



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

OPTIMIZATION PARAMETERS OF INJECTION MOULDING MACHINE FOR REDUCING WARPAGE ON POLYPROPYLENE (PP) DOG BONE PART

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Manufacturing Engineering Technology (Process and Technology) with Honours.

by

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FOR REDUCING WARPAGE ON POLYPROPYLENE DOG BONE PART

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DECLARATION

I hereby, declared this report entitled OPTIMIZATION PARAMETERS OF INJECTION MOULDING MACHINE FOR REDUCING WARPAGE ON POLYPROPYLENE DOG BONE PART is the results of my own research except as cited in references.

Signature:

Author : DHARSHINI VEJEKUMARAN

Date: 10/12/2019

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering Technology (Technology and Process) with Honours. The member of the supervisory is as follow:

Signature:

Supervisor : **SALLEH BIN ABOO HASSAN**

ABSTRAK

Proses Pengacuan Suntikan adalah operasi pemrosesan polimer yang penting yang digunakan secara meluas dalam Industri Plastik. Polimer biasanya disuntik ke rongga acuan dan menguatkan bentuk acuan. Proses pengacuan suntikan melibatkan pelbagai parameter yang mengurangkan kecacatan kualiti permukaan dan meningkatkan kualiti dan produktiviti bahagian plastik. Dalam proses pengoptimum, parameter mesti beroperasi pada tahap optimum untuk prestasi yang boleh diterima. Parameter Molding Yang Paling Dipertimbangkan yang terlibat dalam kajian ini adalah suhu cair bahan, suhu acuan, masa suntikan dan tekanan suntikan. Kajian ini melibatkan spesimen Bone Dog Polypropylene yang disuntikkan di bawah pelbagai parameter pemrosesan. Arahan Orthogonal nisbah Taguchi dan S / N digunakan untuk mencari tahap optimum untuk menunjukkan kesan parameter proses pada warpage. Parameter yang paling ketara akan diketahui pada akhir eksperimen. Kajian penyelidikan ini boleh membantu jurutera dan kuliah secara berkesan dalam menentukan tetapan parameter proses yang optimum dan mencapai kelebihan daya saing kualiti produk dan kos.

ABSTRACT

Injection Moulding Process is an important polymer processing operation which widely used in Plastic Industry. Polymer usually injected into a mould cavity and solidifies to the shape of the mould. Injection Moulding process involves of various parameters which reduce surface quality defect and increase the quality and productivity of plastic parts. In the optimization process, the parameters must be operating at optimum levels for acceptable performance. Most considered Moulding Parameters involved in this study were material melt temperature, mould temperature, injection time and injection pressure. This study involves with Polypropylene Dog Bone specimen which injected under various processing parameters. Orthogonal Arrays of Taguchi and S/N ratio utilized to find the optimum levels to indicate the impact of the process parameters on warpage. The most significant parameters will find out at the end of the experiment. This research study propose can effectively help engineers and lectures in determining the optimal process parameter settings and achieve competitive advantage of product quality and costs.

DEDICATION

To my beloved parents

ACKNOWLEDGEMENTS

I would like to thank everyone who had contributed to the successful completion of this research. I would like to express gratitude to my Research Supervisor En. Salleh Bin Aboo Hassan for his invaluable advice, guidance and his enormous patience throughout the end of my research.

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TABLE OF CONTENTS

	PAGE
DECLARATION	
DEDICATION	
ABSTRACT	i
ABSTRAK	ii
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	
LIST OF TABLES	iv
LIST OF FIGURES	v
LIST OF APPENDICES	vi
CHAPTER 1: INTRODUCTION	
1.1 Introduction	1
1.2 Background of Study	1
1.3 Objective	3
1.4 Problem Statement	3
1.5 Scope	4
1.6 Significance of Study	5

CHAPTER 2: LITERATURE REVIEW

2.1 History of Plastic	6
2.2 Classification of Plastic	7
2.2.1 Thermoplastic	12
2.2.1.1 Application of thermoplastic	14
2.2.1.2 Polypropylene Plastic Resin	15
2.2.1.3 Advantages and Disadvantages	17
2.2.2 Thermosetting	18
2.2.2.1 Application of Thermosetting	19
2.3 Plastic Shaping Process	21
2.3.1 Injection Molding Process	21
2.3.2 Plastic Mold	23
2.4 Dog Bone Specimen Part	25
2.5 Taguchi Method	26
2.6 Process Parameter	27
2.7 Warpage	29
2.7.1 Incorrect Processing Parameter	30
2.7.2 Mould Issue	30
2.7.3 Injection Moulding Main Issue	31
2.7.4 Part Design Issue	31
2.7.5 Poor Material Selection	31
2.8 Profile Projector Horizontal	31

