

259c Predicting Fluid Flow and Pressure Drop in Randomly Packed Beds of Cylindrical Particles by Coupling DEM and CFD

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Randomly packed bed reactors are widely used in many commercial chemical processes. Accurate prediction of packing structure and pressure drop through packed beds is critical to the transport characteristics of the overall bed. Traditionally, design of a fixed bed is based on homogeneous model with averaged semi-empirical correlations. However, this design concept fails for low tube-to-particle size ratios (2-5) where local phenomena dominate. This presentation is a follow-up of the previous work of modeling packing structure and fluid flow in fixed beds by coupling Discrete Element Method (DEM) and Computational Fluid Dynamics (CFD). Random packing structures of packed beds of more realistic shaped particles (cylinders) are simulated using a commercial DEM software package PFC3D by ITASCA. The resulting DEM packing structure is then imported to generate grid for Computational Fluid Dynamics (CFD) flow simulations using commercial CFD package, FLUENT. The predicted packing structures and pressure drops are compared with lab experimental measurements. The root cause of differences in pressure drop between experimental and computational data is identified as artificially introduced deviations of the packing porosity and solution is proposed and verified.