

Optimization of air curtain performance by particle image velocimetry measurements and computational fluid dynamics simulations

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Semi volatile organic compounds (SVOC) are known to be ubiquitous in indoor environments and frequently detected from house dust. It is reported that the levels of SVOC concentration in indoor floor dust have correlations with asthma and allergies of the inhabitants. SVOCs have the tendency to attach to the surface of airborne particle and house dust instead of gaseous matter in the air because of their low vapor pressures. The aim of this study was to investigate SVOC adsorption characteristics by the experiments to adsorb DEHP on test settled particles in various experimental conditions. The dust concentration was analyzed with TD-GC/MS. The amounts of bleed-out on the PVC sheets surface were also measured as the indicator of SVOC emission rate by wiping with quartz filters dipped into methanol. As a result, DEHP concentration is not dependent on the kinds of particle but the surface area. Also the concentration increased in proportion to exposure time, and the adsorption rate is correlated with the amount of bleed-out from material surfaces. It is indicated that the SVOC adsorption of dust on floor materials can be expected by the exposure time, the amount of bleed-out of materials and the surface area of dust particle.

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OPTIMIZATION OF AIR CURTAIN PERFORMANCE BY PARTICLE IMAGE VELOCIMETRY MEASUREMENTS AND COMPUTATIONAL FLUID DYNAMICS SIMULATIONS: TURBULENCE MODEL VALIDATION

Air curtain; Impinging jet; PIV measurements

Khayrullina, A.A. , Hooff, T.A.J. van, Blocken, B.J.E. , Heijst, G.J.F. van ,

Air curtains can be applied to aerodynamically separate two environments. Air curtains are plane impinging jets at high-Reynolds numbers, preventing the transfer of heat and mass from one environment to another. The performance of an air curtain is called the separation efficiency, which depends on a wide range of jet and environmental parameters, such as jet velocity and turbulence intensity, jet thickness, air temperature differences and pressure differences over the air curtain. This study presents the first results of ongoing research on the optimization of air curtain performance. The first results consist of reduced-scale experiments in a water channel using Particle Image Velocimetry (PIV), and of steady Reynolds-averaged Navier-Stokes Computational Fluid Dynamics (CFD) simulations. The PIV measurements are used to validate the CFD model. Comparison of the experimental results with the results obtained with steady RANS CFD simulations in combination with three different turbulence models showed a fairly accurate agreement.

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SECONDARY ORGANIC AEROSOL COMPOSITION FORMED FROM VOLATILE ORGANIC COMPOUNDS ON VARIOUS ENVIRONMENTAL CONDITIONS.

indoor environment; secondary organic aerosol (SOA); volatile organic compound (VOC)

Arai, M.A. , Kagi, N. , Fujii, S. , Namiki, N. , Sekiguchi, K. , Azuma, K. , Suwa, Y. , Tamura, H.