Spouting stability in a prismatic spouted bed and apparatus optimization

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SPOUTING STABILITY IN A PRISMATIC SPOUTED BED AND APPARATUS OPTIMIZATION

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Abstract:
This contribution deals with the characterization, modeling and optimization of a prismatic spouted bed. The influence of the geometry on the particle flow in the apparatus has been extensively studied. For the experimental investigations with different solids and bed masses as well as to validate the coupled CFD-DEM simulations a transparent laboratory setup with a variable geometry was installed, where the angle of the prismatic apparatus part, the shape and size of the gas inlet, as well as the equipment depth were varied. Furthermore experiments were performed with different configurations of draft plates. The simulations show a good agreement with experiments concerning the gas and particle dynamics. The apparatus hydrodynamics was characterized and analyzed quantitatively for different regions (spout, annulus and fountain). An optimization of the vessel geometry resulted in a significant improvement in the stability of the particle flow, in which draft plates with geometry and positioning adapted to the particle flow, have been installed near the gas entrance in order to improve the spouting stability (Figure).

Reference 1:
Reference 2 :
Reference 3 :
Reference 4 :

Highlight 1: A spouted bed was investigated experimentally and by means of coupled CFD-DEM simulations
Highlight 2: Effect of the inlet design, prismatic angle, and draft plates was studied
Highlight 3: A method for significant improvement of spouting stability is proposed