Study of airflow and impact of Exhaust, window AC and split AC on air ventilation in MFHT Room at IIT Bombay

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Abstract

This research delves into the importance of Air Changes Per Hour (ACH) in comprehending and managing indoor air quality. The main focus is on monitoring and optimising ACH to ensure sufficient ventilation, maintain indoor air quality, decrease the likelihood of disease transmission, and enhance the well-being, comfort, and productivity of indoor occupants. The study examines air residence time in a room equipped with one exhaust, one inlet (which functions as a door), and one air conditioner. Approximately 27 simulations with a fixed exhaust height and different horizontal positions aim to determine air residence time at two heights: 1.3 meters and 1.6 meters, corresponding to individuals seated and standing, respectively. The objective is to reduce air residence time by optimizing the placement of the exhaust. Results demonstrate that residence time decreases further by adding an extra window AC. Moreover, a machine learning algorithm attains 92.16% and 86.10% accuracy in forecasting air residence time at 1.6 meters and 1.3 meters, respectively, based on simulation data.

References:

OpenFoam Documentation - www.openfoam.com

Sinha, K., Yadav, M. S., Verma, U., Murallidharan, J. S., & Kumar, V. (2021). Effect of recirculation zones on the ventilation of a public washroom. *Physics of Fluids*, *33*(11).