

RESEARCH BRIEF

2003/004

Evaluation of Energy Efficient Personalised Air Units for Enhanced Ventilation in the Tropics

INTRODUCTION

The concept of personalised ventilation (PV) is at the cutting edge of technological developments in the area of air-conditioning and is fundamentally based on improving ventilation to every individual in the built environment. Better ventilation implies improved Indoor Air Quality (IAQ) and is essentially aimed at improving the health, comfort and productivity of the workforce. The PV concept has tremendous potential in enhancing the acceptability of ventilation, IAQ and thermal comfort in air-conditioned buildings by supplying clean fresh air directly to the occupant's breathing zone without mixing with re-circulated air, which is usually contaminated with indoor pollutants.

THE RESEARCH

This research project, in collaboration with the International Centre for Indoor Environment and Energy research team at Technical University of Denmark, was embarked as a pilot study in the tropics and was aimed to evaluate the acceptability of the PV system in conjunction with a conventional ceiling supply air-conditioning system and the energy efficiency potential of such a combined system.

The experiments were conducted in a controlled environment IAQ chamber, developed in the Department of Building at NUS. The pilot study has shown that the use of a PV system in conjunction

Very acceptable

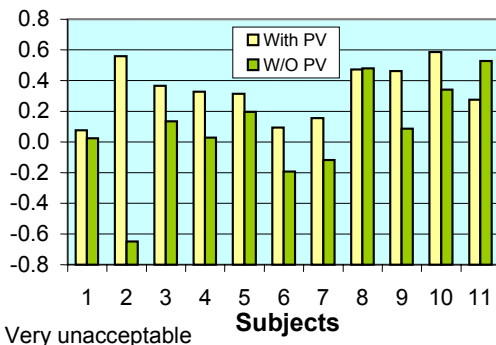


Figure 1. Mean responses of thermal comfort acceptability (y-scale).

Very acceptable

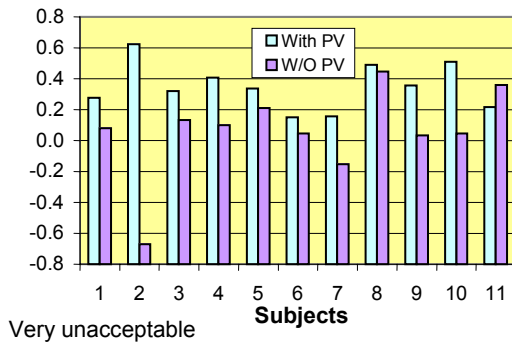


Figure 2. Mean responses of IAQ acceptability (y-scale).

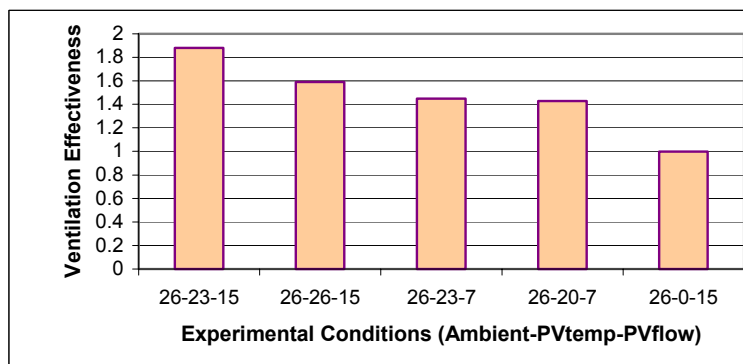


Figure 3. PV and MV ventilation effectiveness comparison. The higher the ventilation effectiveness (maximum possible is 2), the better the IAQ.



Figure 4. Personalised Ventilation (PV) experiments in the IAQ Chamber.

with a secondary air-conditioning system significantly enhances thermal comfort and IAQ acceptability as well as the perception of freshness in the air. It has been observed that the use of a PV system tends to lower the average temperature of air in the breathing zone, to which enhanced Perceived Air Quality (PAQ) may be attributable.

An interesting preliminary observation that needs further substantiation is the increased thermal comfort and air movement acceptability at higher draft rating values among tropical subjects. It has also been observed that a warmer ambient temperature coupled with a cooler PV air temperature was acceptable, leading to the possibility of conserving energy.

Findings from this research project were presented as three papers at Healthy Buildings 2003, 7th International Conference held at NUS in December 2003, attended by about 400 delegates from almost 30 countries.

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