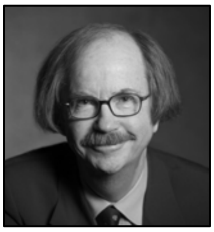
AIR

AIR INFORMATION REVIEW

Vol 28, No. 1, December 2006 A quarterly newsletter from the IEA Air Infiltration and Ventilation Centre

AIVC

In memoriam
P. Ole Fanger (1934 – 2006)



One of the stars of the indoor climate field has left us for the firmament. P. Ole Fanger died suddenly this September at the age of 72.

For more than 30 years Professor Fanger was in charge of the indoor environmental research at the Technical University of Denmark and headed the International Centre for Indoor Environment and Energy. He had recently retired as its head to become a Senior University Professor. This March he had been raised to the status of University Professor at the University of Syracuse, which is where he was when he was struck with a fatal abdominal aortic aneurysm.

Ole Fanger burst on the scene with the book, *Thermal Comfort,* which was derived from his Ph.D. dissertation and first published in 1970. This and subsequent works were and still are the standards used to describe thermal comfort. His pioneering work used the perceptions of human subjects to quantify thermal comfort; having thus related a measure of comfort to environmental variables, more standard engineering techniques could be used to evaluate thermal conditions. The "Fanger Comfort Equations" are known to all students in the field.

In the 1980s he began to broaden his interests outside of thermal comfort to include the areas of ventilation and indoor air quality. He tried to do for the indoor air quality what he did for thermal comfort. Fanger was successful at being able to develop some quantification of perceived indoor air quality using trained panels of "sniffers" who could evaluate the perceived IAQ of different spaces.

Professor Fanger's research has been recognized by 69 scientific awards in 27 countries, including 11 honorary doctorates, 18 medals, 16 honorary memberships of professional engineering societies, and four memberships of scientific academies, including the US National Academy of Engineering and the Royal Academy of Engineering (UK). He was President of SCANVAC, a Federation comprising 20 000 HVAC engineers in Scandinavia. For a more complete description of his work see ***http://-----------------------*** ---------.

On a more personal note Ole was known as quite a gourmet and enjoyed his international traveling as it gave him an opportunity to sample food from around the world. He would often call out the chef to inquire about dishes, but woe be it to the sommelier who served the wine at the wrong temperature. Ole always carried a golden thermometer and would not hesitate to use it. Although he did appreciate fine dining he would not let that get the way of his work. He was, however, known to have room service bring him a meal in middle of standards or committee meeting that went on too long.

The wit and wisdom of Ole Fanger will be missed at venue's around the world.

Max Sherman, Chairman AIVC Steering Group

AIVC Conference 2007

Building Low Energy Cooling and Advanced Ventilation Technologies in the 21st Century

27 - 29 September 2007 – Crete Island – Greece

More information on page 12

List of books and book chapters by
P. Ole Fanger

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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 is to encourage and increase information exchange among ventilation researchers and practitioners worldwide.

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Residential Furnace Blower Performance in U.S. Homes

Dr. Iain S. Walker, Staff Scientist
Lawrence Berkeley National Laboratory

Introduction

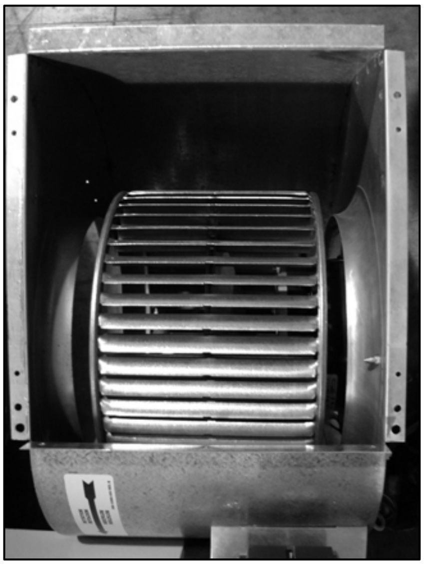
Most heating (and cooling) systems in the U.S. use a centralized air handler or "furnace blower" to circulate conditioned air around the house. Although the space conditioning components themselves have become more efficient over the last couple of decades, residential forced air system blowers have not experienced similar improvement. The most common blowers have been shown by in-field testing to have efficiencies of only 10% to 15% corresponding to about 2 cfm (1 L/s) for every Watt of power consumption. These low efficiencies indicate that there is significant room for improvement of both electric motor and the aerodynamic performance of furnace blowers. Typical furnace blower power consumption in U.S. homes is about 500 to 700W and is increasing as larger new homes require larger heating and cooling systems. This is a significant power draw and represents 20 to 25% of the power consumed by a high efficiency air conditioner.

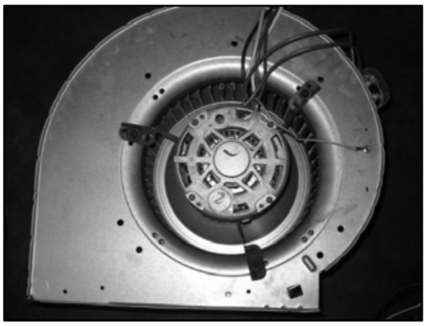
An important consideration in analyzing forced air system blowers is that essentially all of the wasted electricity is manifested as heat. This extra heat reduces air conditioning cooling and dehumidification performance and effectively acts as a low-efficiency electric supplement to fossil-fueled furnaces. For heat pumps, this heat substitutes for vapor compression-based high COP heating and effectively reduces the COP of the heat pump.

Currently in the United States the energy use of these blowers is unregulated and is not accounted for in building energy codes. However, there plans for the State of California and the Environmental Protection agency to introduce energy credits for better blower performance and the current U.S. Federal EPAct program and several utility programs offer incentives for using BPM motors in blowers. This work was undertaken to provide guidance for these code authorities and utility programs as well as providing guidance for consumers.

Blower Characteristics

Blower performance is determined by the type of electric motor and the aerodynamics of the blower wheel and scroll housing. Typical blowers have poor aerodynamic performance due to using simple sheet metal blades, with large gaps between the wheel and housing. In the U.S. market only one type of blower wheel and scroll housing are available and the only performance variation is due to the two kinds of blowers: Permanent Split Capacitor (PSC) and Brushless Permanent Magnet (commonly called DC motors). PSCs represent about 90% of the current U.S. market. BPMs are sold in more complex furnaces and are seen as a more efficient alternative to PSC motors.





