178e Computational Evaluation of Impeller Performance Based on Information Entropy Theory

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The performance of commonly used mixing impellers for stirred vessels are evaluated computationally in terms of a mixing index based on information entropy theory. The index quantifies mixing performance in each region of the tank on a scale of 0 to 1. A fully baffled cylindrical vessel with a flat bottom and a free surface is divided into a number of non overlapping regions in which a mixing index is applied to each region. The average value of these indices is then defined as the overall performance index for the impeller. The validity of the evaluation scheme relies on the accurate prediction of local flow patterns in the vessel. Computational fluid dynamics is able to predict in detail the flow patterns in stirred tanks. This study examines several mesh and turbulent models by means of the commercial CFD code FLUENT6.1. The indices calculated numerically are compared with those previously obtained by experiments [1]. It is confirmed that appropriate computational model and scheme provide reasonable index values that would be useful for understanding the characteristics of a mixing impeller.

[1] R. Konishi, S. Ookawara, K. Ogawa, 2005, Performance comparison of typical small and large impellers by a unified index based on information entropy theory, 7th World Congress of Chemical Engineering, Glasgow, Scotland, the paper will be included in the conference CD-ROM.