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Effect of Boundary Condition on Granular Pressure of Gas-Solid Flow in a Rotating Drum

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Abstract : Various simulations have been conducted to understand the particle's macroscopic behavior in the solid-gas multiphase flow in rotating drums in the past. In these studies, the particle-wall no-slip boundary condition was usually adopted. However, the non-slip boundary condition is rarely encountered in real systems. A little effort has been made to investigate the particle behavior at slip boundary conditions. The paper represents a study of the gas-solid flow in a horizontal rotating drum at a slip boundary wall condition. Two different sizes of particles with the same density have been considered. The Eulerian–Eulerian multiphase model with the kinetic theory of granular flow was used in the simulations. The granular pressure at the rolling flow regime with specularity coefficient 1 was examined and compared with that obtained based on the no-slip boundary condition. The results reveal that the profiles of granular pressure distribution on the transverse plane of the drum are similar for both boundary conditions. But, overall, compared with those for the no-slip boundary condition, the values of granular pressure for specularity coefficient 1 are larger for the larger particle and smaller for the smaller particle.

Keywords : boundary condition, eulerian–eulerian, multiphase, specularity coefficient, transverse plane
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