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Geometric parameter optimization of a liquid jet liquid ejector[1]

IVAN KORKISCHKO, CECCO, Nuclear and Energy Research Institute, Sao Paulo, Brazil, FELIPE SILVA MAFFEI, Dept. Mechanical Engineering, POLI, University of Sao Paulo, Sao Paulo, Brazil, RAFAEL DOS SANTOS GIORIA, Dept. Mining and Petroleum Engineering, POLI, University of Sao Paulo, Santos, Brazil, JULIO ROMANO MENEGHINI, Dept. Mechanical Engineering, POLI, University of Sao Paulo, Sao Paulo, Brazil — Ejectors are devices employed as pumps or compressors, which work transferring momentum from a primary fluid (high pressure) to a secondary fluid (low pressure). On the one hand, their main advantages over standard pumps and compressors are no moving parts, no need of lubricants and seals, and low noise and maintenance. On the other hand, ejectors have low efficiency compared to other devices and a very narrow region of optimal operation. Thus, ejectors certainly benefit from optimization studies. This investigation was based on a CFD model of a liquid jet liquid (LJL) ejector. The finite element method was used, coupled with the k-epsilon turbulence model. The optimization study had three steps. First, the constants of the turbulence model were recalibrated to minimize the difference between the numerical and experimental efficiency curves. Second, using the main geometric parameters as control variables, the peak efficiency was maximized. Finally, the optimized geometry was further improved, considering the transitions between the different ejector components, which were originally sharp corners. The optimized round corners increased the ejector efficiency.

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