Process Parameters Optimization of Multiple Quality Characteristics in Plastic Injection Molding Using BPNN and GA

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Abstract

This paper presents an optimization approach to find optimal process parameters of multiple quality characteristics in plastic injection molding (PIM). Melt temperature, injection velocity, packing pressure, packing time, and cooling time are selected as process parameters in the experiment. Besides, product length and warpage are chosen as multiple quality characteristics. Taguchi orthogonal array is firstly conducted in the experiment and the experimental data are employed to calculate the signal-to-noise (S/N) ratio. Analysis of variance (ANOVA) is then used to find the best combination of parameter settings for product length and warpage. In addition, BPNN is used to construct an S/N ratio predictor. Then, the S/N ratio predictor is associated with GA to obtain the optimal process parameter. Finally, two confirmation experiments are taken to exam the effectiveness of proposed approach. Experimental results show that the proposed optimization approach not only can satisfy the quality characteristics, but also can improve process stability.

Keyword：ANOVA, BPNN, GA, injection molding,taguchi method