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Analysis of the Particle Movement in Dense Granular Flow

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Measuring of the particle motion in granulation systems has been an area of increasing interest in recent years. As an example, for the understanding of the mechanisms of the granulation or agglomeration process in a fluidized bed the detailed knowledge of the particle dynamics is essential. To visualize and quantify the granular flow continuously, a novel non-intrusive 3D measurement technique is used, the Magnetic Particle Tracking (MPT). The MPT technique is based on the analysis of a quasi-static magnetic field emitted by a single magnetically marked tracer particle.

In this work the complex granular flow in a fluidized bed and a rotor-based equipment is investigated experimentally. The MPT technique is used to quantify the particle velocities, shear rates and particleresidence time distributions for dry and wet granular flow. Due to the precisely defined magnetic dipole axis of the tracer particle, the MPT allows for the first time a detailed analysis of the translational and rotational movement of particles. Thus, the translational as well as the rotational motion in a dense granular flow can be simultaneously investigated. The focus in this contribution is a detailed analysis of the particle rotation behaviour in several zones, e.g. spray and shear zone, of the processors.The results indicate that the bed porosity has a significant effect on the particle rotation.