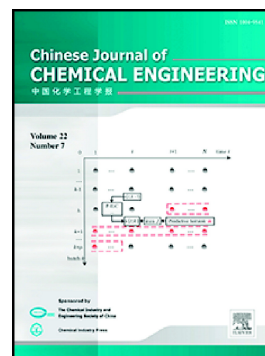


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Characterization on the Hydrodynamics of a Covering-plate Rushton Impeller*

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Abstract A modified Rushton impeller with two circular covering-plates mounted on the upper and lower sides of the blades was designed. There are gaps between the plates and the blades. The turbulent hydrodynamics was analyzed by the computational fluid dynamics (CFD) method. Firstly, the reliability of the numerical model and simulation method were verified by comparing with the experimental results from literature. Subsequently, the power consumption, flow pattern, mean velocity and mixing time of the covering-plate Rushton impeller (RT-C) were studied and compared with the standard Rushton impeller (RT) operated under the same conditions. Results show that the power consumption can be decreased about 18%. Compared with the almost unchanged flow field in the lower stirred tank, the mean velocity was increased at the upper half of the stirred tank. And in the impeller region, the mean axial and radial velocities were increased, the mean tangential velocity was decreased. In addition, the average mixing time of RT-C was shortened about 4.14% than the counterpart of RT. The conclusions obtained here indicated that RT-C has a more effective mixing performance and it can be used as an alternative of RT in the process industries.

Keywords covering-plate Rushton impeller (RT-C), power consumption, flow pattern, mean velocity, mixing time, computational fluid dynamics(CFD)

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