香港科技大學
THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

SENG 工學院 SCHOOL OF ENGINEERING

MSc Program in Intelligent Building Technology & Management

TECHNICAL WORKSHOP

October 2, 2008 (Thur) 6:00-7:00pm
Room 6581-82 (via Lift 27/28),
The Hong Kong University of Science and Technology
Clear Water Bay, Hong Kong SAR

Co-organised by ASHRAE Hong Kong Chapter

Presentation Topic: Why personalized ventilation?

Prof. Arsen K. Melikov, International Centre for Indoor Environment and Energy, Technical University of Denmark

People, building materials, office equipment, etc. generate pollution indoors. Studies show that occupants' complaints of headache, tiredness, dizziness, eye and nose irritation, sleepiness, decreased ability to think, etc., increase and their work productivity decreases at too high or too low temperature, at high pollution level and at insufficient ventilation in spaces. Present indoor climate standards allow for up to 20% occupants dissatisfied with the indoor environment in spaces. Even these loose requirements can not be met today. Survey data for Denmark identify indoor climate problems for more than 25% of approx. 400.000 office workplaces. Significantly more complaints related to indoor environment are reported in open-plan offices (up to 50% of occupants) than in cellular offices. Large differences exist between people in regard to preferred temperature and air movement, clothing thermal insulation and activity level. These differences can not be addressed today in buildings because the used HVAC systems are designed to provide more or less uniform temperature and air movement in the occupied zone with limited or not existing occupant control. Today's HVAC systems are inefficient because clean and cool air is supplied far from occupants' breathing zone and is mixed with the polluted room air by the time it is inhaled. The air distribution methods used today are not efficient to protect occupants from airborne transmission of infectious agents and in some cases may even enhance the transmission. In order to solve the problem it is suggested to increase the supply of clean air from the recommended in the present standards 7-10 L/s person to 25 L/s person. This however will lead to more energy use. Apart of inability for providing high quality indoor environment the present HVAC systems are energy inefficient because a great deal of energy is used for heating, cooling and ventilating of the entire space, i.e. also areas which are not occupied. It is clear that the present practice and HVAC systems can not meet the challenge for improved indoor environment at reduced energy use. New advanced methods for efficient ventilation are needed. Personalized ventilation aims for providing clean air to the breathing zone of each occupant. Each occupant is delegated with individual control of velocity, temperature and direction of the supplied personalized flow. Thus personalized ventilation has potential to decrease the SBS symptoms and to protect occupants from cross-infection. It also has potential to improve the quality of air inhaled by occupants and their thermal comfort which will lead to increase satisfaction and work performance. In this talk the limitations of the existing ventilation methods in providing occupants with healthy and comfortable indoor environment will be discussed. The positive effect of personalized ventilation on peoples' health, comfort and performance will be presented. The challenges in development of more efficient systems for advanced air distribution in spaces will be outlined.

About the Speaker

Arsen Melikov

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Dr. Melikov is teaching university students in ventilation and air conditioning, indoor climate, fluid mechanics, heat-and-mass transfer. He has been supervisor for 59 Master of Science students, 17 Ph.D. students and 2 Postdoctoral students from 10 countries. He has performed research on advanced methods for air distribution in spaces (buildings, vehicles, etc.), indoor climate and its impact on peoples' health, comfort and performance, optimization of heating and ventilation systems in buildings and vehicles, development of measuring systems, aerodynamics and heat-and-mass transfer. The results of his research are incorporated in European, American and international standards as well as engineering handbooks. Measuring instruments have been developed based on the research. He has been principle and co-principle investigator of 45 research projects sponsored by government and private organizations from USA, Japan, Germany, Sweden, Denmark, Russia, Ukraine, Bulgaria and the European Community. He has participated in the development of European, American and international standards in the field of indoor climate and heating, ventilation and air-conditioning (HVAC). He is author and co-author of 276 technical papers published in 15 languages, chapters in books, technical reports, etc. He is member of HVAC societies in several countries.

Dr. Melikov has received numerous awards for his research including International Honorary Member of the Society of Heating, Air-Conditioning and Sanitary Engineers of Japan – SHASE (2007), Distinguished Services Award of the American Society of Heating, Refrigerating and Air-Conditioning Engineers – ASHRAE (2006), Medal for long-standing contribution to the field of environmental engineering of the Czech Society of Environmental Engineering (2006), Member of the International Academy of Indoor Air Sciences (2005), Honorary Member of the Bulgarian Society of Heating, Refrigerating and Air-Conditioning Engineers – BULSHRAE (2003), Fellow Award of the American Society of Heating, Refrigerating and Air-Conditioning Engineers – ASHRAE (2003), etc.

The international research activities of Dr. Melikov also include collaboration with top researchers from more than 15 universities, including University of Tokyo (Japan), National University of Singapore (Singapore), Tsinghua University (China), Syracuse University (USA), Harvard University (USA), Czech Technical University in Prague (Czech Republic), University of La Rochelle (France), University of Hong Kong (China), Hong Kong University of Science and Technology (China), etc. He has actively collaborated with industry in research and development of new technologies and products.