A Study of Plastic Injection Molding Optimization Process Using Taguchi Method and PCA

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ABSTRACT

In modern society, plastics injection molding technology has been widely used in variety of industrial products. Conventional plastic injection molding process has popular problem of ineffective control of quality; occurrence of this phenomenon is due to lack of systematic method to maintain stable quality, if it can be solved, then product quality could be raised to higher level, further reinforcing its industry competency. This study focused on optimization of multiple dimensions in injection molding process, applied Taguchi method to conduct preliminary Taguchi test first; then combined with Principle Component Analysis, obtained optimum factor and level combination, and enhanced stability of product geometry. Thereafter, this study found that Principle Component Analysis could be effectively used in multiple-quality-feature problems to obtain integral solution, so as to compensate disadvantage of conventional Taguchi method; furthermore, holding pressure could be regarded as adjustment factor of target process, this parameter factor could regulate mean size of finished product so as to approximate to target value and increase geometry accuracy. From analysis of variance result, it's known that three parameters, material temperature, holding pressure and injection location, have significant impact on size of finished product.

Keywords: Plastic Injection Molding; Taguchi Method; Principle Component Analysis; Adjustment Factor; Analysis of Variance (ANOVA)

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