Blower wheel viewed from the air exit showing small forward curved blades and direct drive motor mounted in air inlet.

Lab Testing Results

BPM motors are better at maintaining airflow as static pressures increase. This means that they are more tolerant to high-resistance duct installations in the sense that they are better able to maintain the air flow across heating and cooling heat exchangers so that they operate efficiently. The flip side of maintaining airflow into increasing pressure differences is the corresponding increase in power use. Therefore, there is a balance between maintaining heat exchanger effectiveness and the extra fan power requirements.

BPMs have significantly higher cfm/W (L/s/W) as pressures are reduced. The PSC air handlers are fairly constant at about 2 to 2.5 cfm/W (1 to 1.25 L/s/W) for all speeds, with slightly lower cfm/W rating for lower speeds. The performance falls off sharply above about 1.0 inch of water static pressure (250 Pa). BPMs have significantly higher cfm/W ratings as pressures are reduced, approaching values greater than 15 cfm/W (7.5 L/s/W) for low pressures, but at pressures above 0.8 in. water (200 Pa) their cfm/W (L/s/W) performance is similar to a PSC.

Energy Modeling

To determine the yearly energy use effects of the two blower technologies a DOE2 simulation was used to calculate hourly heating and cooling loads for a house in the California Central Valley. The model of the furnace and air conditioner included the following:

- Standby energy use of 5W for the PSC and 9W for the BPM
- Energy used by the draft inducer including pre and post purge for every cycle
- On and off blower delays and igniter energy use for each cycle
- Effect of changing air flow and outdoor temperature on air conditioning efficiency
- Reduction in natural gas use due to blower motor heating
- Increase in air conditioner operation due to blower motor heating

Four design options were examined:

1. Single stage PSC
2. Single stage BPM
3. Two-stage PSC
4. Two-stage BPM

Three systems were investigated:

1. One that met the low pressures (typically 0.2 to 0.3 inches of water (50 to 75Pa)) use in Federal test procedures for furnaces and air conditioners,
2. a typical U.S. system with 0.8 in. of water (200 Pa) typical operating pressure difference, and
3. a system operating at typical manufacturer's rating point of 0.5 in. of water (125 Pa).

The results showed that: for typical U.S. systems the energy savings are minimal for a single-stage furnace, but for lower flow resistance systems and for two-stage furnaces the savings are significant.

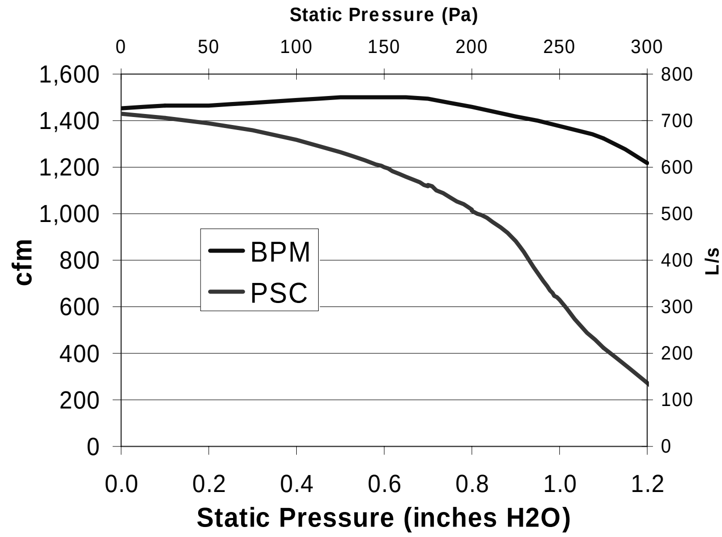
Summary

The fully realize the performance advantages of BPM blowers the static pressures that are prevalent in residential thermal distribution systems need to be minimized. These pressures are difficult to reduce due to the presence of filters and cooling coils that account for more than half of the system static pressure. Pressure reductions can be achieved by increasing return duct sizing (or number of returns), return grille area (often accomplished by having multiple returns) and for four-inch pleated filters that have reduced pressure drop.

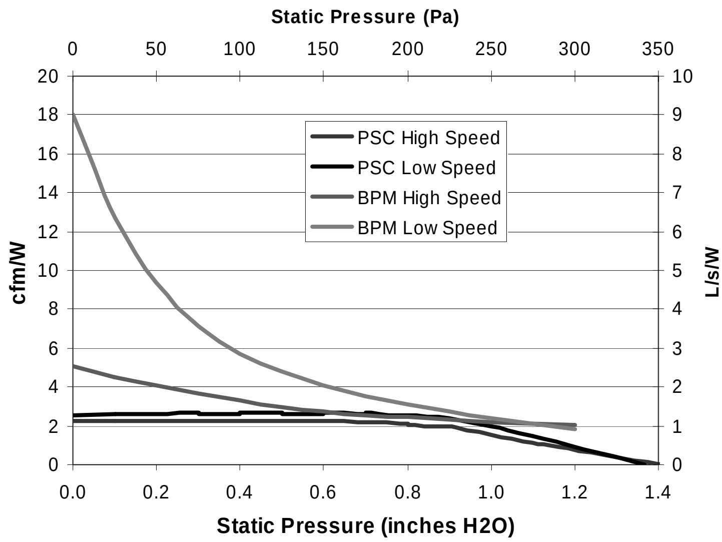
For multi-speed systems with staged furnace burners or operation for filtration and air mixing the low flow (and resulting low pressure) operation result in clear BPM advantages.

More details of this study are available at: ***http://-----------------------***

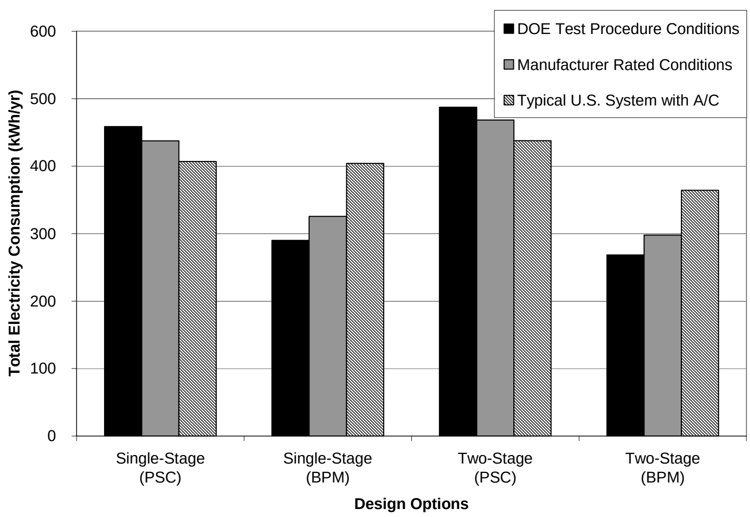
Iain S. Walker and Jim D. Lutz, "Laboratory Evaluation of Residential Furnace Blower Performance" (September 1, 2005). Lawrence Berkeley National Laboratory. Paper LBNL-58742. 54pp.



