ANN and GA-based process parameter optimization for MIMO plastic injection molding

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Abstract

Determining optimal initial process parameter settings critically influences productivity, quality, and costs of production in the plastic injection molding (PIM) industry. Up to now, most production engineers have either used trial-and-error or Taguchi’s parameter design method to determine initial settings for a number of parameters, including melt temperature, injection pressure, injection velocity, injection time, packing pressure, packing time, cooling temperature, and cooling time. But due to the increasing complexity of product design and multi-response quality characteristics, these multiple input- multiple output (MIMO) methods have some definite shortcomings. This research integrates Taguchi’s parameter design methods with back-propagation neural networks, genetic algorithms, and engineering optimization concepts, to optimize the initial process settings of plastic injection molding equipment. The research results indicate that the proposed approach can effectively help engineers determine optimal initial process settings, reduce set-test iterations, and achieve competitive advantages on product quality and costs.

Keyword：Plastic injection molding; Back-propagation neural networks; Taguchi’s parameter design; Genetic algorithms