World Academy of Science, Engineering and Technology
International Journal of Bioengineering and Life Sciences
Vol:9, No:05, 2015

Characterization of Laminar Flow and Power Consumption in Agitated Vessel with Curved Blade Agitator

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Abstract : Stirring is one of the unifying processes which form part of the mechanical unit operations in process technology such chemical, biotechnological, pharmaceutical, petrochemical, cosmetic, and food processing. Therefore determining the level of mixing and overall behavior and performance of the mixing tanks are crucial from the product quality and process economics point of views. The most fundamental needs for the analysis of these processes from both a theoretical and industrial perspective are the knowledge of the hydrodynamic behavior and the flow structure in such tanks. Depending on the purpose of the operation carried out in mixer, the best choice for geometry of the tank and agitator type can vary widely. Initially, a local and global study namely the velocity and power number on a typical agitation system agitated by a mobile-type two-blade straight (d/D=0.5) allowed us to test the reliability of the CFD, the result were compared with those of experimental literature, a very good concordance was observed. The stream function, the velocity profile, the velocity fields and power number are analyzed. It was shown that the hydrodynamics is modified by the curvature of the mobile which plays a key role.

Keywords : agitated vessels, curved blade agitator, laminar flow, finite volume method
Conference Title : ICBB 2015 : International Conference on Bioinformatics and Biomedicine
Conference Location : Istanbul, Türkiye
Conference Dates : May 21-22, 2015