Slurry transport in a pipeline ? Comparison of CFD and DEM models

In this paper, experimental data of solid distributions in horizontal pipelines were modelled using CFD and Discrete Element Method (DEM). Experimental data were taken from Gilles et al. (2004), Roco et al. (1983) and Hill (1996) for pipe diameter in the range from 51 mm to 103 mm, the average sand particle size from 90 ?m to 4400 ?m and average solid volume fraction from 0.092 to 0.21.Two CFD models available in STAR-CCM+ for Eulerian multiphase flows were used, the simple solid pressure model that uses the exponential formula for the solid pressure force and more sophisticated model based on the kinetic theory of granular flows that takes into account bulk, collisional, kinetic and frictional viscosities, which result from the presence of solid particles. In both models the turbulent flow was modelled using the standard k-?model. The drag force acting on the particles was modelled using the Gidaspow formula.The granular flow model was compared with the DEM implemented in STAR-CCM+. The DEM formulation used in STAR-CCM+ is based on the soft-particle formulation where particles are allowed to develop an overlap. The non-slip Hertz-Mindlin contact model was used to account for particle-particle interactions and the Gidaspow drag formula for liquid-particle interaction.CFD and DEM predictions of solids concentration were compared against experimental data. The comparisons were made in terms of accuracy and computational time.

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