

A Weighted Sum Particle Swarm Approach (WPSO) Combined with a Novel Feasibility-Based Ranking Strategy for Constrained Multi-Objective Optimization of Compact Heat Exchangers

Authors : Milad Yousefi, Moslem Yousefi, Ricarpo Poley, Amer Nordin Darus

Abstract : Design optimization of heat exchangers is a very complicated task that has been traditionally carried out based on a trial-and-error procedure. To overcome the difficulties of the conventional design approaches especially when a large number of variables, constraints and objectives are involved, a new method based on a well-stablished evolutionary algorithm, particle swarm optimization (PSO), weighted sum approach and a novel constraint handling strategy is presented in this study. Since, the conventional constraint handling strategies are not effective and easy-to-implement in multi-objective algorithms, a novel feasibility-based ranking strategy is introduced which is both extremely user-friendly and effective. A case study from industry has been investigated to illustrate the performance of the presented approach. The results show that the proposed algorithm can find the near pareto-optimal with higher accuracy when it is compared to conventional non-dominated sorting genetic algorithm II (NSGA-II). Moreover, the difficulties of a trial-and-error process for setting the penalty parameters is solved in this algorithm.

Keywords : Heat exchanger, Multi-objective optimization, Particle swarm optimization, NSGA-II Constraints handling.

Conference Title : ICMEDA 2015 : International Conference on Mechanical Engineering Design and Analysis

Conference Location : Istanbul, Türkiye

Conference Dates : January 26-27, 2015