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Optimization of prismatic spouted bed apparatuses using a novel experimental setup and discrete particle modelling

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Spouted beds are used for drying, granulation, coating or layering of particles and chemical reactions. The flow of solids in a spouted bed has a profound influence on the particle morphology and thus on the product quality as well as on process efficiency. Different formulation processes and particle systems demand specialized motion of particles: the general aim of the research activities presented is the development of tailored spouted bed apparatuses for the different particulate systems and applications.

In this contribution, results of experimental evaluations of the influence of apparatus construction parameters (different base angle, apparatus depth, and the width of the freeboard region) on the fluid and particle motion will be presented and discussed. Coupled CFD-DEM simulations (DPM, Discrete Particle Modelling), which were performed parallel to the experimental investigations, are used to gain a deeper understanding of the particle dynamics and thus allow more extended analyses. For example, the gas flow, friction, and angle of the symmetric side walls were found to have a pronounced influence on the mobility and the rotation of particles. With this information a scale up of the process to industrial dimensions is possible.

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