Genetic-algorithm-based optimisation for exothermic batch process

Abstract

The aim of this chapter is to optimise the productivity of an exothermic batch process, by maximising the production of the desired product while minimising the undesired by-product. During the process, heat is liberated when the reactants are mixed together. The exothermic behaviour causes the reaction to become unstable and consequently poses safety issues. In the industries, a dual-mode controller is used to control the process temperature according to a predetermined optimal reference temperature profile. However, the predetermined optimal reference profile is not able to limit the production of the undesired by-product. Hence, this work proposed a genetic-algorithm-based controller to optimise the batch productivity without referring to any optimal reference profile. From the simulation results, the proposed algorithm is able to improve the production of the desired product and reduce the production of the undesired by-product by 15.3 and 34.4 %, respectively. As a conclusion, the genetic-algorithm-based optimisation performs better in raw materials utilisation as compared to the predetermined optimal temperature profile method.