Performance of ductless personalized ventilation in conjunction with displacement ventilation - DTU Orbit (13/10/2019)

Performance of ductless personalized ventilation in conjunction with displacement ventilation: Physical environment and human response

The performance of ductless personalized ventilation (DPV) in conjunction with displacement ventilation was studied and compared with displacement ventilation alone and mixing ventilation. Thirty subjects were exposed in a climate chamber to environmental conditions representing three levels of indoor air temperature (23, 26 and 29 °C) and three levels of temperature difference between indoor air temperature and supply air temperature: 3, 5 or 6 K below room temperature. During a 1 h exposure the subjects answered questions with regard to thermal comfort, perceived air quality and general perception of the environment. The subjects could control the position of the DPV supply diffuser and the personalized air flow (air velocity). The use of DPV improved perceived air quality and thermal comfort compared to displacement ventilation alone. At 26 °C and 29 °C the percentage dissatisfied with air movement decreased with DPV compared to corresponding conditions with displacement ventilation alone and reached the same level as mixing or displacement ventilation at 23 °C. Subjects were able to control the volume and speed of the personalized air flow in order to avoid eye irritation. However, increased eye dryness sensation was reported by 30% of subjects. The personalized air flow selected by nearly 80% of the subjects at 26 °C was between 10 and 20 l/s corresponding to the target air velocity of 1.2–1.7 m/s. At 29 °C almost 90% of subjects chose a personalized air flow between 15 and 20 l/s (1.5–1.7 m/s).

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