BPM Maintains air flow as static pressure increases



BPM mostly superior at low pressures



New Research from ASHRAE

Lower Temperatures, Increased Ventilation Boost Student Performance

Along with pencils and paper, increased ventilation is a fundamental necessity for students, according to research from the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).

Research shows that kids learn better in schools with better air quality. An article describing the research is featured in the October issue of the ASHRAE Journal. The research was funded by ASHRAE and conducted in Denmark. A final report is due later in the year.

The research indicates that lowering the temperature and increasing ventilation in classrooms increases student performance by 10 to 20 percent. The students' performance improved mainly in terms of how quickly they worked and also how many errors were made.

"ASHRAE looked at whether 'is it possible that Johnny can't read because Johnny can't breathe' so to speak," Terry Townsend, P.E., ASHRAE President, said. "The preliminary results seem to indicate the answer is yes. The study confirms earlier ASHRAE research that increased ventilation rates positively impact productivity in buildings."

"Environmental conditions in schools have been found to be inadequate and frequently much worse than in office buildings," says Pawel Wargocki of the University of Denmark, who led the research team with David Wyon. "This study shows the importance of improving air quality in schools so students can have optimal learning conditions."

Results from the research, once finalized, will be incorporated into ASHRAE technical guidance, used by engineers around the world in designing heating, ventilation, air conditioning and refrigeration systems in all types of buildings.

School officials can take several actions in response to this research to optimize learning conditions for students:

- Visit each classroom on a regular basis, particularly on warmer days, to make sure the air conditioning system is providing adequate conditions in the room, including acoustical considerations (eliminate a noisy fan). If a unit does not appear to be operating properly, get it inspected by an HVAC professional.
- Develop and adhere to a preventative maintenance program for all HVAC equipment on site. This will improve the uptime and performance of all units while also helping to extend their service life.
- Allow and encourage teachers to lower the temperature in the classroom on warmer days if they wish.
- Investigate and implement methods to reduce the heat build-up in classrooms in ways other than HVAC, such a window shading devices, building envelope sealing and insulation, or just turning lights off or down when not needed.
- Allow and encourage teachers, if appropriate, to open operable windows in the classroom on milder days so that more outside air can be introduced into the room. Set up procedures for then securing windows at end of day.
- Encourage maintenance staff to replace supply air filters more frequently, particularly during pollen season.
- Investigate the feasibility of introducing more outside air into the classrooms than codes require in an energy efficient manner with a mechanical engineer.

Conducted in Denmark, the study used six identical classrooms with 10- to 12-year-old students in an elementary school. In three experiments conducted in late summer and in winter, the outdoor air supply per person was increased from 6.4 to 20.1 cfm (10.9 to 34.2 m³/h) using existing mechanical ventilation equipment. In two additional experiments conducted in late summer, the temperature was reduced from 77ºF to 68ºF (25°C to 20°C) by either operating or idling split cooling units that were installed specifically for this experiment.

Teachers and students alike were blind to the changes being made to the air quality in each classroom. Each experiment lasted for one week, and crossover design was used; the improved condition imposed in one classroom was switched with an unaltered classroom the next week, using the students as their own controls. Noise levels were unaffected by the experimental changes. For each condition, tasks related to normal school work, such as reading and mathematics, were performed by students.

For the ventilation experiments, the existing systems at the school were fitted with a larger fan motor with a frequency controller and dampers that made it possible to change the airflow in alternate weeks. In the interest of realism, teachers were allowed to open windows as they had been accustomed to doing. As a result, the actual effective ventilation rates were estimated using the number of pupils in classrooms and the assumption that students produced carbon dioxide at a rate similar to that of adults due to the students' higher level of activity, as suggested by other research.

Classroom temperatures were manipulated in two experiments. In the first experiment, the outdoor air supply rate was also manipulated, and the average temperature when the air was cooled was 68°F (20°C), and the average temperature when the air was not being cooled was 74.5°F (23.6°C). In the second experiment, conducted in the same two classrooms the following summer, the air temperature was 70.9°F (21.6°C) with cooling provided and 76.8°F (24.9°C) in the reference condition. To ensure consistent background noise, the air circulation fans were run at all times whether cooling was being provided or not. For both experiments, new supply air filters were installed weekly.

A report on the research is due to be published in ASHRAE's archival research publication, HVAC&R Research, in which the research will be discussed in greater detail.

@ http://-----------------------

Contrasting the capabilities of building energy performance simulation programs

AIVC Contributed Report n°4 – 68pp

For the past 50 years, a wide variety of building energy simulation programs have been developed, enhanced, and are in use throughout the building energy community. Modelling ventilation is handled by all these programmes.

This report provides a comparison of the features and capabilities of twenty major building energy simulation programs:

BLAST BSim DeST DOE-2.1E ECOTECT
Ener-Win Energy Express Energy-10 EnergyPlus eQUEST
ESP-r IDA ICE IES <VE> HAP HEED
PowerDomus SUNREL Tas TRACE TRNSYS.

It is important to underline that the comparison is based on information provided by the program developers in the following 14 categories:

1. general modelling features;
2. zone loads;
3. building envelope, daylighting and solar;
4. infiltration, ventilation and multi-zone airflow;
5. renewable energy systems;
6. electrical systems and equipment;
7. HVAC systems;
8. HVAC equipment;
9. environmental emissions;
10. economic evaluation;
11. climate data availability;
12. results reporting;
13. validation;
14. user interfaces, links to other programs, and availability.

It is important to recognize (as the authors have) that the reporting of software features was self nominated by each tool author without verification. This leads to three areas of confusion:

- Terminology - how does one person describe a feature compared to another, who may be from another country?
- Usability - what is an 'expert' option for one user may be a standard requirement for another.
- Accountability - who is in a position to check the tables?

