A Simple Particle Saltation Model Using Computational Fluid Dynamics

A. Landázuri[1], V. Benavides[1]

[1]Chemical Engineering Department, GICAS Group, Universidad San Francisco de Quito, Quito, Ecuador

Abstract

A three-dimensional model of particle saltation using computational fluid dynamics (CFD) is presented. This model domain reproduces a flat and irregular terrain with uniform roughness. The domain extends 2 m in X, 0.5 m in Y and 0.5 in Z for both cases. The model includes the motion of particles due to shear force, gravity, drag and the effect of turbulence as a result of the retardation of the wind. The k-e turbulent model along with appropriate boundary conditions allowed to explore the effect of wind speed, angles of impact and rebound, as well as the quantification of energy loss at the first two rebounds. An average loss of 37±13% from the first to second bounce for particles from 50 to 140 um is observed. Flat terrain simulations were validated to previous studies that could reproduce experimental observations. Additionally, irregular topographic effects have been included to evidence deviations and effects of the sloping surface from ideal conditions. Fine particles (<50 um) follow the wind stream lines, whereas drag and gravitational effects become important for bigger particles .