

Parameters Optimization of Surface Grinding Process with Particles Swarm Optimization, Gravitational Search, and Sine Cosine Algorithms: A Comparative Analysis

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Abstract.

The selection of parameters in grinding process remains as a crucial role to guarantee that the machined product quality is at the minimum production cost and maximum production rate. Therefore, it is required to utilize more advance and effective optimization methods to obtain the optimum parameters and resulting an improvement on the grinding performance. In this paper, three optimization algorithms which are particle swarm optimization (PSO), gravitational search, and Sine Cosine algorithms are employed to optimize the grinding process parameters that may either reduce the cost, increase the productivity or obtain the finest surface finish and resulting a higher grinding process performance. The efficiency of the three algorithms are evaluated and compared with previous results obtained by other optimization methods on similar studies. The experimental results showed that PSO algorithm achieves better optimization performance in the aspect of convergence rate and accuracy of best solution. Whereas in the comparison of results of previous researchers, the obtained result of PSO proves that it is efficient in solving the complicated mathematical model of surface grinding process with different conditions.

Keywords: Particle swarm optimization Gravitational search algorithm Sine Cosine algorithm Surface grinding process Production costs