Although these issues have been identified but not addressed, the published tables give the interested reader a basis from which to gain an opinion of a tool. Furthermore, the data presented could form the basis of a discussion/demonstration about a particular tool, e.g. show me how you would model single sided natural ventilation in a classroom?

The authors found that even among the 'mature' tools, there is not quite a common language to describe what the tools could do. There is much ambiguity which will continue to require additional work to resolve in the future.

While the 14 tables may indicate a tool has a capability, there are many nuances of 'capability' that the developers found difficult to communicate. For example, there are several levels of resolution—one tool may do a simplified solution while another may have multiple approaches for that feature.

It is interesting to observe that human interactions/modeling is not accounted for in the tables.

Table 2 covers the calculation of standard comfort/discomfort metrics but nowhere is the heat gain and behaviour of occupants mentioned, e.g. opening/closing windows or the control of local ventilation diffusers. This could have serious implications for a given modeling study if the tool could not address these issues.

The tables attempt to clarify this by providing more depth than a simple **X** (has capability) by including:

- **P** (partially implemented),
- **O** (optional),
- **R** (research use),
- **E** (expert use), or
- **I** (difficult to obtain input data) or
- through extensive explanatory footnotes.

In many tables, many tools allow user-specified correlations, solution methods, or convergence criteria. For integrated building air flow simulations the key features required of a tool are: simultaneous solution of technical domains, user defined time step (say down to 1 minute in length), how convection is modeled, and the data provided in tables 4, 7 and 8. Table 4, although limited, does point to deficiencies in several of the tools (e.g. modeling of natural ventilation). However, table 8 suffers from the confusion of system naming in different countries and a feature competition (e.g. should 'Ice rink in building space' be classified under HVAC equipment, alongside groups such as coils and humidifiers?).

This report does not attempt to deal with whether the tools would support analysis over the lifetime of the project - from design through construction into operation and maintenance.

From the experience of the authors, many users are relying on a single simulation tool when they might be more productive having a suite of tools from which to chose. Early design decisions may not require a detailed simulation program to deal with massing or other early design problems. The authors encourage users to consider adopting a suite of tools which would support the range of simulation needs they usually see in their practice.

The authors also found that there was a relatively new level of attention and interest in publishing validation results. Several program developers also indicated that they plan to make the simulation inputs available to users for download in the near future.

There is also the issue of trust: Do the tools really perform the capabilities indicated? What level of effort and knowledge is required by the user? How detailed is the model behind a tick in the table? For open source tools, everyone can check the model and adapt it. For the other tools, only very detailed BESTEST-like procedures can give the answer. We may need a way for users to provide feedback and ratings for these in the future.

The authors envision this report as a community resource which will be regularly updated and expanded as the tools (and the simulation field) mature and grow. It is hoped that the table categories will become better defined in the future to allow easier comparisons between tools.

Ultimately, they see a dynamic web-based community resource with direct links for each tool to example input files for each capability as well as the suite of validation inputs.

Although the report has a much wider scope than ventilation modelling, we believe that it contains very valuable information for all those interested in modelling ventilation in building and who are interested to have a better understanding of the possibilities and limitations of simulation programmes.

Information of these simulation tools can be found in the **building energy codes database**, which can be consulted on the AIVC website (***http://www.aivc.org***) and which is operated by the US Department of Energy.

Contrasting the capabilities of building energy performance simulation programs - AIVC Contributed Report n°4 – 68pp.

First reports of FP6 eco-buildings project BRITA in PuBs available

Heike Erhorn-Kluttig,
Fraunhofer Institute of Building Physics

By far the biggest part of the energy consumption for heating, domestic hot water, cooling, lighting and ventilation of European buildings is with 95 % in the field of existing buildings built before 1980. In order to meet the objectives of the Kyoto Protocol, we have to concentrate on improving the energetically poor building stock. Public buildings can act as shining examples to society, so that they will help to increase the market penetration of energy-efficient retrofit. The Fraunhofer Institute of Building Physics with 22 European partners from public administration, research, design and consultancies are working on the project „Bringing Retrofit Innovation to Application in Public Buildings – BRITA in PuBs“ within the 6th Framework Programme of the European Union. The project started in 2004 and the planned project duration is 4 years.

The BRITA in PuBs project aims to increase the market penetration of innovative and effective retrofit solutions to improve energy efficiency and implement renewables, with moderate additional costs. In the first place, this is realised by the exemplary retrofit of 8 public demonstration buildings in the four participating European regions (North, Central, South, East). By choosing public buildings of different types such as colleges, cultural centres, nursery homes, student houses, churches etc. for implementing the measures it is easier to reach groups of differing age and social origin. Public buildings can be used as engines to heighten awareness and sensitise society on energy conservation. The energy-efficient retrofit measures are funded by 35 % by the EU.

Secondly, the research work packages will include the socio-economic research such as the identification of real project-planning needs and financing strategies, the assessment of design guidelines, the development of an internet-based knowledge tool on retrofit measures and case studies and a quality control tool-box to secure a good long-term performance of the building and the systems.

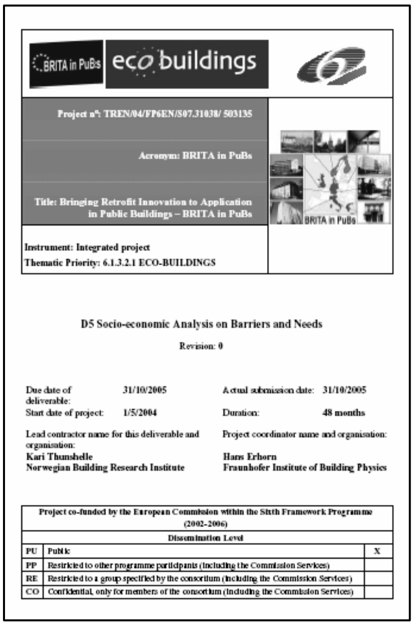
The third main pillar of the BRITA in PuBs project is dissemination. This is divided into a minor part, the training of users and maintenance personnel, and a larger section on publishing the research and demonstration work to different target groups. This is done in a combination of targeted PR-campaigns and using local, national and international networks such as Energie Cités, the internet and other media, and arrangement and participation in symposia and conferences.

