fully described simple methods appear to be a good answer to these points in this context.

Jean-Robert Millet presented the Ventilation related aspects in the CEN calculation procedures with focus on prEN 15241 & 15242. The first one "Calculation methods for the determination of air flow rates in buildings including infiltration (prEN 15242)" is devoted to the calculation on the ventilation flows in a building (e.g.) between rooms and with the outside. The second one "Calculation methods for energy losses due to ventilation and infiltration in commercial buildings" (prEN 15241) is devoted to the energy impact of the ventilation system. The relationship with the other standards depends on the applications: design and dimensioning standard, airflow and energy due to ventilation standards, overall energy and summer comfort standards.

Jaap Hogeling made the Johan Zirngibl presentation on the treatment of heating systems in the CEN/EPBD standards worked out by CEN TC 228/ WG4. He distinguished between overall energy use, primary energy and CO_2 emissions, annual performance of the different heating technologies, economic calculations for RES, inspection/ maintenance of heating systems and boilers. One particular point was on the final expression of results either on primary energy (using primary energy factor or primary resource energy factor) and CO_2 emission factors: marginal CO_2 emission factor (takes into account the reduction of energy consumption) and end use CO_2 emission factor (average emission factor for a complete year by specifying the uses).

Existing buildings: Calculation procedures - certification, labeling

Aleksander Panek

The session "**Calculation procedures - certification, labeling"** coordinated with the help of the EIE-SAVE project ENPER-EXIST (Applying the EPBD to improve the Energy Performance Requirements to Existing Buildings) attracted 85 people from various European countries.

The analysis provided in the original proposal of Directive on energy performance of buildings [COM (2001) 226 final, 11.5.2001] prepared by the EC indicated the global potential of about 22 per cent reduction of present consumption that can be realised by 2010 by economically feasible investment. The consumption was estimated for heating, hot water, air conditioning and lighting and it should be remembered that it accounted only EU-15 and not EU-25. Different researches and studies prepared nationally are reporting at least similar potential at New Member States. Moreover, the achievement of energy standard same as for the newly constructed building by existing one after modernisation is considered to be difficult. Some other issues as e.g. data collection, accuracy of assessment, adaptation of calculation methodologies, data bases and verification protocols have been discussed.
The saving potential and mentioned difficulties are showing importance of existing building stock in EPBD implementation.

The objective of the session was to present areas of interest of ENPER project itself, and the interaction with other ongoing SAVE supported projects, to finally confront their scope with a scope of one of the main topics of Concerted Action the Certification of Buildings where the official statements of 21 Member States are discussed.
The table below shows the coverage of the issues of concern by the fore mentioned SAVE project that have been presented on a session.

Additionally to these, the RESNET assessment network operating in US for many years has been presented by the US Raters and collaboration on future development offered.

The general conclusion of the session could be expressed as follows:
Existing buildings did not attract adequate recognition within the national and CEN procedures as their potential impact on energy conservation. Therefore there is a need for intensive cooperation in the subject.

Issues of Concern	Con Action	Enper exist	EPA NR	EP Label	Best cert	Resnet	Budi	Stable	Impact
Certification acceptance									
Information campaigns									
Certifiers selection and training									
Certifiers accreditation									
Pilot tests on real buildings									
Building assessment method			AR*	OR*	AR*	AR*			
Software tools			D**	D**	Use	Use			
Certification organisation and impact									
Knowledge of building stock									

*AR – asset rating, OP- operational rating; **D- under development (light color indicates indirect address of the issue).

Indoor climate considerations and the EPBD

Olli Seppänen

Easy way to reduce energy consumption is to reduce indoor environmental quality. This is what happened after the first energy crisis in 70´s and sick building syndrome and other indoor problems were created. This is what has to be avoided by integrating IAQ in the implementation of energy performance directive.

Indoor environment is not only the comfort issue as it also affects performance and health (Seppänen 2005)
- High and low indoor temperature reduces performance.
- Low ventilation rates increase short term sick leave caused.
- Good ventilation improves the productivity or low ventilation rates decrease performance.
- Poor air quality in general reduces performance.

Alternate approaches how to handle the overheating risk in energy performance calculations
(Dick van Dijk 2005)
- Ignore comfort level,
- Fixed comfort level,
- Allow higher kWh/m2 if with better IAQ (neutralise comfort level),
- Require for lower kWh/m2 with bad IAQ (penalty for bad comfort),
- Prescriptive requirement.

A NEW EUROPEAN STANDARD draft standard prEN 15251 (Olesen 2005)

Standard sets the requirement which parameters have to be specified and gives examples of numeric values in three categories for:
- Sizing the equipment (fixed value).
- Energy calculations (range of temperature).
- Evaluation of indoor environment and long term indicators.
- Inspections and measurements in existing buildings.
- Classification and certification criteria of indoor environment.

Indoor environmental factors in the standard
- Thermal environment – temperature (air and operative temperature)
- Ventilation rates.
- Air quality (only CO2).
- Draft (air velocity for winter and summer).
- Noise level.
- Humidity (only for specific cases, do not humidify or dehumidify too much).
- Lighting.

