UNIVERSITI TEKNOLOGI MARA

DISPOSABLE MOUTH MIRROR USING POLYPROPYLENE: DEVELOPMENT AND SIMULATION ANALYSIS WITH MOLDFLOW FOR PROCESS PARAMETER OPTIMIZATION

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ABSTRACT

This study developed a new 3D model of disposable mouth mirror and simulated the model to study the material behaviour of the product during injection moulding process. Today, the present availability of this product does not make efficient use of the disposable mouth mirror function, which not implying the possibility of making the product's function into multi-use. Hence, this study proposed a new integrated 3D model of disposable mouth mirror. Furthermore, major problem with this kind of manufacturing process is if the setup parameter is incompatible with the material and process cycle, the product is prone to defects which affecting the products functionality. This study has three goals: (1) To create and integrate 3D CAD/CAE model of disposable mouth mirror, (2) To simulate and analyse material behaviour on disposable mouth mirror using Moldflow™, and lastly (3) To identify the most significant parameters that influence the existence of warpage, shrinkage and sink mark on disposable mouth mirror. In this research, an integration of computer aided technology known as CAD/CAE was proposed for a new development of disposable mouth mirrors made of Polypropylene (PP). During CAD process, a software known CATIA V5 has been implies. Meanwhile, Moldflow™ Plastic Insight software is utilised in order to achieve objectives number two. To reduce the development of volumetric shrinkage, warpage, and sink marks on disposable mouth mirrors, a parameter optimization based on the integration of Taguchi method, ANOVA and Grey relational analysis (GRA) was used. Four main controlling parameters, including melt temperature, flow rate, cooling time, and mould temperature, were utilized to examine the main effects of these parameters on the product. According to the multi-objectives results, melt temperature shows the highest contribution to the presence of the product defects. Meanwhile, the combination of the best operating parameter for this study is found to be melting temperature at 180°C, flow rate at 243.6 cm^3/s, cooling time at 12 seconds and mould temperature at 30°C was suggest for best optimum combination.

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For indeed, with hardship [will be] ease.
Indeed, with hardship [will be] ease.
{QURAN 94:5-6}

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