

**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<sup>3</sup>/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}*

# TABLE OF CONTENTS

	<b>Page</b>
<b>CONFIRMATION BY PANEL OF EXAMINERS</b>	<b>ii</b>
<b>AUTHOR'S DECLARATION</b>	<b>iii</b>
<b>ABSTRACT</b>	<b>iv</b>
<b>ACKNOWLEDGEMENT</b>	<b>v</b>
<b>TABLE OF CONTENTS</b>	<b>vi</b>
<b>LIST OF TABLES</b>	<b>ix</b>
<b>LIST OF FIGURES</b>	<b>xi</b>
<b>LIST OF SYMBOLS</b>	<b>xiv</b>
<b>LIST OF ABBREVIATIONS</b>	<b>xvi</b>
<b>CHAPTER ONE INTRODUCTION</b>	<b>1</b>
1.1 Research Background	1
1.2 Problem Statement	4
1.3 Research Question	5
1.4 Research Objectives	5
1.5 Research Scope and limitations	5
1.6 Significant of Study	6
<b>CHAPTER TWO LITERATURE REVIEW</b>	<b>7</b>
2.1 Introduction	7
2.1.1 Current Status of Disposable Mouth Mirror	7
2.1.2 Ergonomics Aspects	10
2.2 Design Processes	12
2.2.1 Process Step	12
2.2.2 Morphological Chart	13
2.2.3 Pugh Method	15
2.3 Material for Disposable Hospital Goods	16
2.3.1 Thermoplastics	17
2.4 Processing Parameter in Injection Moulding	21

2.4.1	Defects in Plastic Injection Moulding	23
2.5	Computer Integrated Manufacturing	31
2.5.1	CAD Processes	31
2.5.2	CAE Processes	36
2.6	Parameter Optimization Method	47
2.6.1	Taguchi Design Approach	48
2.6.2	Analysis of Variance (ANOVA)	49
2.6.3	Multi-Objective Optimization	51
2.7	Research Gap	53
 <b>CHAPTER THREE RESEARCH METHODOLOGY</b>		<b>58</b>
3.1	Project Methodology	58
3.1.1	CAD – Designing Method	60
3.2	CAE – Finite Element Analysis	67
3.2.1	Moldflow™ Simulation Flowchart	68
3.2.2	CAE Simulation Process	70
3.2.3	Mesh Match Percentage Test	74
3.2.4	CAE Cavity Model	75
3.2.5	Design of Experiment (DOE) in Moldflow™	79
3.2.6	Simulation Output	81
3.3	Process Parameter Optimization	82
3.3.1	Parameters and Levels Selection	83
3.3.2	Multi-Objectives Optimization	84
 <b>CHAPTER FOUR RESULTS AND DISCUSSION</b>		<b>86</b>
4.1	To create and integrate 3D CAD/CAE model of disposable mouth mirror	86
4.1.1	Design and Analysis of Disposable Mouth Mirror	86
4.1.2	3D CAD Model of Disposable Mouth Mirror	87
4.2	To simulate and analyse material behaviour on disposable mouth mirror by using Moldflow™	89
4.2.1	CAE Analysis	89
4.2.2	Disposable Mouth Mirror Defects Based on Simulation Analysis	97