Indoor temperature should depend on the running outdoor temperature (Nicol 2005).

Conclusions:
- Indoor climate affects, not only comfort but also, performance, health and productivity.
- Energy performance is not improved if indoor air climate is getting worse due to energy saving measures.
- It does not make any sense to declare energy consumption if indoor environment is not specified at the same time.
- Information on indoor air quality has to be included in energy certificates and other performance criteria of buildings.
- Fortunately, technologies exist for simultaneous improvement of energy efficiency and indoor environment (Keep cool Leutgöb 2005 and many others).

Very low energy new and existing buildings

Viktor Dorer

The demand of new and existing very low energy buildings is much lower than the required demands for ordinary new buildings based on the EPBD procedure. However these buildings represent the technology which is expected to become a commonly required standard under future revisions of the EPBD energy codes. The presentations summarized below are to be seen in this context with the EPBD.

H. Erhorn presented the successful introduction of low energy houses in Germany, starting with the solar architecture buildings, designed for maximum solar gain or for minimized losses. He highlighted the long introduction periods and emphasised the need for close collaboration with industry. Demonstration buildings are necessary to promote the technology and to learn from it. Small loads require very low power system. Small wood stove would lead to overheating of the room, if not attached to the hot water storage.

K. Engelund Thomson reported about the promotion of low energy buildings in Denmark. The low energy building class 2 is at 75 %, class 1 at 50 % of the present energy code level. These levels are envisaged to become the required levels in the revision of the energy regulation in the years 2010/ 2015.
For extension and renovations still three approaches are accepted: U-value, heat loss or energy frame approach.

S. Dyrbøl presented three low energy inspiration projects in perspective to EPBD: A class 1 low energy building, a renovation project and an optimized renovation project. She concluded that class 1 low energy building are feasible with existing technology, that renovation has be approached by an integral planning process, and proposed for costs to change from pay-back time to net present values.

H. Erhorn-Kluttig presented projects in the EU FP6 Eco-buildings part, namely DEMOHOUSE, ECO-Culture, SARA, and in more detail the project BRITA in PuBs, where 9 public buildings, representing 18‘000 comparable buildings in Europe, are retrofitted to an energy standard significantly lower than the present EPBD standard. A list of retrofit measure was presented both for envelope and fenestration, and for the integration of renewable energy and local energy conversion systems.

A. Pindar outlined the Passive-On project where two possible approaches to bring Passive Houses to the Mediterranean are evaluated: to adapt the present PH standard (example requirement 15 kWh/m^2 for heating to be split into 10 for heating, 5 for cooling), or to develop an independent standard considering passive cooling.

H. Kaan reported about a similar project to promote the Passive House standard in western and northern European countries by identifying the energy saving potential in Europe, by specifying climate and country related constructions, by preparing national info packages and a web site, and by harmonizing PH certification with EPBD procedures.

Already today very low energy buildings comply with future EPBD energy requirements, and have to pass a certification procedure. The Passive House technology is established for new buildings, the present focus of technology development is on retrofit. The technology has to be pushed in an ongoing effort, promoting new technologies and gaining experience. For this, demonstration projects and collaboration with key industry are crucial. A holistic approach in planning has to be promoted. Cooling aspects and perhaps also embedded energies have increasingly to be considered.

Calculation procedures must be detailed but remain applicable. They should credit the use of innovative low energy technologies.

Innovative systems and the EPBD

François Durier

In the framework of this session, innovative systems were defined by Peter Wouters and Nicolas Heijmans (BBRI - Belgium) as building systems which give better energy performance and whose performance cannot be assessed by standard methods. This lack of testing or calculation method for performance assessment of innovative systems could create barriers to their market introduction.

According to the speakers, examples of innovative systems can be found in building envelope (insulation, windows, double skin facade, use of thermal mass,…), heating (solar, condensing boilers, CHP, heat pumps, biomass, geothermal,…), cooling (passive cooling, absorption chiller,…), ventilation (hybrid, natural, ground heat exchangers, humidity or CO_2 controlled,…), lighting (daylighting, high efficiency artificial), controls and monitoring.

Hans Erhorn (Fraunhofer Institut für Bauphysik - Germany) mentioned that using innovative systems is investigated in several European Eco-buildings research projects ; potential of innovative systems requires to integrate them in energy performance procedures and EPBD Concerted Action identified several systems for which members states do not know yet how to take them into account in national regulations.

Peter Wouters noticed that performance assessment procedure for innovative systems could rely on the equivalence principle (can the performance be compared to the one of classical systems ?), event if this approach may sometimes be difficult to apply.

Nicolas Heijmans described the probabilistic approach used in Rhesyvent project about hybrid ventilation: several (100) calculations from a set of input data, each of them being associated to a probabilistic distribution, were perfomred in order to compare innovative and conventional systems. Hans Erhorn also mentioned the possible use of a simple calculation method from existing standards and litterature, as in BestFaçade project about double skin façades.

