The Rotating-Molded Thermoplastic Foaming Process Optimization Design by Using Taguchi Methods

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ABSTRACT

Rotating-molded technology has been widely used in the production of large plastic containers. Due to the manufacturing process of rotational molding, a variety of products with non-symmetric shape can be produced. However, high-temperature and gas are inevitable by-products during foaming process. They could cause gas explosion because of excessive pressure on the mold. This process cannot be easily controlled, and they produce a lot of industrial waste and low efficiency. For these reasons, the development of reliable process such as rotational foaming process has become a favorable process for plastic foaming industry. In this study, we investigated the effects of the key characteristics of the foaming process and explored the optimal parameters through Taguchi ’ s method with a systematic experimental design. We used two-models in single axis for two different molds and foaming agents to conduct pair comparison. That can not only reduce the cost of experiment, but also decrease the time consumed for the experiment. We found that the characteristics of process such as speed of rocker arm, heating temperature at the first phase, heating time at the first paragraph, heating temperature at the second phase, heating time at the second phase, and cooling time, air-cooled time , water-cooled time. The parameters of forming process include speed, temperature and time was also discussed. We have used L18(2137) orthogonal array, S / N ratio and theoretical analysis of variance (ANOVA) to analysis our data. The study found that the product quality can be ensured by setting a set of optimal parameters such as molding temperature, length of reaction time and cooling time of foam.

Keywords : rotating-molded ; Taguchi experimental design ; rotating foam ; ANOVA ; S/N ratio

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