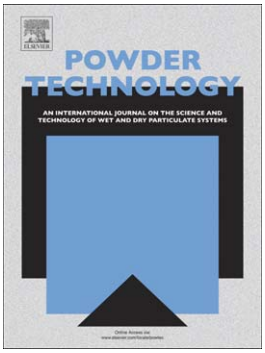

A two-way couple of Eulerian-Lagrangian model for particle transport with different sizes in an obstructed channel

Mahla Maskaniyan, Saman Rashidi, Javad Abolfazli Esfahani

PII: S0032-5910(17)30161-4
DOI: doi:10.1016/j.powtec.2017.02.031
Reference: PTEC 12369

To appear in: *Powder Technology*

Received date: 6 October 2016
Revised date: 24 January 2017
Accepted date: 15 February 2017

Please cite this article as: Mahla Maskaniyan, Saman Rashidi, Javad Abolfazli Esfahani, A two-way couple of Eulerian-Lagrangian model for particle transport with different sizes in an obstructed channel, *Powder Technology* (2017), doi:10.1016/j.powtec.2017.02.031

A two-way couple of Eulerian-Lagrangian model for particle transport with different sizes in an obstructed channel

Mahla Maskaniyan, Saman Rashidi*, Javad Abolfazli Esfahani

Department of Mechanical Engineering, Ferdowsi University of Mashhad, Mashhad 91775-1111, Iran
*Corresponding author contact details: Mech. Eng. Dep., Ferdowsi University of Mashhad; P.O. Box 91775-1111, Mashhad, Iran, Email: samanrashidi3983@gmail.com.

Abstract:

In this paper, a two-way couple of Eulerian-Lagrangian model is used to simulate and account the discrete nature of Al_2O_3 particles in a particulate channel flow with a built-in heated obstruction. The governing equations for fluid flow and particle motions are solved by using the finite volume and trajectory analysis approaches. The simulations are performed for different particle sizes and solid volume fractions of particles (φ) in the ranges of 30-500 nm and 0-0.05, respectively and at fixed values of blockage ratio (S=1/8) and Reynolds number (Re=100). The effects of interaction forces acting between the fluid and particles containing the drag, gravity, Brownian, and thermophoresis forces on the particle transport and thermal behaviour of system are investigated. It was found that the nanometer particle does not follow the flow streamline and in fact diffuses across the streamlines. For larger sizes (i.e. 100 and 250 nm), particles concentrate in the vorticity regions around the periphery of the vortices. Moreover, the particle deposition percentage increases with an increase in the particle size.

Keywords: Eulerian-Lagrangian; Two-way couple; Particle size; Obstruction; Interaction forces

Nomenclature

A surface (m^2)