CHAPTER 3: METHODOLOGY

3.0 Introduction	33
3.1 Weekly Progression	33
3.2 Planning of Study	37
3.3 Flow Chart	38
3.3.1 Pre-Planning of Experiments	40
3.3.2 Sample Measuring Process	40
3.3.3 Selecting Key Variable and Quality Characteristics	40
3.3.4 Optimizing Parameter	40
3.3.5 Influential Parameters	41
3.3.6 Material Consideration	41
3.3.7 Mould and Injection Machine	43
3.3.8 Measuring the S/N Ratio and optimization	44
3.4 Analysing Data using Taguchi Method	45
3.5 Preliminary result	47
3.6 Conclusion	48

CHAPTER 4 RESULT AND CONCLUSION

4.1 Introduction	49
4.2 Experiment factor level used	50
4.3 Setting of parameter for each trials	52
4.4 Design of experiments (DOF)	54
4.5 Standard Operation Procedure (SOP) of Taguchi method	56
4.6 Sample Measurement	60

4.7 Findings and Data Analysis of Warpage	61
4.8 Main Effects of Means Response	64
4.9 Main Effect of S/N ratio	66
4.10 Predicted Result at Optimum Setting Condition	68
CHAPTER 5 CONCLUSION AND RECOMMENDATION	
5.1 Summary and Conclusion	69
REFERENCES	70
APPENDICES	75

LIST OF TABLES

TABLE	TITLE	PAGE
Table 1.0	Code Number According the	9
Table 1. 1	General Properties and Example of Each Type of Plastics	10
Table 1.2	Thermosetting Plastic Properties and Examples	11
Table 1.3	Detail Explanation of Advantages & Disadvantages of Polypropylene	20
Table 1.4	Weekly Progression of Project	30
Table 1.5	Material Consideration of Polypropylene	35

LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 1.0	Classification of Plastics	8
Figure 1.1	Injection Moulding Machine Diagram	15
Figure 1.2	Chain Growth Polymerization of Polypropylene	18
Figure 1.3	Dog Bone Specimen's Structure Analysis	22
Figure 1.4	Image of Warpage Defect in a Material	26
Figure 1.5	Gantt Chart of the Weekly Progression	31
Figure 1.6	Example Dog Bone Specimen	36
Figure 1.7	Preparation of Pre-Planning Experiments	34
Figure 1.8	CHESO Model Injection Moulding Machine	37
Figure 1.9	P-diagram or Process Diagram	39

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix 1	Example Appendix	13

LIST OF SYMBOLS

D, d	-	Diameter
F	-	Force
g	-	Gravity = 9.81 m/s
I	-	Moment of inertia
l	-	Length
m	-	Mass
N	-	Rotational velocity
P	-	Pressure
Q	-	Volumetric flow-rate
r	-	Radius
T	-	Torque
Re	-	Reynold number
V	-	Velocity
w	-	Angular velocity
x	-	Displacement
z	-	Height
q	-	Angle

LIST OF ABBREVIATIONS

PCA Principal Component Analysis

LIST OF PUBLICATIONS

CHAPTER 1

INTRODUCTION

1.1 Background

Kenaf is a warm annual crop. It is a member of hibiscus family and related to cotton and jute. Kenaf is originally a native in Africa. For the last 200 years, India has produced and used kenaf. In the United States, kenaf was introduced as material for the war effort during World War II. Then in 1950s, the US researchers have found that kenaf was an excellent cellulose fiber source for pulping of paper products (Webber et. al., 2002).

Kenaf plant is growing to more than 3 meters tall within 4-5 months. The stems are 2.5cm – 3.5cm diameter and consisting of two parts, an outer fibrous bark and an inner woody core (Zhang, 2003). Raw kenaf fiber obtained from the outer fibrous bark is abundant of lignocelluloses fibers. The core is the spongy tissue inner the bark of the plant.

This chapter introduces the subject matter and problem(s) being studied, and indicates its importance and validity. Introduction is the first part of a thesis and allows the readers to get the general idea of what your thesis is about. It also acquaints the readers with the thesis topic, explaining the basic points of the research and pointing the direction of your research. Introduction sets out the hypotheses to be tested (if applicable) and research objectives to be attained. It is important to remember that the research objectives stated in the thesis should match the findings of the study. Failing to do so could result a

recommendation by the examiners to conduct additional studies so that the stated objectives are met.

1.2 Statement of the Purpose

The purpose of the research is to investigate the effect of fiber treatment on the mechanical properties such as tensile, flexural and impact properties and water absorption of kenaf/polyester composite.

1.3 Problem Statement

Composite materials offer many exceptional properties that are difficult or impossible to match with traditional materials such as steel, aluminum and wood. Previously, composites made of glass and carbon fibers replaced many metal applications by supplying the benefits of low cost and high strength properties. Synthetic fiber composite is very well known for its strength and rigidity. For an example, the bicycle frame made from glass-carbon composites are offer high strength and lightweight.

