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# ANALYSIS OF RELATIONSHIPS FOR THE DETERMINATION OF THE AERODYNAMIC FORCES ACTING ON PARTICLES IN A GAS-DISPERSED FLOW

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The aim of this work is to analyze existing analytical and empirical relationships for determining the forces acting on a solid particle in a gas flow which are caused by its rotation (the Magnus force) and the gradient of the carrying gas velocity (the Saffman force). These forces act transversely to the velocity of a particle in a gas flow with restricting walls, and their effect is crucial in terms of the adequacy of calculation of the particle trajectory parameters. The paper analyzes relationships for Magnus and Saffman force determination obtained analytically or by mathematical treatment of experimental data and limited by certain values of criterion parameters. The force determination criteria are the Reynolds numbers based on the particle diameter and flow-past velocity ( $Re_d$ ), on the square of the particle diameter and the particle rotation angular velocity ( $Re_\omega$ ), and on the particle diameter and the gradient of the carrier gas local velocity. Particle rotation and the Magnus force are caused by inelastic collisions of particles with restricting surfaces (walls). Comparative calculations on Magnus force determination by the relationships under analysis give contradictory results at comparable values of the determining criteria, thus calling for a thorough analysis of the validity of their use in specific conditions. The Saffman force reaches its maximum in gas flow regions with a high velocity gradient (in the vicinity of a restricting surface). The calculations by the relationships for Saffman force determination showed a far narrower spread in comparison with the case of the Magnus force. A specific numerical example with particles of different diameters is considered to show the ranges of variation of the determining Reynolds criteria in the process of motion of a particle in a turbulent carrying gas flow in a two-dimensional channel. The results obtained may be used in numerical simulation of gas-dispersed flows in channels and in the vicinity of restricting surfaces.

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