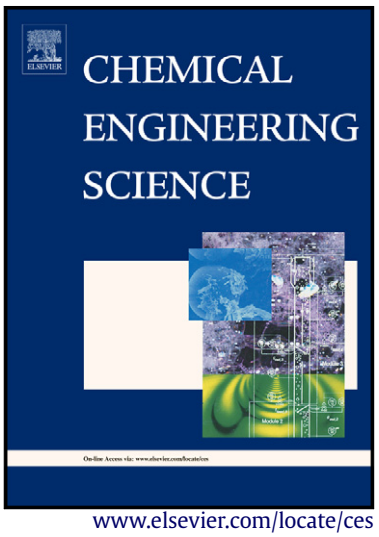

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www.elsevier.com/locate/ces

PII: S0009-2509(15)00519-9
DOI: http://dx.doi.org/10.1016/j.ces.2015.07.034
Reference: CES12506

To appear in: *Chemical Engineering Science*

Received date: 3 May 2015
Revised date: 21 July 2015
Accepted date: 29 July 2015

Cite this article as: R.J. Goetsch, J.D. Regele, Discrete element method prediction of particle curtain properties, *Chemical Engineering Science,* http://dx.doi.org/10.1016/j.ces.2015.07.034

Discrete element method prediction of particle curtain properties

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Abstract

The discrete element method (DEM) is used to predict the properties of a particle curtain created by the three-dimensional granular flow through a hopper constricted by a slit opening. The profiles of the mean and fluctuation velocity components and solid volume fraction within the particle curtain are estimated. The model is validated against experimental measurements of the mean and fluctuation velocity profiles in a granular channel flow. Good agreement is observed between the experimental channel flow measurements and our DEM simulations. The approach is extended to model the behavior of the particle curtain after it exits the hopper. The model predictions suggest that the volume fraction is not uniform across the curtain as expected from experimental results.

Keywords: Discrete element method, Granular channel flow, Granular Temperature, Particle curtain, Hopper flow

1. Introduction

Multiphase particle-laden flows occur in a wide variety of phenomena. Some, such as fluidized bed reactors, have very important industrial applications. For this reason, these types of flows have been actively studied for decades. There has been success in modeling these flows when the solid phase is in either the dilute (Drew, 1983; Magnaudet and Eames, 2000; Crowe et al., 2012) or densely

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