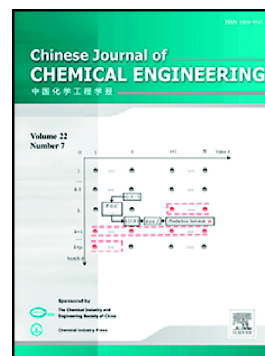


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An improved artificial bee colony algorithm for steelmaking-refining-continuous casting scheduling problem

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Process Systems Engineering and Process Safety

An improved artificial bee colony algorithm for steelmaking-refining-continuous casting scheduling problem[☆]

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Abstract: Steelmaking-refining-Continuous Casting (SCC) scheduling is a worldwide problem, which is NP-hard. Effective SCC scheduling algorithms can help to enhance productivity, and thus make significant monetary savings. This paper develops an Improved Artificial Bee Colony (IABC) algorithm for the SCC scheduling. In the proposed IABC, charge permutation is employed to represent the solutions. In the population initialization, several solutions with certain quality are produced by a heuristic while others are generated randomly. Two variable neighborhood search neighborhood operators are devised to generate new high-quality solutions for the employed bee and onlooker bee phases, respectively. Meanwhile, in order to enhance the exploitation ability, a control parameter is introduced to conduct the search of onlooker bee phase. Moreover, to enhance the exploration ability, the new generated solutions are accepted with a control acceptance criterion. In the scout bee phase, the solution corresponding to a scout bee is updated by performing three swap operators and three insert operators with equal probability. Computational comparisons against several recent algorithms and a state-of-the-art SCC scheduling algorithm have demonstrated the strength and superiority of the IABC.

Key Words: Artificial bee colony, Steelmaking-refining-continuous casting, Hybrid flowshop scheduling, Variable neighborhood search

1 Introduction

Iron and steel production is a worldwide problem, providing raw materials for a series of industries, such as petro-chemical, construction, machinery manufacturing and so on [1]. In the production, Steelmaking-refining-Continuous Casting (SCC) processing is the bottleneck [2], which processes hot metal to steel with a well-defined chemical composition and solidifies the steel into slabs. Effective SCC scheduling methods are crucial to improve production productivity, resulting in significant monetary savings. Moreover, the problem is well known to be NP-hard and considered as one of the

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