Abstract Submitted
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CFD Simulation to Characterise Variation In-Duct Germicidal UV System Performance[1] CATHERINE NOAKES, University of Leeds, AZAEL CORTES CAPETILLO, Tecnologico de Monterrey, P. ANDREW SLEIGH, University of Leeds — Germidical UV lamps applied in ventilation ducts can inactivate microorganisms in air and on system surfaces; the approach is advocated for infection control and to tackle excess energy consumption associated with contaminated cooling coil surfaces. Here we use CFD simulation to explore the influence of UV system design and flow parameters on the effectiveness of the system against airborne pathogens. Simulations are carried out in ANSYS Fluent, with a discrete ordinates model to model the UV lamp irradiation. Lagrangian particle tracking models are used to determine cumulative UV dose within the duct, with a coupled survival model to simulate microorganism inactivation. A parametric study considers single and multi-lamp configurations at velocities between 0.5 and 4 m/s and duct reflectivity of 0% and 15%. CFD modelled microbial inactivation compares well to experimental data for three microorganisms, however simulations reveal the variation in dose distribution that is not apparent experimentally. Single lamp systems show a higher mean dose and inactivation when located parallel to the duct, but a greater distribution of dose compared to particle residence time. Multi-lamp systems show similar mean dose, but variation in the distribution with lamp location.

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Catherine Noakes
University of Leeds

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