

Performance of Personalized Ventilation and Chair Fans: Experimental Measurements in a multi-occupied Living Lab

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ABSTRACT

As showcased by multiple field studies, one of the main challenges continuously plaguing the building sector is the need for energy efficient means of improving occupant comfort and productivity. This had led to the emergence of personalized environmental control systems (PECS) – a type of system installed in the vicinity of each occupant and which operating conditions can be individually controlled to satisfy each occupant's personal environmental comfort needs (acoustic, visual, thermal and IAQ). The aim of this study is to assess through experimental measurements the IAQ performance of personalized ventilation system coupled with chair fans in a mechanically ventilated multi-occupied classroom. Results showed that personalized ventilation improved the breathable air quality of all occupants by 50-66 %. PV could improve IAQ in the background by 15-20% except between occupants' workstations where PV caused a build-up of contaminant originating from exhalation. The addition of chair fans can improve thermal comfort but can cause additional mixing deteriorating IAQ in the breathing zone by 8-15 % and in the background by 10-20%. Consequently, additional design considerations should be taken when combining PECS for comfort benefits under relaxed background conditions.

KEYWORDS

personalized environmental control systems, personalized ventilation, chair fans, indoor air quality