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EFFECT OF BATCH TIME ON THE PARETO OPTIMAL OPERATING SOLUTIONS FOR A CHEMICAL REACTOR BASED ON FAILURE PROBABILITY INDICES

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Abstract

Recently, a new failure probability index was introduced that characterizes the operation of highly sensitive chemical reactors (i.e. when highly exothermic / hazardous reactions are conducted). Based on this, the current paper exemplifies the application of the risk analysis methodology proposed to generate the Pareto optimal operating solutions accounting for reactor productivity maximization (product yield) and probabilistic risk minimization. The multi-objective optimization problem formulation accounts for uncertainty in the runaway boundaries and for random disturbances of the operating parameters and control variables (in the presence of technological constraints). Exemplification is made for a case study from literature, i.e. a semi-batch reactor (SBR) of high thermal sensitivity used for the catalytic aceto-acetylation of pyrrole with diketene in homogeneous liquid phase. In this paper, novel aspects related to the effect of shorter batch times on the selected Pareto-optimal solution are approached.

Key words: chemical reactor operation, failure probability, Pareto optimal solutions, safety limits, uncertainty

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