

**LIFE CYCLE ASSESSMENT (LCA) OF WOOD PLASTIC
COMPOSITE (WPC): IDENTIFYING END-OF-LIFE OPTION**

ZAKIAH HANI BINTI AB RASHID

**Final Year Project Report Submitted in Partial
Fulfilment of the Requirements for the
Degree of Bachelor of Science (Hons.) Furniture Technology
in the Faculty of Applied Sciences
Universiti Teknologi MARA**

JULY 2019

CANDIDATE DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as reference work. This proposal has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

In the event my thesis is found to violate the conditions mentioned above, I voluntarily waive the right of conferment of my degree and agree to be subjected to the disciplinary rules and regulation of Universiti Teknologi MARA.


Name of Candidate : Zakiah Hani Binti Ab Rashid
Candidate's Id No : 2016668374
Programme : Degree of Bachelor of Science (Hons.) Furniture
Technology AS247
Faculty : Applied Sciences
Thesis Title : Life Cycle Assessment (LCA) of Wood Plastic
(WPC): Identifying end-of-life option.
Signature of Candidate : 
Date : JULY 2019

TABLE OF CONTENTS

	Page
APPROVAL SHEET	1
CANDIDATE DECLARATION	2
ACKNOWLEDGEMENTS	3
TABLE OF CONTENTS	5
LIST OF TABLES	7
LIST OF FIGURES	8
LIST OF ABBREVIATIONS	10
ABSTRACT	12
ABSTRAK	13
CHAPTER 1 INTRODUCTION	
1.1 Background of the study	14
1.2 Problem statement	17
1.3 Significant of study	18
1.4 Objectives of study	18
1.5 Plastic - Environment and Human Health	19
CHAPTER 2 LITERATURE REVIEW	
2.1 Wood Based Composite	22
2.2 Wood Plastic Composites	24
2.3 Life Cycle Assessment (LCA)	26
2.4 Trend and Market Potential	27
2.5 Polypropylene	29
2.6 Types of Testing	30
CHAPTER 3 METHODOLOGY	
3.1 Raw materials collection and preparation	31
3.2 Preparation of Wood Plastic Composite	31
3.2.1 Blending In Dispersion Mixture	33
3.2.2 Crushing Into Pellets	34
3.2.3 Hot Press	35
3.2.4 Cold Press	36
3.3 Sample Cutting and Conditioning	37
3.3.1 Tensile Board	37
3.3.2 Bending Board	38
3.4 Testing Method	38
3.4.1 Determination of Tensile Strength (MOR and MOE)	39

3.4.2	Determination of Bending Strength (MOR and MOE)	40
3.4.3	Determination of Water Absorption (WA)	41
3.4.4	Determination of Thickness Swelling (TS)	41
3.5	Statistical Analysis	41
3.6	Experimental Design	42

CHAPTER 4 RESULTS AND DISCUSSION

4.1	ANOVA Analysis	43
4.1.1	Summary of ANOVA on Different Amount of Loadings	43
4.1.2	Summary of ANOVA on Cycle Time	44
4.2	DMRT Analysis	45
4.2.1	DMRT Analysis on Different Amount of Loadings	45
4.2.2	DMRT Analysis on Recycle of Loadings	45
4.3	Effect of different filler loading on mechanical properties	46
4.3.1	Tensile (MOE) strength properties	46
4.3.2	Tensile (MOR) strength properties	48
4.3.3	Bending (MOE) strength properties	49
4.3.4	Bending (MOR) strength properties	50
4.4	Mechanical properties for Recycle of Loadings	51
4.4.1	Tensile (MOE and MOR) strength properties	51
4.4.2	Bending (MOE and MOR) strength properties	53
4.5	Physical Properties for Different Amount of Loadings	55
4.5.1	Thickness Swelling and Water Absorption	55
4.6	Physical Properties for Recycle of Loadings	57
4.6.1	Thickness Swelling and Water Absorption	57

CHAPTER 5

5.1	CONCLUSION AND RECOMMENDATIONS	59
-----	--------------------------------	----

CITED REFERENCES	61
CURRICULUM VITAE	65
EVALUATION OF FINAL YEAR PROJECT UNDERTAKING	66
PUBLICATION OF THE PROJECT REPORT UNDERTAKING	67
PERMISSION FOR REFERENCES AND PHOTOCOPYING	68

ABSTRACT

Wastes and scraps from wood based and plastic industry can contribute to environmental harm if no appropriate handling methods are taken. Combinations of both wood and plastic wastes are able to produce wood plastic composite. The objective of this research was to observe the LCA of the WPC and to determine the physical and mechanical properties of WPC after recycle process. Three different filler loadings (50%, 70% and 90%) were used. Blending of polypropylene with sawdust took place in the dispersion mixer for 1 hour at 180 °C before hot pressed and cold pressed. Next, testing on bending, tensile, water absorption and thickness swelling were done. Results shown that there was a significant effect of different amount of loadings and recycle of filler loadings on the wood plastic composite. 70% of polypropylene with 30% of wood filler showed the highest percentage mechanical properties for tensile and bending MOR. While for the recycling process, first recycle showed the highest strength of tensile and bending. Thermoplastic composite boards were then tested for tensile, bending, water absorption are according to ASTM standard.