The overall goal of the 9 different demonstration buildings is the decrease of the primary energy demand for heating, cooling, ventilation, domestic hot water and lighting by at least 50 %, partly far higher reductions are planned. Additionally the comfort in the buildings shall be improved, so that the percentage of the dissatisfied users (investigated by questionnaires before and after the retrofit) shall be halved. The retrofit concepts of all buildings will be evaluated through monitoring of at least a one-year period. The technology applications include measures at the building envelope like improved insulation and high-efficient windows, advanced ventilation concepts like hybrid systems, integrated supply technologies like combined heat and power units, energy-efficient lighting and integrated solar application.

The BRITA in PuBs partners are pleased to announce that the first public results after the first 18th months period of the project are now available.

The documents are:

1. Socio-economic Analysis on Barriers and Needs
2. Communication Guide
3. Financial Strategies for low energy public retrofits in Europe
4. Reports on the concept development of the demonstration buildings in BRITA in PuBs



BRITA in PuBs
eco buildings

Project n°: TREN/04/FP6EN/S07.31038/ 503135

Acronym: BRITA in PuBs

Title: Bringing Retrofit Innovation to Application in Public Buildings – BRITA in PuBs

Instrument: Integrated project
Thematic Priority: 6.1.3.2.1 ECO-BUILDINGS

D5 Socio-economic Analysis on Barriers and Needs

Revision: 0

Due date of deliverable: 31/10/2005 | Actual submission date: 31/10/2005
Start date of project: 1/5/2004 | Duration: 48 months

Lead contractor name for this deliverable and organisation:
Kari Thunshelle
Norwegian Building Research Institute

Project coordinator name and organisation:
Hans Erhorn
Fraunhofer Institute of Building Physics

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

The socio-economic report deals barriers and needs that arise for public building owners during the planning phase of a retrofit project. It gives an overview on the planning situation in the different participating countries. The communication guide shows ways for communicating good retrofit projects, retrofit materials and systems including well-known and modern disseminating strategies and channels. The report on financial strategies summarises different used methods to finance low-energy retrofit projects, indicates where they are used and how and describes at two buildings how the financing of the BRITA in PuBs demonstration buildings is realised. The fourth report gives insights into the concept development of the 8 demonstration buildings in BRITA in PuBs.

@ http://-----------------------------------

New guide about air handling units

A new AICVF guide (in French language) has been published in March 2006 about air handling units.

It first describes the different types of air handling units and their components (envelope, heat exchangers, air filters, fans, air humidifiers, …). Practical rules are then given for the choice and installation of air handling units, especially for an easy maintenance. Commissioning and maintenance operations are explained in details. Finally, an overview of standards, regulations and certficiation which apply to air handling units is given.

AICVF is the French association of HVAC engineers. Founded in 1910, it groups together 2000 individual members and 100 companies.

Original title : Recommandation AICVF 03-2005 - Mise en œuvre des centrales de traitement d'air

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Nano-particles, air filtration and ventilation

Nanotechnology intends to develop and produce new materials, devices and systems involving the manipulation and/or creation of matter on a near-atomic scale (1 to 100 nm).

Several recent reports, often published by government departments or agencies, deal with the risks linked to nanotechnologies. They especially mention the health and safety risks linked to exposures to airborne nanosized particles. They emphasize the role of ventilation and air filtration to reduce the risks for workers and public. Some of these reports (the list is probably not exhaustive) are available online for free :

From the UK:

- Nanoparticles: An occupational hygiene review - Health and Safety executive (2004)
  @ http://www.----------------------
- Characterising the potential risks posed by engineered nanoparticles - Department for Environment, Food and Rural Affairs (2005)
  @ http://----------------------------
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From Canada:

- Les nanoparticules: connaissances actuelles sur les risques et les mesures de prévention en santé et en sécurité du travail (in French) - Institut de recherche Robert-Sauvé en santé et en sécurité du travail - IRSST (2006)
  @ http://-------------------------------

From the USA:

- Approaches to Safe Nanotechnology: an Information Exchange with NIOSH (2006)
  @ http://---------------------------------
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From France:

- Les nanomatériaux - effets sur la santé de l'homme et sur l'environnement - French Agency for Environmental and Occupational Health Safety - AFSSET (2006)
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Interesting information about nanotechnologies and the associated risks can also be found in:

- Nanotechnologies: a preliminary risk analysis on the basis of a workshop organized in Brussels on 1-2 March 2004 by the Health and Consumer Protection Directorate General of the European Commission
  @ http://--------------------------------
  -
  -
- Nanotechnology Project of the International Risk Governance Council
  @ http://-------------------------------
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Final Reports Of Ec-Reshyvent Project Available

P. Op't Veld,
Project Coordinator
Cauberg-Huygen
Raadgevend Ingenieurs

Description Of Ec-Reshyvent Project
The aim of the EC RESHYVENT project (2003-2005) was to integrate renewables and hybrid technologies in domestic ventilation systems by researching, developing, and constructing four complete hybrid ventilation concepts for different EU climate zones and by delivering generic output to companies in terms of technical specifications and guidelines including market economical and social aspects.

In order to streamline all actions and also for optimisation of the available resources, this project is a clustering of four industrial consortia with a multi-disciplinary scientific consortium. The industrial consortia are served and supported by scientific Support Units corresponding with the defined tasks in the work packages.

The key elements of the RESHYVENT project were reflected in the work packages:

1. State of art review of ventilation techniques in residential buildings, available simulation and calculation models, other related EC and IEA work.
2. Making of a market survey and SWOT analyses and give description of market chances/prospects, restrictions and boundary conditions for the application of hybrid ventilation and study the social aspects of advanced ventilation systems.
3. Integration of renewables (as well as active as passive application of renewables) and integration of hybrid ventilation in heating and cooling concepts
4. Give an overview and analyses of the meaning of current standards and regulations including solutions for equivalent functional requirements, improvement and modifications of regulations with special attention for CEN.
5. Compile design parameters and constraints, making sensitivity analyses.
6. Development of a calculation model for designing hybrid ventilation and for predicting the performance
7. Development of control and ventilation strategies for hybrid ventilation
8. Specifications and terms of references for the development of components for hybrid ventilation systems
9. Development, with active participation of four industrial consortia, of four complete hybrid ventilation concepts (as demonstration-ready products) for different European climates (severe, cold, moderate and mild/warm conditions)
10. Asses the impact of urban environments in EU on hybrid ventilation and its potential solutions

Deliverables
The activities in this project were carried out in different work packages.

A brief overview of the work in each work package is given as well as the major publications.

