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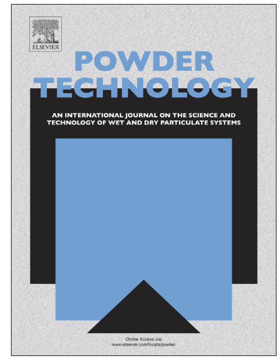

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Particle Scale Modelling of Bubble Properties in Central Air Jet Gas-Solid Fluidized Beds

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Abstract

Bubbles properties play an important role in determining the characteristics of gas-solid fluidized beds and thus influence the bed performance significantly. In this work, the bubble properties such as bubble size and bubble shape are studied by the combined approach of CFD and DEM for bubbling gas-solid fluidized beds operated with a continuous central jet. The process of the continuous injection of a central air jet to the bed is successfully reproduced featured with the formation of series of bubbles which rise through the bed and burst at the bed top. The results show that the average initial bubble diameter increases with the increase of jet velocity, and can be well predicted by the leakage based empirical models. The bubble size distribution in the overall bed shows a decrease in frequency as the size of the bubble increases for all the jet velocities. At a higher jet velocity, the distribution is more scattered signifying the presence of small and large bubbles. The distributions of bubble aspect ratio and bubble shape factor are also examined in detail, showing a normal distribution. Specifically, the distribution of bubble aspect ratio exhibits a positively skewed distribution for all jet velocities while that of bubble shape factor shows a negatively skewed distribution. The study provides a useful basis for further work on the understanding of bubble dynamics.

Keywords: bubble formation, bubble size, bubble shape, single jet, CFD-DEM

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