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Comment

Comments on the article "Turbulent characteristics in turbine tanks of different sizes and geometries" by E. Stahl and C. Trägardh

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Dear Sirs,

I read the article of Stahl and Trägardh (Chem. Eng. J. 72 (1999) 97–107) with great interest. It consists of valuable results on the velocity field in an agitated system with multiple Rushton turbines and radial baffles under turbulent regime of flow of agitated liquid. Nevertheless, I would like to offer the following remarks dealing with interpretations of the experimental data presented in the article:

1. Three reactors of different sizes with multiple turbine impellers are investigated. Velocity fields in the discharge stream form the lowest impeller for Tanks A and B are compared with the flow streaking from the second highest impeller in the largest Tank C. The relative distance of impeller above the bottom for Tank A ($\Delta C/D$)=2.1 and for Tank B ($\Delta C/D$)=1.35, and relative vertical distance between impellers in Tank C ($\Delta C/D$)=1. It is known from literature [1,2], that the power input of the multiple turbine impellers is affected by their distance, when ($\Delta C/D$)<2. It is then possible to consider the velocity field in all three investigated systems similar, especially when for Tanks A and B the lower circulation loop is affected by the solid bottom, and in Tank C both the loops are between two adjacent impellers, only?
2. Ensemble-averaged velocity field in the turbine impeller discharge stream is three-dimensional and is significantly affected by the vessel bottom [3,4]. Why did the authors consider the constant position of the probe 45° from the radial direction when the angle between the resultant mean velocity vector and the radial ray crossing the impeller centre changes between the impeller blade tips and vessel wall within interval $10^\circ<\alpha<80^\circ$? Did the authors consider the shift of the velocity maximum on the radial profile of the above-mentioned mean velocity off the horizontal plane of symmetry of the impeller, especially in case of Tank B?
3. From Table 2 of the article, it follows that the number of samples per experiment in Tanks A and B was the same (4200 samples). Why did the authors select the number of samples in Tank C so low (500 samples), especially when the time characterising macromixing phenomena increases with increasing tank diameter?
4. The authors considered two components of the local mean velocity in the turbine discharge stream, $\bar{U}_1$ and $\bar{U}_2$, to be the same. The stream in question exhibits significant anisotropy, both just behind the blades of impeller [5,6] — trailing vortices, and farther in the region of the cylindrical jet [3] — velocity field in the boundary layer between discharge flow and bulk flow. Did the authors consider the above-mentioned features of the stream investigated when they found equality of the components $\bar{U}_1$ and $\bar{U}_2$?

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