UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ENVIRONMENTAL ASSESSMENT OF DESIGN OF BIODEGRADABLE FOOD PACKAGING

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in fulfillment of the requirements for the degree of
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DECLARATION

I declare that this Choose an item. entitled “Environmental Assesment Of Design Of Biodegradable Food Packaging” is the result of my own research except as cited in the references. The Choose an item. has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature	:	
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Date	:	7/6/2022

APPROVAL

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Mechanical and Manufacturing Engineering Technology (Product Design) with Honours.

Signature : 

Supervisor Name : DR. MASTURA BINTI MOHAMMAD TAHA

Date : 7/6/2022

DEDICATION

I dedicate this project to Allah SWT, my creator, my strong pillar, my source inspiration, wisdom, knowledge, and understanding. Throughout this journey, Allah has been the source o my strength, and I have only flown on Allah's wings. I also devote my dissertation effort to my family and numerous friends. Besides that, my beloved parents, Mr. Zainal Bin Muharam and Srinaton Binti Hamdan. Whose of their words encourage me and advice me for this project. In addition, I would like to thank to my siblings for giving their support and always be there for me whenever sometimes I give up. I wish that I will make them proud of me. After that, I also thanks to my supervisor, Dr. Mastura Binti Mohammad Taha for her dedication and guidance throughout this entire project. Thanks to Allah SWT for giving me good and nice people surrounding me.

ABSTRACT

Purpose this project initially is to design and develop a multipurpose biodegradable food Packaging and develop it which is can satitsfies customer requirement and solves problem such as not comfortable and no added compartment. A questionnaire survey is conducted as preliminary research to establish the consumers' requirements early in the project. The technical qualities of these clients' requests are ranked using an AHP pairwise comparison matrix. The House of Quality (HOQ) is the method's principal tool, where all of this data will be recorded and calculated. Besides, this project is also focus on how the product will give the impact to the environment. So, with the using of Gabi, it will help to know and identify which material whether the biodegradable or non-biodegradable will give the higher impact to the environment. From the result, the material that make the higher impact to the environment is Polypropylene (PP). This is because chemical in the polypropylene release harmful substance that can occur pollution. So, based on the findings, Polylactic Acid (PLA) is the right material that can be used for making a product. By using biodegradable plastics, it give many advantages such as produce less emission, less waste, less energy and can be decompose quickly.

ABSTRAK

Tujuan projek ini pada mulanya adalah untuk mereka bentuk dan membangunkan Pembungkusan Makanan Terbiodegradasi pelbagai guna dan membangunkannya yang dapat memenuhi keperluan pelanggan dan menyelesaikan masalah seperti tidak selesa dan tiada ruang tambahan. Tinjauan soal selidik dijalankan sebagai penyelidikan awal untuk menentukan keperluan pengguna pada awal projek. Kualiti teknikal permintaan pelanggan ini disenaraikan menggunakan matriks perbandingan berpasangan AHP. Rumah Kualiti (HOQ) ialah alat utama kaedah, di mana semua data ini akan direkodkan dan dikira. Selain itu, projek ini juga memberi tumpuan kepada bagaimana produk tersebut akan memberi impak kepada alam sekitar. Jadi, dengan penggunaan Gabi, ia akan membantu untuk mengetahui dan mengenal pasti yang mana sama ada biodegradasi atau tidak terbiodegradasi akan memberi impak yang lebih tinggi kepada alam sekitar. Jadi, dengan penggunaan Gabi, ia akan membantu untuk mengetahui dan mengenal pasti bahan yang mana sama ada biodegradasi atau tidak terbiodegradasi akan memberi impak yang lebih tinggi kepada alam sekitar. Daripada hasilnya, bahan yang memberi kesan yang lebih tinggi kepada alam sekitar ialah Polipropilena (PP). Ini kerana bahan kimia dalam polipropilena membebaskan bahan berbahaya yang boleh berlaku pencemaran. Jadi, berdasarkan penemuan, Polylactic Acid (PLA) adalah bahan yang sesuai digunakan untuk membuat sesuatu produk. Dengan menggunakan plastik biodegradasi, ia memberi banyak kelebihan seperti menghasilkan kurang pelepasan, kurang bahan buangan, kurang tenaga dan boleh terurai dengan cepat.

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LIST OF SYMBOLS AND ABBREVIATIONS

QFD	-	Quality Function Deployment
HOQ	-	House of Qualty
PETE	-	Polyethylene Terephthalate
PEN	-	Polyethylene Naphthalate
PVdC	-	Polyvinylidene Chloride
VOC	-	Voice of Customer
CAD	-	Computer-Aided Design
EDS	-	Engineering Design Specification
PLA	-	Polylactic Acid
LCIA	-	Life Cycle Impact Assesment
LCI	-	Life Cycle Inventory

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CHAPTER 1

INTRODUCTION

1.1 Introduction

A biodegradable material is one that can be decomposed by bacteria or other natural organisms without polluting the environment.

