Abstract Submitted
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Effect of particle size distribution on the hydrodynamics of dense CFB risers AKHILESH BAKSHI, Massachusetts Inst of Tech-MIT, SAMIR KHANNA, RAJ VENUTURUMILLI, BP, CHRISTOS ALTANTZIS, AHMED GHONIEM, Massachusetts Inst of Tech-MIT — Circulating Fluidized Beds (CFB) are favorable in the energy and chemical industries, due to their high efficiency. While accurate hydrodynamic modeling is essential for optimizing performance, most CFB riser simulations are performed assuming equally-sized solid particles, owing to limited computational resources. Even though this approach yields reasonable predictions, it neglects commonly observed experimental findings suggesting the strong effect of particle size distribution (psd) on the hydrodynamics and chemical conversion. Thus, this study is focused on the inclusion of discrete particle sizes to represent the psd and its effect on fluidization via 2D numerical simulations. The particle sizes and corresponding mass fluxes are obtained using experimental data in dense CFB riser while the modeling framework is described in Bakshi et al 2015. Simulations are conducted at two scales: (a) fine grid to resolve heterogeneous structures and (b) coarse grid using EMMS sub-grid modifications. Using suitable metrics which capture bed dynamics, this study provides insights into segregation and mixing of particles as well as highlights need for improved sub-grid models.

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