

Internal circulation exchange rate of sand particles in a semi-dual fluidized-bed biomass gasifier using gas-solid two-fluid CFD model

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A semi-dual fluidized-bed (sDFB) gasifier is proposed to increase the gasifier-riser heat and mass reciprocations in this study. A cold-rig sDFB (0.8 m x 0.2 m x 3.85 m height) was designed and installed to investigate hydrodynamics of the apparatus and the solids circulation. In order to calculate the amount of direct back-mixing particles through the gasifier-riser interconnection area, an Eulerian-Eulerian two-fluid unsteady-state two-dimensional (2D) model incorporating with kinetic theory of granular flow was used. The packing limit of this CFD model was adjusted according to the experiment data for the solid circulation rate and the pressure drop. It was found from the simulation that about 5-12% of the solid circulation rate is directly back-mixed through the gasifier-riser interconnection area.