

The Effect of Particle Shape on Flowability

Benjamin James and Jennifer Sinclair Curtis

University of Florida, Department of Chemical Engineering
P.O. Box 116005, Gainesville, Florida 32611-6005
bjames@che.ufl.edu, jcurtis@che.ufl.edu

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Abstract

Virtually all fluid-solid handling operations involve particles that are non-spherical in shape, and it is well known that the influence of particle shape on particle flow behavior is significant. However, most fundamental studies of particulate flow undertaken to date have involved spherical particles. Hence, there is a current significant disconnect between the model particles which are used in fundamental research studies and the characteristics of real particles dealt with in industry. While industrial practitioners comprehend fully that the influence of particle shape on particle flow behavior is significant, the role of particle shape is not understood.

This paper presents the results from a series of DEM simulations probing the effect of particle shape (aspect ratio and roughness) on bulk particle flow behavior. A basic premise of this work is that, by studying how non-spherical particles interact in a simple flow geometry (planar shear flow) and neglecting other forces, insight into the fundamental relationship between particle shape and particle-phase stress as a function of both solids volume fraction and particle interaction properties can be developed. Such particle-phase stress relations are also sorely needed to improve multiphase CFD models involving realistic particle systems.