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Table 1.1: Comparison of Experimental and Computer Simulation Results

Distance Ratio	Experiment (Mean value)	Computer Simulation (Mean Value)
0.125	0.25	0.137
0.250	0.46	0.560
0.375	0.63	0.738
0.500	0.75	0.861
0.625	0.83	0.939

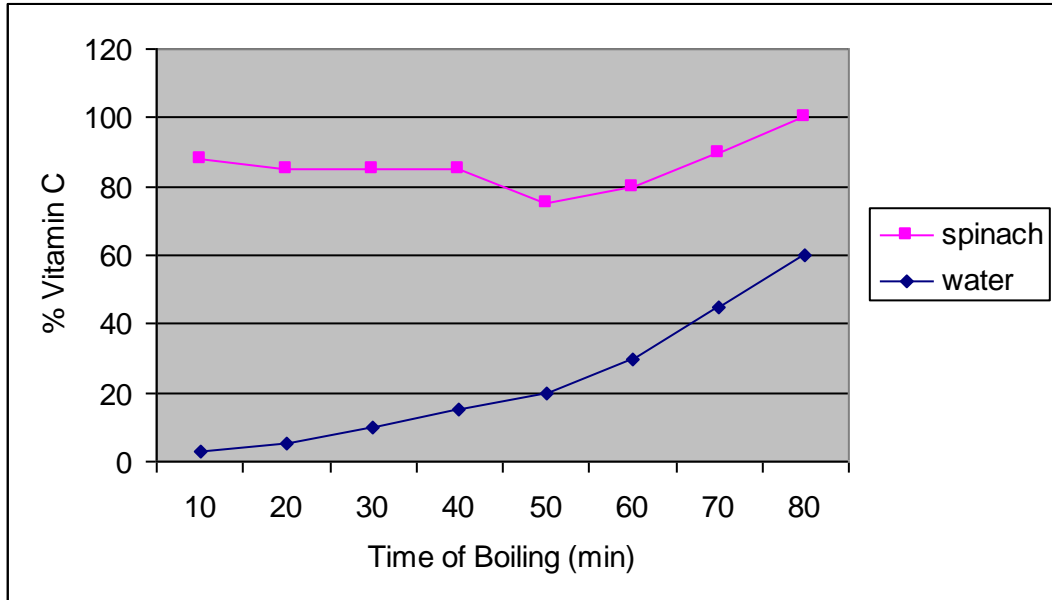


Figure 1.1: Example of Graph Effect of Boiling on Leaching of Vitamin C from Spinach

Example of Pie Chart

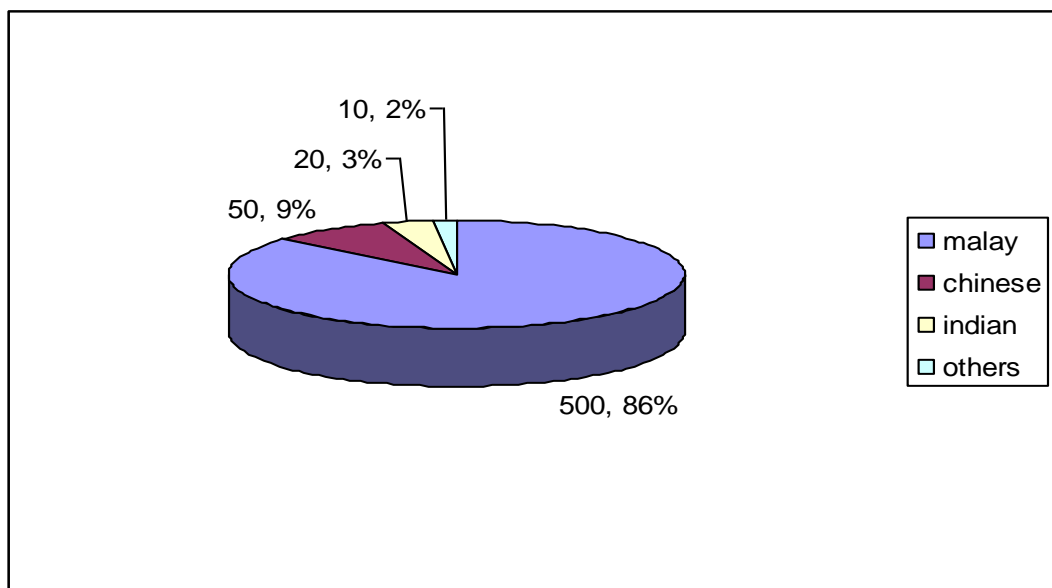


Figure 1.2: Number of Population in Jasin by Races

CHAPTER 2

LITERATURE REVIEW

2.1 Sub-heading 2

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