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Mixing Performance of Ribbon Mixers: Effects of Operational Parameters

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Abstract

Ribbon mixers are widely used in practice because they are capable of providing high speed convective mixing. Here, the discrete element method (DEM) is used to investigate the effects of impeller speed and fill level on the mixing behaviours of mixtures of particles with different cohesion in two-bladed and four-bladed ribbon mixers, each having a horizontal cylindrical vessel. The mixing behaviours are characterized by a particle-scale mixing index. Simulations show that the mixing rate increases with the impeller speed for both the cohesive and non-cohesive particle mixtures up to a certain speed, beyond which it shows a reduction. The mixing rate becomes poorer at higher impeller speeds for mixing of cohesive particles in the 2-bladed mixer. Inspection of velocity fields shows that many localized recirculation flows exist when the mixing non-cohesive particles, preventing the overall mixing. By contrast, when mixing cohesive particles, there exist circumferential flow about the shaft axis and convective flow in the horizontal

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