



Materials and Manufacturing Processes >

Volume 26, 2011 - [Issue 2](#)

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Investigating the Effects of Injection Molding Parameters on the Mechanical Properties of Recycled Plastic Parts Using the Taguchi Method

Nik Mizamzul Mehat & Shahrul Kamaruddin

Pages 202-209 | Received 22 Jul 2010, Accepted 28 Sep 2010, Published online: 24 Mar 2011

Cite this article <https://doi.org/10.1080/10426914.2010.529587>

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Abstract

The growing amount of plastic parts produced nowadays makes the search for alternatives in recycling and the further use of these nonbiodegradable materials imperative. The degradation of the mechanical properties of recycled plastic products poses the primary limitation for the usage of recycled plastic. One of the foremost causes of mechanical property degradation is variation in processing parameters. An appropriate optimization method that effectively controls all influential processing parameters during manufacturing is therefore critical. This study investigates the effects of injection molding parameters on the mechanical properties of recycled plastic parts. The preliminary experiment is conducted by using Moldflow Plastic Insight (MPI) integrated with the L_{18} Taguchi orthogonal array (OA). The significant processing

parameters obtained from the preliminary experiment were used to conduct the principal experiment. By adopting L₉ Taguchi OA, the parts made from recycled plastic were produced by injection molding. ANOVA confirms that the most significant factor for flexural modulus of a recycled toolbox tray is injection time (~40.49% percentage contribution). For stress at yield, the most significant factor is melt temperature with percentage contribution of about 43.34%.

Keywords:

- Flexural modulus
- Injection molding
- Recycled plastic
- Simulation
- Stress at yield
- Taguchi method

ACKNOWLEDGMENT

The authors acknowledge the Short-term Research Grant provided by University Sains Malaysia, Pulau Pinang, for funding the study that resulted in this article.

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