OR-37
MODELING THE HYDRODYNAMICS OF A TWO-COMPONENT SOLUTION IN THE VOLUME OF A FLOW-THROUGH REACTOR WITH A TWO-LEVEL THREE-BLADE STIRRING DEVICE

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Abstract. In this study, we studied a flow-through industrial reactor equipped with a two-tier three-blade mixing device. Data were obtained on the distribution of two technological media and flow rates in the volume of the apparatus at different rotation frequency of the mixing device.

For numerical calculations of hydrodynamics in the apparatus, the multiphase model of Manninen [1] and the standard k-epsilon model of turbulence [2] were used under the operating conditions of the reactor in a periodic mode to enter the technological mode, as well as Large Eddy Simulations (LES) [3] for modeling in continuous mode.

It has been established that during mixing with a two-tier mixing device in all considered operating modes, a uniform distribution of technological media in the reactor volume is observed. In all investigated operating modes of the mixing device, a similar distribution of flows inside the reactor was observed. Two circulation loops (large and small) are observed in the reactor volume. The results of numerical calculations of the flow rates are presented in Table 1.

Table 1. The values of the flow rates at different operating modes of the mixing device.

	imal	erage	imal
20	0,1	0,2	1,0
40	0,1	0,3	2,2
60	0,1	0,4	3,2
80	0.2	0.4	4.4
100	0,2	0,6	5,8
120	0,3	0,9	4,9
140	0,4	0,9	7,3
160	0,4	1,2	8,8
1	0,8	2,0	8,7
240	1,0	2,5	9,9
420	1,1	3,1	14,8
	1,3	4,5	18,2
	1,5	5,6	17,4
0	2,0	8,1	28,5
0	2,6	9,5	24,9

References

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