Biodegradable wastes are waste materials that are degraded by natural forces such as bacteria and abiotic elements such as temperature, UV, and oxygen, among others. Food waste, kitchen garbage, and other natural wastes are examples of such wastes. The entire procedure is natural, and it might happen quickly or slowly. As a result, biodegradable wastes pose little environmental concerns and risks.

However, non-biodegradable wastes are garbage that cannot be degraded by biological processes. Non-biodegradable garbage makes up the majority of inorganic waste. "Recyclable waste" refers to non-biodegradable garbage that can be recycled, while "non-recyclable waste" refers to waste that cannot be recycled.

1.2 Background

This project reports represents my product which is biodegradable food packaging inspired by classic food packaging in the markets. The purpose for this project is to develop a unique and creative design based on the use of food packaging generally. For this project, the purpose is want to enhance a product that focus on solving community problems. This innovation initiative is also considered as the implementation of improved solutions that meet new requirements, unarticulated needs, and also information about client needs using

various strategies such as creating a mission statement, conducting surveys, and other activities related to my product.

To invent a product, the used of product development abilities is important to generate concepts based on customer requirements and specifications. The House of Quality is done to discover customer desires for my product, which are anchored by the capabilities and resources of the business seeking to achieve those desires. It is a process of understanding customer needs, interpreting their demands into a detailed plan, and prioritizing execution processes based on what is most essential to the customer. Furthermore, 3 conceptual sketches of my product have been offered, and the concept is chosen using concept selection scoring and screening methodologies.

The product design specification has been thoroughly developed for each and every part based on the concept that has been chosen. It is easier to create and develop the 3D modelling and detail drawings for our suggested product. This procedure ensures to keep the project on pace. As a result, the prototype can be created based on the 3D modelling and detail drawings that have already been completed.

1.3 Problem Statement

Most of Biodegradable Food Packaging in the market have the same design and pattern in terms of their shapes. It somehow is inconvenient for all several of food. Especially gravy food, it easy to spill out when holding it with the wrong way. This is because most of food packaging did not seal perfectly. Food Packaging in the market are not durable and strong. Therefore, it is inconvenient to store the food inside. Food packaging that can protect the food and can be use long last are option to consider for food packaging. Nowadays, cost of biodegradable food packaging is too high in the market. The texture of packaging or material that are used can make the cost high. So, by redesigning the food packaging, it helps

to cut the rising cost. Last but not least, most of existing food packaging does not comfort user when handling the food packaging.

Besides, society is also facing the problem of plastic waste that can affect the environment. This is because most of food packaging are made from non-biodegradable plastic. So, Life Cycle Assessment is a tool for accessing environmental impacts by evaluating the product that wanted to produced. In this task, the Gabi result between the non-biodegradable and biodegradable will specify which plastic will lead high impact of the environment.

1.4 Research Objective

The main aim of this research is to design and analyze biodegradable food packaging in the environment. Specifically, the objectives are as follows:

a) To develop a design of biodegradable food packaging based on the voice of customer (VOC).

b) To fabricate biodegradable food packaging using FDM.

c) To access environmental impact of FDM printed biodegradable food packaging using Gabi software.

1.5 Scope of Research

The scope of this research are as follows:

- To understand the definition of biodegradable and its material.
- To design food packaging that are safe and can ensure the covenient of user.
- Maerial selection for packaging will be used in this study.

1.6 Summary

In summary, the goal of this project is to improve food packaging that satisfies the expectations of customers while also addressing the issues that have arisen.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this literature review section, it is a summary of studies in a certain field of study. It identifies and summarizes all relevant studies on a certain subject. It consists a introduction of biodegradable food packaging. All the research that have been read helps to aids in the evaluation of previous research, the identification of specialists, the identification of essential questions, and the determination of methodology utilized in previous studies. There is also include Product Design Development (PDD) that have been explained related to my project. Besides, this project is created using Computer Aided Design in the form of a three-dimensional design. However, the research for this project will be also discussed in this chapter.

2.2 Definition of Biodegradable

A biodegradable material is one that can be broken down by bacteria, fungi, or other biological organisms. It's usually connected with environmentally beneficial products that can decompose into natural materials. Biodegradable materials can play a critical role in decreasing pollution by allowing for reasonable modification and controlled decay (Tian, K., & Bilal, M, 2020). There are several examples of Biodegradable materials such as paper and food waste, manure, sewage sludge, hospital waste, slaughterhouse waste, dead animals and plants and food waste.