An experimental evaluation on air purification performance of Clean-Air Heat Pump (CAHP) air cleaner

The escalation of energy consumption in buildings and heightened concerns about acceptable indoor air quality stimulate interest in the usage of air cleaner as an adjunct for indoor environmental conditioning. A regenerative desiccant wheel integrated into a ventilation system termed Clean-Air Heat Pump (CAHP) can improve the air quality during the process of dehumidification without using additional energy. An experimental study in a field lab was performed to investigate the air cleaning performance of CAHP. Photoacoustic gas analyzer-INNOVA was used to characterize chemical removal of indoor air pollutants by the CAHP. The results revealed that all the detected VOCs were removed effectively by the CAHP with an average single pass efficiency of 82.7% when the regeneration temperature for desiccant wheel was 60 °C. The mass balance between adsorption and desorption of the desiccant wheel was 96.8%, which indicated that the most of gaseous pollutants were not accumulated in the CAHP. The regeneration temperature for the wheel could affect the air purification performance of CAHP. At 70 °C of regeneration temperature, the air-cleaning efficiency reached 96.7%. Up to 70% of the outdoor air ventilation can be saved with the operation of CAHP. The clean air deliver rate (CADR) was over threefold of the outdoor air supply rate when CAHP was in operation.

General information
Publication status: Published
Organisations: Department of Civil Engineering, Section for Indoor Climate and Building Physics, Tianjin University
Contributors: Sheng, Y., Fang, L., Sun, Y.
Number of pages: 8
Pages: 69-76
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: Building and Environment
Volume: 127
ISSN (Print): 0360-1323
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
Original language: English
Keywords: Indoor air quality, Air purification, Gaseous pollutant removal, Chemical measurement, Ventilation
DOIs:
10.1016/j.buildenv.2017.10.039
Source: FindIt
Source-ID: 2393189706
Research output: Contribution to journal › Journal article – Annual report year: 2018 › Research › peer-review