

SIMULATION OPTIMIZATION SOFTWARE

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Since 2000, a major shift has begun in Chemical Engineering, as there is an urgent need for new tools that can optimize existing operating technologies. Progress in computer programming and information technology has accelerated this process even more. Simulation optimization has particularly received considerable attention from researchers and practitioners. The current trend of the main progress in chemical technology is characterized by increasing complexity of process systems used in production. Sustainable development requires efficient use of energy and raw materials. Also, safety and environmental protection always needs to be considered. Innovation plays an important role for design optimization and new manufacturing management. My work at Imperial College London focused on MATLAB and Simulink programming and on their use in reactor design and control. One of the projects investigates the design and control of a circulating fluidised bed reactor for the conversion of n-butane to maleic anhydride. The reactor design was carried out for both isothermal and adiabatic operation utilising MATLAB R2017b; determination of an optimal catalyst recirculation rate and optimisation of maleic anhydride production was also undertaken. Sensitivity analysis revealed that inlet temperature has a dominant effect on the resultant maleic anhydride yield as well as the amount of catalyst used, providing further avenues for improvement of maleic anhydride production. Additionally, a reactor control system was designed using Simulink R2017b. Despite sluggish performance, the control system was adequate and allowed for both outlet temperature and maleic anhydride outlet flowrate to remain within the desired operating regions, despite being subjected to butane inlet flowrate and inlet temperature flowrate disturbances. This investigation sets a basis for further research into the optimization and modelling of the catalytic oxidation of n-butane into maleic anhydride in the circulating fluidised bed reactor.

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