

Investigation on the flow characteristics of a novel multi-blade combined agitator by time-resolved PIV and LES

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Abstract

We investigated the flow characteristics in a tank of $H/T=1.5$ stirred by a novel multi-blade combined agitator (MBC) by using time-resolved PIV and LES approach. The predictions were assessed by Y^+ values and power spectrum analysis, as well as experimental validation of velocity distributions. Results demonstrate that the MBC agitator can load the energy into the system effectively with a power number of 12.5 in a turbulent regime, resulting in improved axial and radial mass exchange. The upper and lower short blades produce an axial down-flow in the top half and an axial up-flow in the bottom half, respectively. Part of axial flows change to radial flows by the radial pumping of the long blades, meanwhile, the impingement of two axial flows improves the axial mass exchange. These flow characteristics leads to an obvious improvement in the turbulent kinetic energy distribution uniformity.

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