According to Peter Wouters, the assessment procedure of innovative systems, wathever its type, should be transparent and reliable, offer help for optimisation, rely on available input data, be opened to new developments, software independent, available now... Nicolas Heijmans pointed out the need of consistency between countries, but also the need to authorise national approaches (national concepts, national boundary conditions, national calculation procedures,…).

Suzanne DyrbØl (Rockwool International) proposed that innovative systems focus where the largest saving potentials exist, unlike for e.g. efficient insulation which mainly goes to the new buildings market while saving potentials are bigger in the existing buildings, and recommended to set up regulations with mandatory requirements and to use money available in the most efficient way (incentives, subsidiaries) to develop the market of innovative systems.

Finally, Alice Andersen (WindowMaster - Denmark) pointed out that barriers exist for natural ventilation systems, due to limited requirements in standards; in such a case, requirements should avoid fixed limit values (e g. room temperatures, air flow rates, CO_2 concentrations) never to be exceeded but should prefer mean values, with autorisations to go beyond limits for small periods of time.

Dissemination, training and non-technical issues

Maria Kolokotroni

The session addressed non-technical implementation and formal training issues in the context of EPBD.

Implementing the EPBD requires raising awareness and training of hundred thousand of people in Europe. Some countries have practical experiences and specific projects are running for facilitating the introduction of EPBD. Formal aspects of training should also be addressed in particular in the areas of certification of buildings and installations.

The session contained four presentations, a summary of which is given below:

H. Van Eck gave a summary of the needs for training and presented a graph indicating the certification chain. Certification needs can be summarised as follows:

- An Industry Advisory report on number of certificates is expected soon – the first indication are that many experts are needed (eg 2.5 million of dwellings in the UK, more than 2.5 million non-domestic in Germany in 2006).
- Responsibilities for service quality – what people? Start point could be the EN/National standards to the service delivery.
- Energy use, reality versus calculation (Quality of methods and Quality of experts) for advice and inspection.
- EPBD article 10 stipulated that work should be carried out in an independent manner by qualified persons.
- Quality of supervision of experts – authorised agencies, professional bodies, accreditation bodies, scheme administrator (national and regional authorities).

M. Kolokotroni presented a project currently funded by EIE which addresses the issue of training material development within the chain of certification. The project aims to develop distance learning training material for the promotion of best practice ventilation energy performance in buildings. Within the project, it is proposed that distance learning might be a suitable format for training large number of professionals. For this the training methodology, operational schedule and requirements for certification must be addressed in detail.

A. Papadopoulos highlighted that apart from technical issues, other factors that influence the implementation of the EPBD should be addressed such as social, economic and cultural aspects. Also hidden factors such as financial and availability of human resources. Such issues can be summarised as follows in the form of questions:

- Hard question - why do things develop so slowly?
  - Example: Densely built urban environment – complex legislative framework and financial incentives, lack of proven expertise, unwillingness to abandon the “business as usual” approach, low energy prices.
- Can the EPBD enforce the accelerated propagation of energy efficient technologies?
  - One barrier was outlined: Tariff structure of utilities does not benefit the penetration.
  - Soft barriers (eg. human resources and local acceptance): Design Advice & Support Units are required.

In conclusion, EPBD is a useful background for enforcing development – the key issue for its effective penetration is to engage local people according to the local needs and the local potential. In addition, pricing of energy should be based on its costing for market penetration of EPBD.

P. Schilken described a project currently funded by EIE. This project is a continuation of the Display Label project for municipal buildings and addresses a similar problem with the same solution. The scheme is voluntarily at present.

- The label includes –
  - primary energy, GHG emissions and water consumption, distribution of energy sources,
  - communication with the public,
  - display classification could be replaced with national classifications.
- Display also includes practical advice and description of technical issues in simple words.
- Facilitates communications with councillors, managers of municipal buildings, general public and building users and therefore bridging the gap between Europe and its citizens.

In conclusion, the session addressed different aspects of non-technical issues

- Description of the whole chain of certification and requirements.
- Methods for developing training material.
- Pricing, cultural and methods of penetration, involvement of local community.
- Methods of adaptation of existing successful certification schemes.

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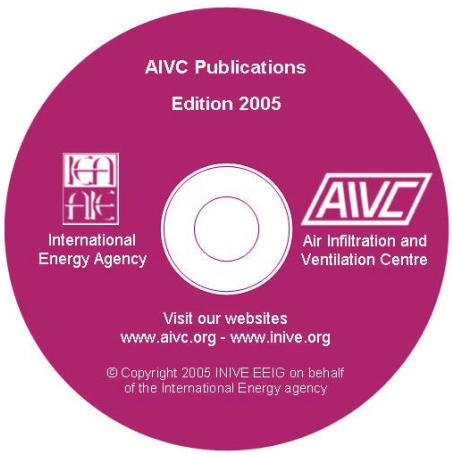

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