



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DESIGN ANALYSIS OF A PRESS MACHINE FOR DISPOSABLE
PET BOTTLE**

This report submitted in accordance with requirements of the Universiti Teknikal Malaysia
Melaka (UTeM) for the Bachelor of Manufacturing Engineering
(Manufacturing Design) with Honors

by

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APPROVAL

This thesis submitted to the Faculty of Manufacturing of UTEM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Design) with Honors. The member of the supervisory committee is as follow:

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Main Supervisor

(Puan Nurazua Binti Mohd Yusop)

ABSTRACT

Press machine for disposable PET bottle is one of the devices to flatten the PET bottle by using compress concept. This machine is a device to replace the traditional method where PET bottle flattened by manually method either using hand or step on by using foot. It is because this press machine can reduce the times, costs and spaces for storage the PET bottle. The tests on the press machine can be done by doing experiment on PET bottle repeatedly by using this press machine. Apart of that, analysis on press machine also carried out by using required software to study effectiveness level of press machine to compress PET bottle. By developed this press machine, not only the time and space can be reduced but with easy method in fact to press PET bottles indirectly contribute the encouragement of recycling activity to consumers.

ABSTRAK

‘Mesin tekan untuk botol PET yang hendak dibuang’ merupakan salah satu alat untuk memenyek botol PET dengan menggunakan kaedah tekan. Mesin ini merupakan salah satu peralatan bagi menggantikan kaedah tradisional dimana botol PET yang hendak dibuang dipenyek dengan menggunakan tangan atau memijak dengan menggunakan kaki. Ini kerana mesin tekan ini dapat menjimatkan dari segi masa, kos, dan juga ruang bagi penyimpanan untuk botol PET. Ujian terhadap mesin tekan ini dapat dijalankan dengan hanya melakukan ujikaji terhadap botol PET bersaiz 500ml berulang kali menggunakan mesin tekan yang telah dicipta. Selain itu, kajian analisa terhadap mesin tekan ini turut dijalankan dengan menggunakan perisian komputer bagi mengkaji tahap keberkesanan mesin tekan tersebut dalam proses menekan botol PET. Dengan hadirnya mesin tekan ini, bukan setakat masa sahaja yang dapat dijitamatkan, malah dengan kaedah yang mudah untuk memenyek sesebuah botol PET secara tidak langsung ianya menyumbang penggalakkan kepada aktiviti kitar semula kepada masyarakat.

DEDICATION

“Dedicated with love to my loving mother, family and my best friends who has been supportive and give encouragement throughout my whole life”

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LIST OF ABBREVIATIONS

PET	-	Polyethylene Terephthalate
PVC	-	Polyvinyl Chloride
HDPE	-	High Density Polyethylene
CAD	-	Computer Aided Design
PDS	-	Product Design Specification
PC	-	Product Characteristic
DFM	-	Design for Manufacturing
PSM	-	Projek Sarjana Muda
DDQ	-	Deep Drawing Quality
ASTM	-	American Society for Testing and Materials
UTM	-	Universal Tensile Machine
FOS	-	Factor of Safety

CHAPTER 1

INTRODUCTION

This report described a project on design and development press machine for disposable PET bottle. This chapter explained on the background of project, problem statement, objectives, scope and report outline.

1.1 Background of Project

Recycling is one activity which considerably claimed by world today because recycling gives many benefits, including surrounding environment. Many products which comprise from range of material can be recycled such as glass, plastic, paper, metal and others. Nowadays, major countries in the world urge peoples to do recycling with various programs, campaigns and encouragement that have been conducted by various organizations including the government. Recycle collecting, sorting and processing site gives easier to everyone to do recycle activity and also as one step indirectly guide everyone to do this recycling [1].

Plastic is the main material that contributes most to the recycling activity. Plastic product such as containers, bottles, households, and many more are the most plastic product recycled. Generally plastic bottles are made from polyethylene terephthalate (PET), polyvinyl chloride (PVC) and others types of plastic. For PET bottle, usually it almost is being used in food and drink containers. So, this product can be found in every house and everyone could participate in recycling activity from their home.

