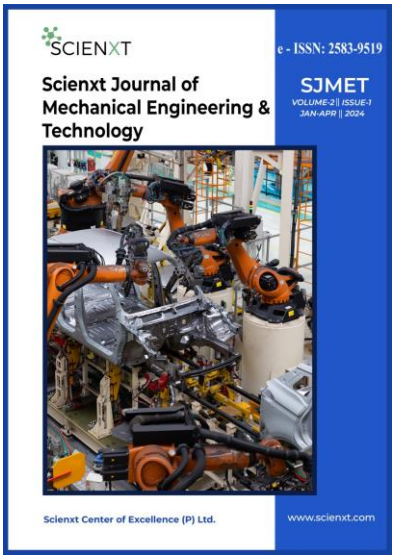

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Utilizing hybrid grey relational analysis for numerical analysis And multiple attribute decision-making optimization of flat plate pin fin heat sink

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Abstract:

The current investigation employs Grey Relational Analysis (GRA) to conduct multi-objective optimization of flat pin fins heat sinks. Through various simulations, including simulations numbered 03, 2, and 11, optimal configurations have been identified. Notably, simulation 03, characterized by specific dimensions (length = 70 mm, width = 70 mm, fin height = 10 mm, base height = 4 mm, fin thickness = 1.2 mm, and 30 fins), emerges as one of the top-performing setups. Additionally, an analysis reveals the significant influence of parameters such as fin length, width, height, thickness, and number on heat transfer efficiency. For instance, optimal values for maximizing the heat transfer coefficient include length = 80 mm, width = 70 mm, fin height = 10 mm, base height = 8 mm, fin thickness = 1 mm, with 30 fins. Conversely, minimizing pressure drop is crucial, with the optimal configuration characterized by length = 90 mm, width = 90 mm, fin height = 30 mm, base height = 6 mm, fin thickness = 0.8 mm, and 10 fins. These findings offer valuable insights for enhancing the performance of flat pin fins heat sinks across various thermal management applications.

Keywords:

Grey Relational Analysis (GRA), multi-objective optimization, flat pin fins heat sink, simulation, optimal configurations, heat transfer efficiency, heat transfer coefficient, pressure drop