Chemical Engineering Thesis Defense

Flowability of Powders in MFiX Simulations

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Abstract

This study presents an evaluation of the predicted flow behavior and the minimum outlet diameter in a computationally simulated hopper. In a prior study, the common pharmaceutical excipient, microcrystalline cellulose (MCC) was tested in a FT4 Rheometer with varying size, shape, and moisture content. The data given was used to build an industrial stainless-steel hopper in the Department of Energy's Multiphase Flow with Interphase Exchanges (MFiX) software following Jenike's hopper design method. A total of five size fractions and twelve moisture levels of MCC were simulated in MFiX to observe the flow patterns. Predictions from MFiX were then compared to current literature. As expected, the smaller size fractions with less water content were closer to ideal funnel flow than their larger counterparts. The predicted minimum outlet diameter in simulations showed good agreement with close to ideal flowability. These findings illustrate the connection between lab flowability experiments and computational simulations. The application of flowability simulations can improve the transport of solids in processing equipment used during the production of powders.

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