Polyethylene terephthalate is abbreviated as PET is a thermoplastic polymer resin of the polyester family and is used in synthetic fibers. Liquid containers, thermoforming applications and engineering resins often used in combination with glass fiber. It is one of the most important raw materials used in man-made fibers [2].

While most thermoplastics can, in principle, be recycled, PET bottle recycling is more practical than many other plastic applications. The primary reason is that plastic carbonated soft drink bottles and water bottles are almost exclusively PET which makes them more easily identifiable in a recycle stream. PET has a resin identification code of 1. PET, as with many plastics, is also an excellent candidate for thermal recycling (incineration) as it is composed of carbon, hydrogen and oxygen with only trace amounts of catalyst elements (no sulphur) and has the energy content of soft coal [2].

This project must be as an evidence to show how important it is by collecting data from community. Questionnaire that consist selection of concept design method, costing, material and others to find the satisfaction level of user and the analysis of all collection data is needed to show how the concept design of the press machine, costing and material is used to develop this machine. Functionability of the machine is also important because it shows the parameter optimization and performance of the machine while running the process. Knowing that no else device that exactly perform to press the PET bottle had not been done yet, this project will discover this problem and at the same time this new design will help to ease user could be commercialized to market.

Press Machine for Disposable PET Bottle is one of the projects that used to solve the problem in recycles PET bottle activity. The machine's function is to compress the PET bottle and also saved a production time and can minimize waste and scrap. Besides, that it also safety guarantee and can produce a good quality product.

1.2 Problem Statement

Based on the study and analysis, it shows that PET bottle is difficult to press by using human energy. The other problem is regarding the space, which PET bottle needed a big space to keep the entire bottle and make it difficult to storage.

With this “Press Machine”, several ideas and design has been conscientious to create a new concept of press application. The machine design is based on the safety environment and safe to be used.

1.3 Objectives

The aims of this project are to:

- (a) To design a device that can press the PET bottle into suitable size before throwing into dustbin.
- (b) To do an analysis of a press machine for disposable PET bottle by using computer aided drawing (CAD) software.

1.4 Scope of Project

The scope of the project is limited to press machine for disposable PET bottle manually and the analysis is focused on the new design. The purpose of this project is to design a device that can press the PET bottle. This study will be done only considerable for a PET as a material and normally PET bottle size in about 500 milliliter (ml) to be press.

In addition, a prototype of the model will be fabricated. Before the real machining take place, machining simulation will be performed using Solidworks.

1.5 Project Outline

Chapter 1 describes the introduction of the project, problem statement, objective and scope of the study. Problem statement is necessary to conduct press machine for disposable PET bottle.

Chapter 2 explained literature review related to the study which includes description on machine system and the performance as well as CAD tools.

Chapter 3 defined the methodology in designing and develops of press machine for disposable PET bottle and brief explanation of each step.

Chapter 4 explained the analysis to be used in the project and describe the entire results that achieved in way to inclusive this project.

Chapter 5 provides a general discussion on the result of study “press machine” for disposable PET bottle, analysis on this machine and implications of the finding of the research.

Chapter 6 may contain a brief summary of the entire work, including methods, results, major conclusion and recommendations about the project.

1.6 Flow Process of the Project

The figure below shows the process flow of the project, to design and develop press machine for disposable PET bottle.

