عنوان مقاله:

Numerical Study on Cubic Particle Solid–Liquid Two-Phase Flow in Multistage Pump

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خلاصه مقاله:

To investigate the movement characteristics of cubic particles in a pump, a deep-sea mining lift model pump with a specific speed of ۹۴ is used as the research object in this study. The discrete element method is coupled with the computational fluid dynamics method to simulate the solid–liquid two-phase flow of cubic particles with different densities in the pump while the effect of particle shape on the solid–liquid two-phase flow in the pump is considered. Results show that the cubic particle movement rules for the same flow component are the same. The cubic particle density imposes a more significant effect on the number of particles in the low-velocity zone than in other zones. The number of particles in the low-velocity zone increases with the increase of density. The cubic particle velocity gradient in the impeller decreases as the particle density increases, and the particles exhibit unsatisfactory following performance in the fluid. As the density increases, the collision exhibited by the cubic particles is primarily particle-to-particle collisions, (i.e., more than ۳۷%), and the collision rate between the cubic particles and first-stage guide vane decreases significantly. Compared with cubic particles, spherical particles are likely to obstruct the flow channel in the guide vane. The collision exhibited by the spherical particles in the pump is primarily particle-to-guide vane collision, and the collision rate between the spherical particles decreases by ۱۵.۹۲%.

کلمات کلیدی:

Numerical simulation, Spherical particles, Cubic particles, Impeller, Guide vane, Collision