Computation of cell transmission model for congestion and recovery traffic flow

ABSTRACT

This paper presents a metaheuristic-based temperature controller for an exothermic batch process. Developing a suitable temperature controller for an exothermic process is a challenging task because large amount of heat is released rapidly during the process. The exothermic behavior will further increase the reaction rate and cause more heat to be liberated. As the result, the improper temperature control might cause the reaction becomes unstable and consequently poses safety concern to the plant personnel and equipment. The conventional non-metaheuristic-based controller, such as fuzzy logic requires empirical data or knowledge about the total amount heat released while developing its fuzzy rules and membership functions for precision control. However, the detailed kinetic model of the heat released is unable to be obtained since there are several unobservable parameters during the process, such as the energy held in the reactor and jacket walls. Therefore, particle swarm optimization algorithm (PSO) is proposed as the controller to maintain the reactor temperature at the desired trajectory by manipulating the inlet jacket fluid temperature and flow rate. The simulation results show the proposed PSO produces better performances in terms of minimizing fluctuation in control actions and overshooting as compared with the conventional fuzzy logic controller.