

DEM study on influence of particle shape and deformation on friction behaviour of flexible cylindrical particle flows

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Abstract

This study used a Discrete Element Method (DEM) model to investigate the Jenike shear process of flexible, cylindrical particles with different aspect ratios. The model was validated through experiments and analytical solutions. It was found that particle shape and deformation have a significant impact on friction behavior, affecting particle deformation, contact forces, orientation, and internal friction angle. Results indicate an increase in shear stress with normal load, regardless of particle stiffness or shape. Flexible particles showed higher shear stress and internal friction angles than rigid ones, especially for aspect ratios of 6. With aspect ratios of 4 and 5, flexible particles deform significantly during shear with complex reconfiguration, while aspect ratio 6 particles experience a uniform reconfiguration, indicating a solid packing structure that enhances flow resistance. These findings will aid in improving kinetic theories for granular flow of complex irregular particle flows.

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