

Building Environment Laboratory

Key Word ▶

Indoor climate, indoor air quality, energy saving, productivity, life cycle assessment (LCA)

Staff ▶ Professor : Hiroshi Matsumoto
Assistant Professor : Yuki Nabeshima

E-mail ▶ matsu@ace.tut.ac.jp
nabeshima@ace.tut.ac.jp
Web ▶ http://www.einstein.ace.tut.ac.jp

Theme 1 ▶ The effect of foliage plants on physiological & psychological responses and productivity

It is said that foliage plants such as Benjamin and Pothos have a variety of beneficial (“green amenity”) effects, including the purification by removing chemical compounds from the indoor air, recovery from fatigue, alleviation of stress and increase in productivity. Our laboratory conducts subject experiments on the effect on those in the same space of foliage plants on physiological & psychological responses and productivity (Figure 1), and investigations and analysis into the office workers’ productivity in actual offices.



Fig.1 Subject experiment on the effect of foliage plants on physiological & psychological responses and productivity

Theme 2 ▶ Evaluation of thermal performance and energy performance of heat exchange type air flow window

The goal of this research is to develop a heat exchange type air flow window system (Figure 2) by enhancing an existing air flow window with a high energy saving capability through the addition of heat exchange ventilation capabilities. Model tests and CFD simulations will be used to ascertain the basic thermal performance and energy performance of the window system, while conducting a demonstrative test using a real scale model of window will be used to verify the practical applications of the heat exchange type air flow window.

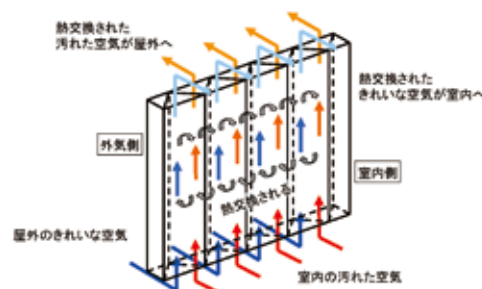


Fig.2 A heat exchange type air flow window system

Theme 3 ▶ VOC removal performance of an air cleaner based on adsorption/desorption effects

We have developed an air cleaner based on adsorption/desorption effects (Figure 3), that uses adsorption/desorption effects to efficiently remove formaldehyde and VOC (Volatile Organic Compounds) from inside air, elements which are responsible for sick house syndrome and chemical sensitivity syndrome. Our laboratory is now aiming for the practical application of this cleaner, conducting a demonstrative test relating to the VOC removal performance by using an air cleaner based on adsorption/desorption effects in a large room.



Fig.3 Air flow window based on adsorption/desorption effects

Theme 4 ▶ Adaptive control of building envelope and related performance evaluation

In order to resolve the trilemma of the 3Es (energy, efficiency, ecology) in architecture and realize a safer inside environment, there is a serious requirement to escape from the brute-force approach to environmental control (active control) and introduce a method of (adaptive) control that adapts to the environment. The goal of this research is to propose and develop structures and systems in which the capability and functionality of building envelopes adapt to the environment and provide an appropriate performance, and to also evaluate these capabilities, (Figure 4).

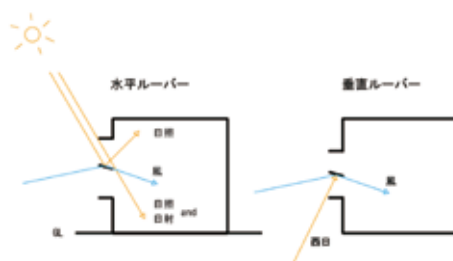


Fig.4 Concept of passive controls of wind and light by movable louver