Optimization of yeast fermentation process using genetic algorithm

ABSTRACT

This paper proposes genetic algorithm (GA) to optimize the productivity of yeast fermentation process. The proposed optimizer aims to maximize yeast productivity while minimizing the by-product of ethanol. Various initial glucose concentrations will affect yeast productivity and influence the performance of yeast fermentation. Yeast has relatively high ethanol production as compared with other microorganisms. Since the excessive ethanol formation in the yeast fermentation process will have a negative impact on quality of the product, it is needed to optimize glucose feeding rate at optimal level for maximizing the yeast productivity. The conventional open-loop feeding system is inadequate to minimize the growth of by-product as the system will not regulate the glucose feeding rate based on the instant needs. Thus, GA is proposed to optimize the glucose feeding profile based on the instant concentration of yeast, glucose, oxygen and ethanol inside the fermentation tank. The results show the proposed GA can obtain a higher yield production of 95.3% as compared to the conventional open-loop system with 92.5% yield production. The results reveal that the optimal glucose feeding rate using GA is achieved satisfyingly and successfully.