WP 1: State Of Art Review
State of art review and interpretation of ventilation techniques in residential buildings, available simulation and calculation models, other related EC work.

⇒ State-of-the-art of low-energy residential ventilation
Peter G. Schild, Norwegian Building Research Institute (NBI)

WP 2: Market Support Unit
Making of a market survey and SWOT (strength-weakness-opportunities-threats) analyses an give description of market chances/prospects, restrictions and boundary conditions for the application of hybrid ventilation.

⇒ Market survey for demand controlled hybrid ventilation in residential buildings
Åke Blomsterberg, WSP Environmental, Sweden

⇒ Occupant Behaviour and Attitudes with respect to Ventilation of Dwellings
J.E.F. van Dongen, TNO, The Netherlands

WP 3: Renewables Integration Support UnitIntegration (active and passive application) of renewables in relation to support energy and integration in heating and cooling concepts

⇒ General information on renewable applications for auxiliary energy suitable for use in hybrid ventilation systems
Signe Antvorskov, Esbensen Consulting Engineers; Rune Winter Andersen, Dennis Aarø, Gaiasolar A/S; Jan Willem Hendriks, Gaiasolar A/S

⇒ Specifications of applicable renewable sources for integration in possible prototypes
Signe Antvorskov, Esbensen Consulting Engineers Jan Willem Hendriks, Gaia Solar

⇒ Impact of reshyvent concepts on the use of renewable energy for heating, cooling and electricity
Signe Antvorskov, Esbensen Consulting Engineers A/S

⇒ Solar chimneys
Pavel Charvat, Miroslav Jicha, Josef Stetina, Brno University of Technology, Brno, Czech Republic

⇒ Tool for assessment, feasibility and pre-dimensioning of PV in ventilation systems
Signe Antvorskov, Esbensen Consulting Engineers, Dennis Aarø, Jan Willem Hendriks, Gaia Solar

WP 4 Standards And Regulations Support Unit
Give an overview and analyses of the meaning of current standards and regulations including solutions for equivalent functional requirements, improvement and modifications of regulations with special attention for CEN.

⇒ Opportunities, barriers and challenges in relation to the application of standards and regulations on hybrid ventilation systems - General considerations
P. Wouters, N. Heijmans, X. Loncour, Ch. Delmotte Belgian Building Research Institute

⇒ Opportunities, barriers and challenges in relation to the application of standards and regulations on hybrid ventilation systems - Standards and regulations concerning indoor air quality and summer comfort
P. Wouters, N. Heijmans, X. Loncour, Ch. Delmotte Belgian Building Research Institute

- ⇒ Opportunities, barriers and challenges in relation to the application of standards and regulations on hybrid ventilation systems - Standards and regulations concerning Energy Performance of Buildings
  P. Wouters, N. Heijmans, X. Loncour, Ch. Delmotte, Belgian Building Research Institute
- ⇒ Outline for a general framework for the assessment of innovative ventilation systems
  P. Wouters, N. Heijmans, X. Loncour Belgian Building Research Institute

WP 5 Design Parameters Support Unit
Setting up design parameters, making sensitivity analyses and design constrains.

- ⇒ Design parameter and constraints: Input from RESHYVENT to the CEN standardisation work
  Viktor Dorer, EMPA, Switzerland, J.-R. Millet, CSTB, France
- ⇒ Parameters for the performance assessment of hybrid ventilation systems Performance criteria, target levels and design constraints
  Viktor Dorer, Andreas Weber, EMPA, Switzerland
- ⇒ Description of reference buildings and ventilation systems
  Andreas Weber, Viktor Dorer; EMPA, Switzerland Eduardo Maldonado, José Luís Alexandre, Petra Vaquero and Jorge Sousa; IDMEC, Portugal Åke Blomsterberg; WSP, Sweden Nicolas Heijmans; BBRI, Belgium Willem de Gids; TNO, Netherlands
- ⇒ Parameters for the design of demand controlled hybrid ventilation systems for residential buildings

WP 6 Performance Assessment Support Unit
Development of models for performance assessment (a.o. an easy to use calculation model for designing hybrid ventilation and for predicting the performance)

- ⇒ Study and assess available calculation and simulation models
  Eduardo Maldonado, José Luís Alexandre, Petra Vaquero, IDMEC Porto, Portugal
- ⇒ Portuguese Ventilation System (IC5)
  Eduardo Maldonado, José Luís Alexandre, Petra Vaquero, Jorge Sousa, IDMEC Porto, Portugal
- ⇒ Reference buildings – Stochastic Methods
  Eduardo Maldonado, José Luís Alexandre, Petra Vaquero, Jorge Sousa, IDMEC, Porto, Portugal
- ⇒ Assessment Performances of the Systems
  Eduardo Maldonado, José Luís Alexandre, Petra Vaquero and Jorge Sousa, IDMEC, Porto, Portugal
- ⇒ REGUI – Reshyvent Graphical User Interface. User Guide - Version 1.0
  Eduardo Maldonado, José Luís Alexandre, Petra Vaquero, Jorge Sousa and Alexandre, Teixeira IDMEC, Porto, Portugal

WP7 Control And Ventilation Strategies Support Unit
Development of control and ventilation strategies for hybrid ventilation in residential buildings

- ⇒ Ventilation control strategies
  Ahmad HUSAUNNDEE, David JREIJIRY, Jean-Robert MILLET, Jean Georges VILLENAVE, CSTB, France

WP 8 Specifications And Terms Of References For Components And Systems
Specifications and terms of references for the development of components for hybrid ventilation systems

- ⇒ Source book for Residential Hybrid Ventilation Development
  Willem de Gids TNO Building and Construction Research

WP 9 Development And Construction Of 4 Systems
Development and construction with active participation of four industrial consortia of four hybrid ventilation concepts for four different European climate zones.

AIVC Online

A full set of reports can be found on the AIVC website (***http://www.aivc.org***).

Information is also given on
http://----------------------------

Fan Noise 2007

Lyon, France, 17 - 19 September 2007

Following the success of Fan Noise 2003, held in September 2003 in Senlis (France), which attracted 300 persons from 26 countries, the Organising Committee has decided to prepare a third edition of this conference. This will be a good opportunity to follow the progress achieved after four years of appraisal and results in the comprehension, prediction and control of fan noise, as well as in the optimisation of fan installation in complex systems or equipment.

