

A Study on the Effectiveness of Alternative Commercial Ventilation Inlets That Improve Energy Efficiency of Building Ventilation Systems

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Abstract : Passive air pollution control devices known as aspiration efficiency reducers (AER) have been developed using aspiration efficiency (AE) concepts. Their purpose is to reduce the concentration of particulate matter (PM) drawn into a building air handling unit (AHU) through alterations in the inlet design improving energy consumption. In this paper an examination is conducted into the effect of installing a deflector system around an AER-AHU inlet for both a forward and rear-facing orientations relative to the wind. The results of the study found that these deflectors are an effective passive control method for reducing AE at various ambient wind speeds over a range of microparticles of varying diameter. The deflector system was found to induce a large wake zone at low ambient wind speeds for a rear-facing AER-AHU, resulting in significantly lower AE in comparison to without. As the wind speed increased, both contained a wake zone but have much lower concentration gradients with the deflectors. For the forward-facing models, the deflector system at low ambient wind speed was preferred at higher Stokes numbers but there was negligible difference as the Stokes number decreased. Similarly, there was no significant difference at higher wind speeds across the Stokes number range tested. The results demonstrate that a deflector system is a viable passive control method for the reduction of ventilation energy consumption.

Keywords : air handling unit, air pollution, aspiration efficiency, energy efficiency, particulate matter, ventilation

Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development

Conference Location : Chicago, United States

Conference Dates : December 12-13, 2020