

Influence of inlet boundary conditions on 3D steady RANS simulations of non-isothermal mechanical ventilation in a generic closure using OpenFOAM

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Synopsis

This document details the recreation of the research conducted by Luyang Kang and Twan van Hooff in their paper, *"Influence of inlet boundary conditions on 3D steady RANS simulations of non-isothermal mechanical ventilation in a generic closure"*¹. Utilizing the OpenFOAM software, this study specifically implements the **SST k- ω turbulence model**, which the original authors identified as providing the optimal balance of accuracy for velocity magnitude and turbulent kinetic energy (TKE). The simulation focuses on a cold air supply from a round nozzle diffuser. By replicating the authors' prescribed inlet boundary conditions, this work aims to validate the sensitivity of indoor airflow patterns to supply-opening specifications within an open-source CFD environment. The recreation emphasizes the critical role of the inlet velocity vector; the study demonstrates that if the airflow direction is not modeled with precise experimental values, it leads to significant deviations in the predicted jet trajectory and subsequent room-wide temperature distributions.