The three-day symposium will include keynote lectures and technical presentations in a single session meeting (no parallel sessions). All types of fans, such as those used in industrial processes, HVAC and electronic equipment, household appliances, automotive applications, fall within the topics of this conference. Conversely, high speed fans in aeronautic propulsion applications will not be considered.

Call for abstracts
One page A4 abstract of 300 to 400 words in English is due before 30 January 2007. The title shall not exceed 20 words or 120 caps

@ http://--------------------------

UNEP launches Green Building Initiative

A new international initiative to "green" the building and construction sector was launched in February 2006 by the United Nations Environment Programme (UNEP).

Construction giants Lafarge, Skanska and Arcelor are among the founding members of the Sustainable Building and Construction Initiative (SBCI), which aims to promote environmental friendly practices across the construction industry.

The overall objective of the SBCI is to achieve worldwide adoption of sustainable building and construction practices that can help deal with such problems. SBCI will also produce reports on key issues, like the impact of energy efficiency in the built environment on climate change. A key feature of the SBCI will be to bring recommendations to implementation, including the development of pilot projects.

It is hoped that the work of the SBCI will help ensure buildings are routinely designed, constructed and maintained from an environmentally sustainable point of view over their entire life span, taking into account the life-cycle approach.

Other goals are that gradually more legislation and building standards include sustainability considerations and requirements and that policies and incentives provided by governments support sustainable building and construction practices.

The SBCI has been set-up as a neutral and worldwide platform, in partnership with international leading companies and others working in this area. As such it will be able to provide direct input to other initiatives, governments and global bodies making recommendations and decisions affecting sustainable development in this sector.
It aims to complement on-going efforts in various countries that are designed to assess and compare the environmental performance of buildings such as LEED in the United States, BREEAM in the UK and HQE in France.

Participants in the inaugural meeting of the SBCI in Paris in February included a wide range of interested parties including construction and engineering firms, air conditioning companies from China and the USA, as well as government representatives, UN organisations, architects, research institutes and financiers.

Further details about SBCI can be found at ***http://-------------------------***

Saving 20% by 2020: European Commission unveils its Action Plan on Energy Efficiency

On 19 October, The EU Energy Commissioner Andris Piebalgs presented his action plan. It foresees to cut Europe's energy consumption by 20% in the next 14 years. If successful, the EU could save more than 100 billion Euro per year. The plan would also help to cut the EU's CO2 emissions and therefore contribute to reaching the Kyoto targets.

As a major step toward meeting the unprecedented energy challenges facing the EU, the European Commission presented on October 19 its **Energy Efficiency Action Plan**. The Plan contains a package of priority measures covering a wide range of cost-effective energy efficiency initiatives. These include actions to make energy appliances, buildings, transport and energy generation more efficient. Stringent new energy efficiency standards, promotion of energy services, specific financing mechanisms to support more energy efficient products are proposed. The Commission will furthermore set a Covenant of Mayors of the 20-30 most pioneering cities in Europe and will propose an international agreement on energy efficiency. Altogether, over 75 measures are set forth.

"Europeans need to save energy. Europe wastes at least 20% of the energy it uses. By saving energy, Europe will help address climate change, as well as its rising consumption, and its dependence on fossil fuels imported from outside the Union's borders." said Energy Commissioner Piebalgs.

"Energy efficiency is crucial for Europe: If we take action now, the direct cost of our energy consumption could be reduced by more than €100 billion annually by 2020; around 780 millions tonnes of CO2 will also be avoided yearly" he pointed out.

The Action Plan, which will be implemented over the next six years, is in response to the urgent call from Heads of State and Government at the Spring European Council this year for a realistic Energy Efficiency strategy. The Plan underlines the importance of minimum energy performance standards for a wide range of appliances and equipment (from household goods such as fridges and air conditioners to industrial pumps and fans), and for buildings and energy services. In combination with performance ratings and labelling schemes minimum performance standards represent a powerful tool for removing inefficient products from the market, informing consumers of the most efficient products and transforming the market to make it more energy efficient. Minimum performance requirements for new and renovated buildings will be developed. Very low energy consumption buildings (or passive houses) will also be promoted. It means that advanced ventilation systems and building airtightness will receive specific attention.

The Plan also contains a number of additional proposals to raise energy efficiency awareness, such as education and training. Finally, the Plan emphasises the urgent need for energy efficiency issues to be addressed on a global level through international partnerships.

For further information on the action plan please see:
@ ***http://----------------------***
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AIVC Online

Read the document in Czech, Danish, Dutch, English, French, German or Greek.

AIVC Conference 2007

Crete Island, Greece, 27-29 September 2007

Building Low Energy Cooling and Advanced Ventilation Technologies in the 21st Century

The joint 2nd Palenc and the **28th AIVC Conference** aims to focus on the advanced low energy cooling and ventilation technologies for buildings.

Increase of the living standards, deterioration of the thermal conditions in the urban environment and non-appropriate architecture design, has caused huge penetration of air conditioning in many parts of the world and not only in hot climates. Such a condition has a very serious impact on the peak electricity demand of the countries and the corresponding energy consumption. Intensive research carried out during the last years has permitted to develop new technologies, components, materials and techniques that permit to decrease seriously or even eliminate the cooling demand of buildings. In parallel, very low energy consumption for cooling new generation buildings have been realized and monitored.

Ventilation in buildings permits to decrease the cooling demand, improve comfort conditions and decrease indoor pollution. A wide range of research activities carried out over the last years, has permitted to develop advanced ventilation systems that highly satisfy the above requirements.

There is in many countries increased interest in regulations to cover the issue of summer comfort, air conditioning and peak power control, e.g. the European Energy Performance of Buildings Directive asks from the Member States to undertake all the necessary measures in order to decrease the energy consumption caused by air conditioning and improve indoor environmental conditions (air quality, summer comfort, ..). Passive and low energy cooling strategies provide interesting options.

The scope of this Conference includes all aspects of technology and building design, dealing with ventilation and passive cooling techniques able to improve the environmental performance of buildings. Papers related on ventilation, solar control, thermal mass, thermal comfort, urban microclimate landscaping, low energy architecture, innovative components and materials, standardization and legislation, advanced and alternative air conditioners, demand side management, etc. are welcomed. The main aims are to present and discuss the state of the art of research and applications dealing with ventilation and cooling and also to assess the results achieved almost two years after the application of the European Energy Performance of Buildings Directive.

