APCOM & ISCM
11-14th December, 2013, Singapore

Prediction of solid recirculation rate and solid volume fraction in an internally Circulating Fluidized bed (ICFB)

***Ravi Gujjula[1], Narasimha.M[1]**

[1]Department of Chemical Engineering, Indian Institute of Technology, Hyderabad, INDIA.

*Corresponding author: ravigujjula@gmail.com

Numerical & experimental study of gas and solid flow in an internally circulating fluidized bed (ICFB). The gas and solid hydrodynamics have been simulated by using the commercially available computational fluid dynamics (CFD) software package, ANSYS's Fluent. A three dimensional geometry was used to represent key parts of a laboratory ICFB. In 3D ICFB, the two-fluid Eulerian model with kinetic theory of granular flow option and the various drag laws like Gidaspow, Syamlal-Obrien, Giblaro and Arastoopour drag models used to predict the hydrodynamic behavior of ICFB. The simulation results by four drag laws show that the Gidaspow and Arastoopour drag models predict the fluidization dynamics in terms of flow patterns, void fractions and axial velocity fields were compared with experimental data. With the Arastoopour drag model the simulations are giving the best fits to the experimental data. The effect of superficial gas velocity, presence of draft tube on solid hold-up distribution, solid circulation pattern, and variations in gas bypassing fraction for the 3D ICFB investigated through CFD simulations. The mechanism governing the solid circulation in an ICFB has been explained based on gas and solid dynamics obtained from the simulations.

Keywords: Internally circulating fluidized bed, Solid recirculation rate, Granular flow, Drag law models, Fluidization, Hydrodynamics.