CFD simulation on wind-box and gasifier of dual fluidized-bed using Eulerian-Eulerian approach

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The hydrodynamic characteristics in a wind-box and gasifier zone of dual fluidized-bed (DFB) were investigated by a computational fluid dynamics (CFD) model. The simulation results of three-dimensional cold-rig CFD model was validated with experiment data on the pilot scale of DFB using air as the fluidization agent and sand as the heat carrier particles at an operating temperature of 800 ℃. Hydrodynamics in the gasifier zone between ideal inlet gas distributor (Ideal case) and the real geometry of nozzle type inlet gas distributor (Real case) were evaluated on pressure drops along the gasifier height, solids volume fraction (SVF), bubbles information, uniformity index (UI), and solids stack volume (SSV) for three inlet air flow rates. From simulation results, similar behaviors of pressure drops along the gasifier height were found for both two cases. However, big differences were observed for the others. Effects of different air flow rates on hydrodynamics of the bubbling gasification zone and SSV were examined and the optimum air flow rate zone was proposed.