Topics

- Passive cooling techniques
- Ventilation for cooling
- Solar control
- Thermal mass
- Natural ventilation
- Hybrid ventilation
- Heat protection techniques
- Advanced control systems and techniques
- Innovative material and components
- Ground cooling
- Evaporative cooling
- Radiative cooling
- Microclimate
- Heat island
- Canyon effect
- Applications in social housing
- Demand side management
- Legislation and in particular results from the application of the European Directive
- Education & distance learning
- Climatic responsive architecture
- Thermal comfort
- Indoor environmental quality
- High efficiency air conditioners

Venue

The Conference will take place at Aldemar Knossos Royal Village, Limenas Hersonissou, Crete. Knossos Royal Village is one of the sic hotel units of the Aldemar.

Travel with Aldemar and sample some of the most unique "flavours in the world" against the background of the Aegean Sea accompanied by the sounds of traditional Greek music. Savour the tastes of various gastronomic specialities in a luxurious atmosphere with top-quality service surrounded by exceptional natural beauty. Explore traditional Greek summer tastes. Experience moments full of..."sea", on the beach, in a hospitable and fresh atmosphere.

The conference centre is located on the grounds of Knossos Royal Village and it can cater for groups of up to 900 people.

@ ***http://palenc2007.conferences.gr***

AIVC Online
Second Announcement & Call for papers

Abstract submission deadline
15 December 2006

Notification for paper acceptance
15 February 2007

Final papers due
31 May 2007

REGISTRATION FEES	Until 31 January 2007	From 1 February 2007 Until 30 April 2007	After 1 May 2007 On site
Participant	420 euro	540 euro	590 euro
Student	210 euro	270 euro	295 euro
Guest	25 euro	25 euro	25 euro

Important Note for authors:

Authors should pay the full registration by 30 April 2007 to ensure that their paper will appear in the programme and will be included in the Proceedings.

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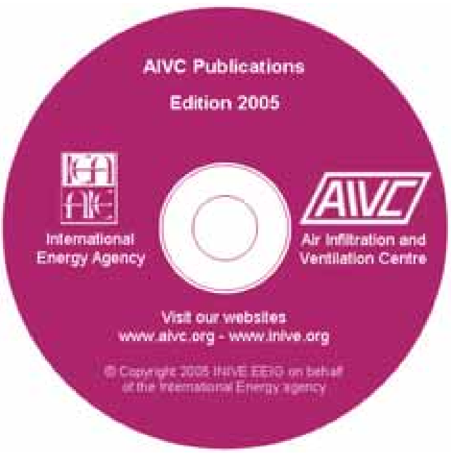

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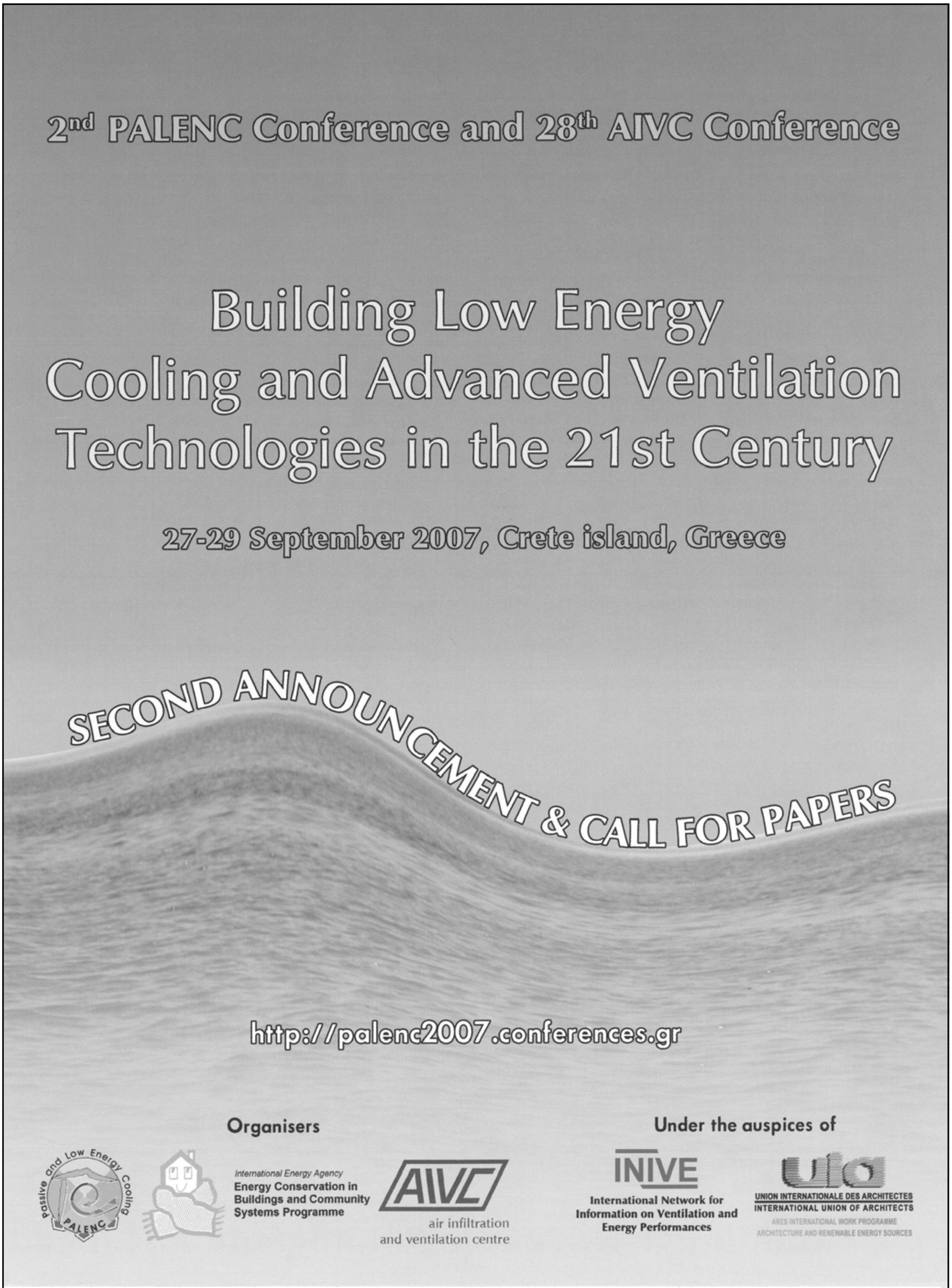

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