

Warpage analyses on thin plate in three-plate mold by Taguchi method and analysis of variance (ANOVA) for PC, ABS and PC/ABS

Abstract

Warpage is a common issue in plastic injection molding process. It can get worse for thin parts and therefore it is more challenging for product design engineers, mold designers and manufacturing engineer to cope with overwhelming customer demands on small and thin products lately. A lot of research have been done on this topic just to study the most significant factors influencing warpage on plastic parts but lack of study on thin plate parts by using pin point gate which is automatic de-gating gate which have an ability to reduce production cost. In this study, thin plate plastic product is to be the subject of analysis. The part with dimension 120mm x 50mm x 1mm is evaluated using pin point gate in three-plate mold. Three experiments have been done using Autodesk Mold flow Insight (AMI) to simulate warpage resulted on the thin plate parts by using Polycarbonate (PC), Acrylonitrile Butadiene Styrene (ABS) and Polycarbonate/Acrylonitrile Butadiene Styrene (PC/ABS) materials. Taguchi Method is applied in identifying the optimum value of injection molding parameters while Analysis of Variance (ANOVA) is used to get the most significant factor affected warpage. The results show that packing time is the most significant factor affecting warpage on thin plate parts for PC, ABS and PC/ABS materials. This finding is significant in helping industrial practitioners particularly in manufacturing ultra-thin shell parts with high quality in term of warpage issues.