The Effects of Agitated Beds Homogenization on Stirrer Geometry and Bed Depth via DEM

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Granular materials such as packed beds present a unique state of matter and are currently in the urgent need of developing the proper theoretical basis for its basic aspects. A number of attempts have been made to find a way how to characterize the forces between granular particles. In spite of this fact, the present state of affairs is rather unsatisfactory.

One of the possible ways for mathematical modelling of mechanical interactions between particles in granular systems is based on discrete element methods (DEM). In DEM models each particle is represented as a sphere with defined properties (diameter, density, Young's modulus, Poisson ratio, etc.) and is tracked individually [1, 2]. The motion of each sphere is calculated as a sum of external (gravitational force, force given by an agitator) and collision forces (caused by the collision of particles between each other or by the contact of the particle with the wall). Resulting translational and angular velocities than characterize the movement of the particles.

In this contribution open source DEM particle simulation software LIGGGHTS (www.liggghts.com) was studied and tested. Collision forces are there modelled by the soft-sphere approach with the Hertzian collision model. As an application we studied agitated particle beds (packed from glass spherical particles of two colours – packed vertically and horizontally) mixed by different types of agitators. Dependence of degree of homogenization on particle diameter, particle properties (Young's modulus), and on geometrical aspects (bed depth, agitator position, etc.) will be also discussed.

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Literature:

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