

The effect of number and width of baffles on mixing time in copper solvent extraction dynamic mixers: CFD simulation and direct photography

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1-Introduction

Dynamic mixers have been used in the hydrometallurgical process as one of the most important instruments in solvent extraction process. Because of their key role in extraction process and total process efficiency, many investigations have been done on optimizing their geometry, physics and operational parameters. The results of numerical and experimental works are improving geometry and operational parameters. Some equations are derived as the results of these projects that describe the importance of each parameter. In copper extraction, solvent extraction is very important parts in the process since extract the copper ions from the leaching solution. Mixer and settler are the main devices in this part. The efficiency of mixers affects the total efficiency of the factory.

2-Experimental

In this work, mixers have been designed and meshed according to copper solvent extraction mixer. Validation of data has been done by the experimental setup. k-ε turbulent model and sliding mesh have been used for fluid flow simulation. Organic and aqueous liquids have been provided from solvent extraction unit of Sarcheshmeh copper complex, Iran. Mixing time has been calculated using population balance model outputs analysis. The variables of the equation are baffles number and width.

3-Results and discussions

In this part mixing time evaluated using experimental formula and numerical simulations. According to the results, baffle width affects the mixing time according to figure 1. In this figure numerical and experimental results

are compared.

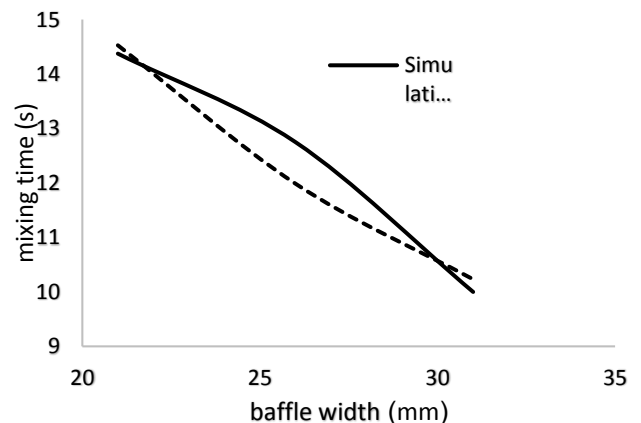


Fig. 1 The effect of baffle width on the mixing time (numerically and experimentally)

As the same way the effect of baffle number on the mixing time investigated (figure 2).

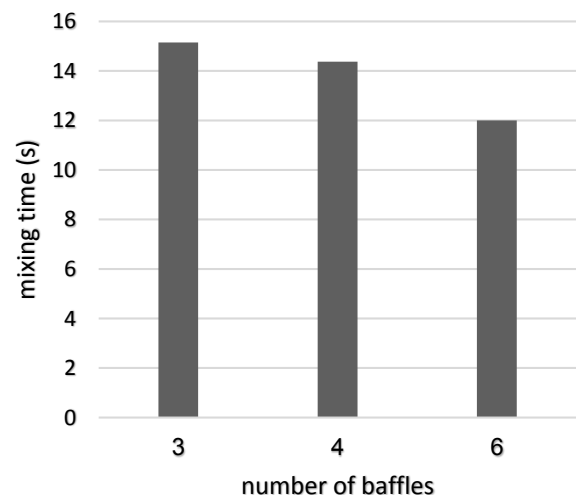


Fig. 2 The effect of baffle numbers on the mixing time (numerically and experimentally)

4- Conclusions

According to the results, by increasing the number and width of baffles, mixing process is improved and mixing time is decreased. Increasing turbulent flow intensity improve the efficiency of the mixer in this situation. An equation has been developed for calculating mixing time (equation No. 1). In this equation the effect of baffle

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width and baffle number on the mixing time, in the mixer of copper solvent extraction has been calculated.

$$M_t = 2.4922 * \left(\frac{b}{T}\right)^{-0.9} * \exp(-0.08n_b) \quad (1)$$