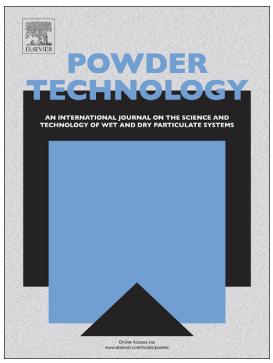

Variation of drag, lift and torque in a suspension of ellipsoidal particles

Long He, Danesh Tafti

PII: S0032-5910(18)30403-0
DOI: doi:10.1016/j.powtec.2018.05.031
Reference: PTEC 13404

To appear in: *Powder Technology*

Received date: 31 October 2017
Revised date: 2 May 2018
Accepted date: 16 May 2018

Please cite this article as: Long He, Danesh Tafti , Variation of drag, lift and torque in a suspension of ellipsoidal particles. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Ptec(2017), doi:10.1016/j.powtec.2018.05.031

Variation of drag, lift and torque in a suspension of ellipsoidal particles

Long He, Danesh Tafti[1], Department of Mechanical Engineering, Virginia Tech, VA 24061, USA

Abstract

Previous research has mostly been focused on the drag force in fluid-particle assemblies. However, when the particle geometry is non-spherical, secondary forces and torque may no longer be negligible. In this study particle-resolved simulations are performed to study the drag force, other secondary forces, and torque in flow through a fixed random suspension of ellipsoidal particles with sphericity ($\psi = 0.887$). The incompressible Navier-Stokes equations are solved using the Immersed Boundary Method (IBM). The suspension of ellipsoidal particles is simulated for solid fraction between 0.1 to 0.35 using 191 to 669 particles, respectively, at low to moderate Reynolds numbers ($10 \leq Re \leq 200$). The results show that the mean drag and lift force and torque with flow incidence angle follow trends similar to that found for isolated particles. However, there are large variations in these quantities under the same conditions of Reynolds number, void fraction, and incidence angle which become more significant as the Reynolds number increases, leading to the conclusion that local flow conditions in the suspension have a large impact on forces and torques experienced by a particle. Secondary lift and lateral forces are compared to the drag force on

[1]Address: 213E Goodwin Hall (0238), 635 Prices Fork Road, Blacksburg, Virginia 24061
Email: dtafti@exchange.vt.edu