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THE EFFECT OF WALL ROUGHNESS ON PARTICLE-WALL COLLISIONS: EXPERIMENTS AND MODELLING

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ВЛИЯНИЕ ШЕРОХОВАТОСТИ СТЕНКИ НА СТОЛКНОВИТЕЛЬНЫЕ ПРОЦЕССЫ ЧАСТИЦ СО СТЕНКОЙ. Мартин ЗОММЕРФЕЛЬД, Норберт ХУБЕР

Key words: particle-laden channel flow, particle-wall collision.

For the development and validation of numerical models describing the collision of spherical solid particles with a rough wall, detailed experiments were performed in a particle-laden horizontal channel flow. In order to assert the influence of wall roughness the roughness structure of the channel walls was analyzed, using a pethometer. The wall collision process was studied, using a pulsed laser-light sheet in connection with digital image processing. The statistical properties of the particle-wall collision (i.e. probability density functions of the change of particle velocity and trajectory angle) were obtained by analyzing the particle traces before and after the rebound from the wall [1].

The influence of correlation between particle size and roughness structure was analyzed, using different wall materials and particles of different size.

Furthermore, numerical simulations were performed, using the particle-wall collision model introduced by Sommerfeld [2], where the local collision angle was assumed to be composed of the particle trajectory angle and a stochastic contribution due to the wall roughness. By using a

Gaussian distribution function with an appropriately selected standard deviation for the roughness angle, it could be demonstrated that this model closely simulates the experimental observations.

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