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Numerical investigation of power consumption and mixing time in a stirred vessel with regular and multiscale impellers SALUR BASBUG, GEORGE PAPADAKIS, CHRISTOS VASSILICOS, Imperial College London — The flow field inside a stirred tank is obtained by means of direct numerical simulation based on finite volume method at Re=500. Two different types of four-bladed radial impellers are considered: the first one is a regular type with rectangular blades and the second one is a modified version of the former with irregular blade edges, having the same thickness and the surface area. The shaft power is averaged over more than sixty revolutions and the comparison between the two cases shows that the impeller with irregular blades has lower energy consumption. Moreover, a passive scalar is injected into the vessel for a quarter period of revolution and the scalar transport equation is solved to investigate the mixing times. The coefficient of variation of the passive scalar is averaged over the whole volume in order to obtain a quantitative indicator of the mixing progress. The homogenization curves depend on the instantaneous flow conditions due to the transient nature of the mixing process, therefore multiple curves are averaged to obtain a representative result. There are indications that irregular blades can decrease mixing time with respect to regular ones.

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