FOCUSING OF THE FLOW CAPTURE FOR LOCAL EXHAUST VENTILATION SYSTEMS

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INTRODUCTION.

The extraction hoods commonly used as inlet element of the local ventilation systems exhibit limited emission capture over moderate distances from the source of the hazardous emissions (Fig. 1). Proposed inclusion of a swirling peripheral jet was found to increase the effective length over which the extraction hood successfully captures harmful fumes. However information on a detailed pattern field of the vortex focused inflow was insufficient thus restricting the potential applications of the method.

METHODOLOGY.

The numerical modeling study of the focusing by vortex inflow was accomplished to reveal the implication of the key operating parameters. In addition the visualization technique was applied to confirm the fume capturing features.

RESULTS AND DISCUSSION.

The simulated overall flow field patterns for an inflow of 10 m sec^{-1} value under sets of 0.5 – 1.5 swirl numbers and 0 - 21 m sec^{-1} outcome velocities of peripheral jet showed the arrangement and contour of the capture stream. Under optimum parameters the capture zone derived from the vector velocity field yielded up to 4 inlet diameters near-axis distance from the extractor entrance. The complimentary observations using laser sheet visualization technique confirmed the enhanced capturing capacity from the mist or smoke sources of emission.

Figure 1. *The extraction hood with swirling peripheral jet.*

CONCLUSIONS.

Through numerical modeling study the capacity of peripheral vortex shielding to generate the more concentrated exhaust inflow comparing with action of the conventional hood has been elucidated. Obtained data demonstrate evolution of focusing capture flow under variation of key parameters. Agreement between modeling results and observed flows has been revealed. The potential benefits of application of the vortex suction technique for local ventilation systems have been considered.