

Application of RSM to optimise moulding conditions for minimizing shrinkage in thermoplastic processing

Abstract

This study focuses on the analysis of plastic injection moulding process simulation using Autodesk Moldflow Insight (AMI) software in order to minimize shrinkage by optimizing the process parameters. Two types of gates which is single and dual gates have been analysed. Nessei NEX 1000 injection moulding machine and P20 mould material details are incorporated in this study on top of Acrylonitrile Butadiene Styrene (ABS) as a moulded thermoplastic material. Coolant inlet temperature, melt temperature, packing pressure and cooling time are selected as a variable parameter. Design Expert software is obtained as a medium for analysis and optimisation to minimize the shrinkage. The polynomial models are obtained using Design of Experiment (DOE) integrated with RSM Center Composite Design (CCD) method in this study. The results show that packing pressure is a main factor that contributed to shrinkage followed by coolant inlet temperature, while melt temperature and cooling time has less significant for both single and dual gates. Meanwhile, single gate shows a better result of shrinkage compared to the dual gates.

Keywords; Injection Moulding, Optimization, RSM, Shrinkage