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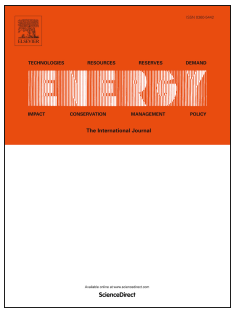

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Leandro V. Pavão, Camila B. Miranda, Caliane B.B. Costa, Mauro A.S.S. Ravagnani

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Efficient multiperiod heat exchanger network synthesis using a meta-heuristic approach

Leandro V. Pavão, Camila B. Miranda, Caliane B. B. Costa, Mauro A. S. S. Ravagnani[1]

Department of Chemical Engineering, State University of Maringá

Av. Colombo, 5790, Bloco D90, CEP 87020900, Maringá, PR, Brazil

Abstract Multiperiod heat exchanger networks (HEN) are required in plants with seasonal alterations to operating conditions. Like for single-period HEN, the synthesis of multiperiod HEN can be formulated as a mathematical programming optimization problem. However, since the network needs to feasibly perform heat integration under different process conditions, additional constraints are required and problem complexity is increased. Studies on the subject based on mathematical programming often use deterministic approaches and rely on commercial solvers. In this work, a meta-heuristic two-level method based on Simulated Annealing and Rocket Fireworks Optimization (SA-RFO), originally developed for single-period HEN synthesis, is adapted to handle multiperiod HEN optimization. A new post-optimization (PO) strategy is coupled with the main method in order to improve the results. Four case studies are investigated and results are compared to the literature. The solutions achieved presented lower total annual costs (TAC) than those obtained by other methods and the new PO scheme was able to significantly improve the results.

Keywords: optimization, multiperiod heat exchanger networks, meta-heuristics

1 Introduction

Operating conditions in industrial plants are commonly subject to seasonal alterations. These may be caused by variations in raw material availability throughout the year, catalyst activity variations, among other factors. In such cases, synthesizing a heat exchanger network (HEN) assuming only the plant nominal operating conditions may lead to the design of equipment with insufficient areas and operating difficulties. Aiming for more robust designs, able to properly perform heat integration under

[1] Corresponding author. Tel: +55 (44) 3011-4774, Fax: +55 (44) 3011-4793

E-mail address: massravagnani@uem.br