

Which impeller should be chosen for efficient solid-liquid mixing in the laminar regime?

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Abstract

The vast majority of solid-liquid mixing studies have focused on high Reynolds number applications with configurations and impeller geometries adapted to this type of regime. However, the mixing of particles in a viscous fluid is an essential element of many contemporary industries. We used the CFD-DEM model previously developed in our group to investigate solid-liquid mixing with close-clearance impellers in the laminar regime of operation. We compared different geometries that is, the double helical ribbon, anchor, ParaviscTM, and MaxblendTM impellers. We investigated the impact of fluid viscosity and compared the results with those obtained with the pitched blade turbine, a more commonly used impeller, based on power consumption for equivalent mixing states. This study highlights that the higher the viscosity of the fluid, the more interesting it is to use close-clearance impellers for their ability to generate a strong shear stress and a strong bulk flow in the entire vessel.

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