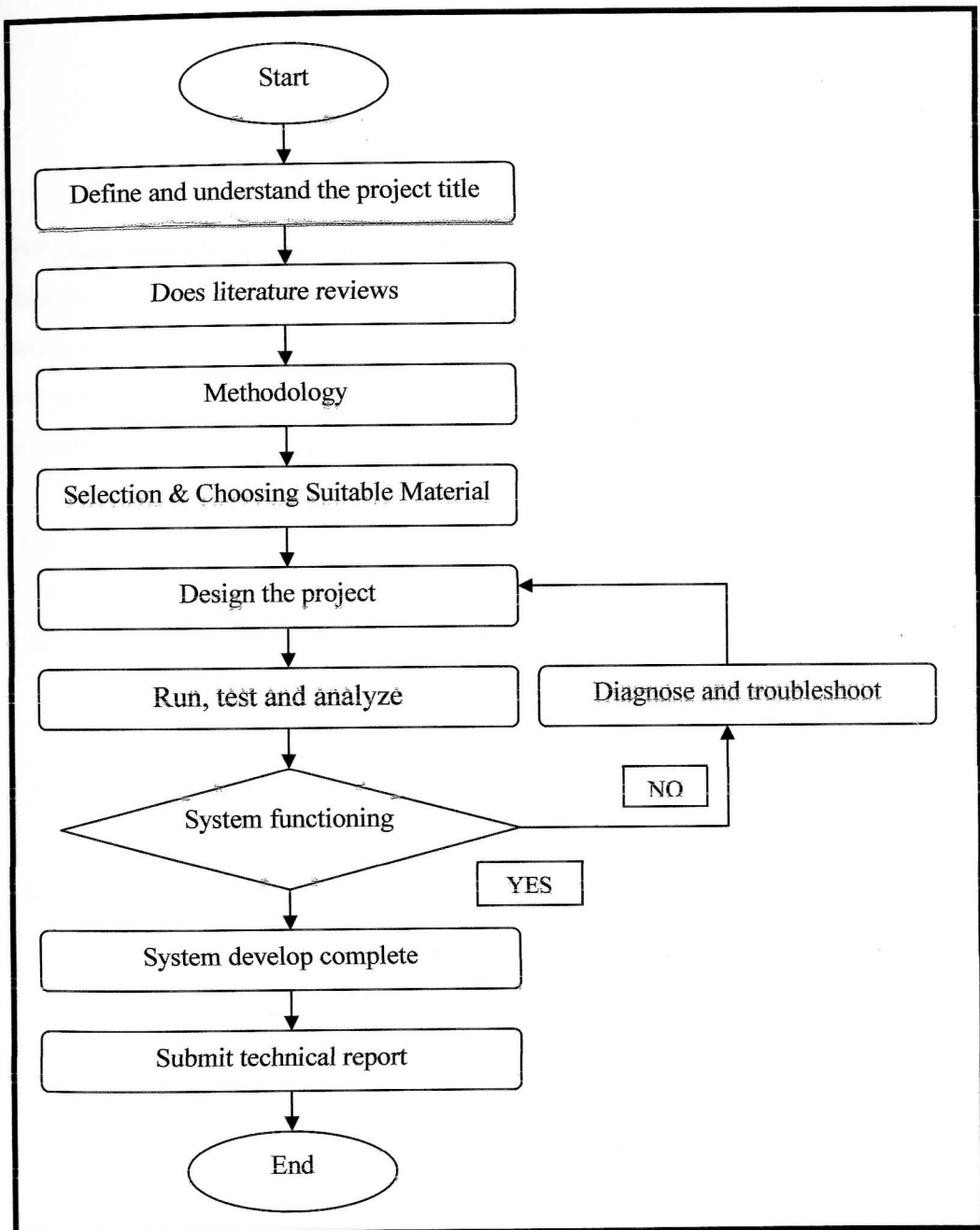


Figure 1.1: Process Flow of the Project.

CHAPTER 2

LITERATURE REVIEW

This section highlights on literature reviews related to the study and research such as journals, case studies, books, technical documents and internet sources that has been selected relevant to this project. Firstly, an overview of design and development of new product, which is, includes the product specification and requirement, concept selection, and various types of prototypes. Then, material used in press machine show the variety of materials often used.

This chapter will elaborate more about development of press machine for disposable PET bottle and also this chapter stated the summary from the recent journal or latest book that related with this project.

2.1 Product Design Specification

The Product Design Specification (PDS) comprises the quantitative statement of what designers want to design prior to starting to design it. In other words, the specifications of the Product Design Specification should be largely independent of any specific embodiment of the product, so multiple solution concepts are possible [3].

A Product Design Specification does not just help the people who design and make the product. Those who eventually use it will also be benefit. Consumers' judgments are all too often overlooked by engineers, but people think critically about the products they