Hybrid flow shop scheduling with energy consumption in machine shop using moth flame optimization

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ABSTRACT

Hybrid flow shop with energy consumption (HFS-EC) combine the flow shop scheduling and parallel machine scheduling problem with the aim to optimize energy utilization, besides regular makespan in the production scheduling. This paper optimizes an HFS-EC case study using Moth Flame Optimization (MFO). The case study has been conducted in a machine shop concentrating on three machining types; lathe, milling and deburring. The objectives were to optimize makespan and total energy consumption in the machine schedule. Optimization using MFO has been conducted and the results was compared with well-established algorithm like Genetic Algorithm, Ant Colony Optimization and Particle Swarm Optimization. The results were also compared with relatively recent algorithm such as Whale Optimization Algorithm and Harris Haws Optimization. Based on the optimization results, the MFO outperformed other comparison algorithms for the mean fitness and also the best fitness. Although there were other solutions with better individual optimization objectives, but results obtained by MFO compromised between minimum makespan and energy consumption. The proposed HFS-EC model and MFO algorithm has a great potential to be implemented in other scheduling case study due to benefit of reducing carbon emission and at the same time maintain the production output.

KEYWORDS

Energy consumption; Hybrid flow shop; Moth flame optimization; Scheduling optimization

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