UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN AND ANALYSIS OF POLYPROPYLENE PLASTIC NAME CARD HOLDER

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Manufacturing Design) (Hons.)

by

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **DESIGN AND ANALYSIS OF POLYPROPYLENE PLASTIC NAME CARD HOLDER**

SESI PENGAJIAN: **2012/2013 Semester 2**

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DECLARATION

I hereby, declared this report entitled "Design and Analysis of Polypropylene Plastic Name Card Holder" is the results of my own research except as cited in the references.

Signature	:	…….
Author's Name	:	Fatin Nabilah Binti Rosly
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APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Design) (Hons.). The member of the supervisory is as follows:

……

(Project Supervisor)

ABSTRAK

Projek ini bertajuk “Merekabentuk dan Menganalisis Pemegang Kad Nama Plastik Polipropilena”. Oleh itu, projek ini lebih memberi fokus terhadap merekabentuk dan menganalisis Pemegang Kad Nama untuk menentukan nilai ketebalan optimum Pemegang Kad Nama tersebut. Rekabentuk Pemegang Kad Nama ini telah direkabentuk dengan menggunakan perisian SolidWorks dan analisa Pemegang Kad Nama ini telah dianalisa dengan menggunakan perisian SolidWorks SimulationXpress. Bahan yang digunakan untuk Pemegang Kad Nama tersebut adalah polipropilena. Projek ini telah dimulakan dengan mengambil ukuran Pemegang Kad Nama yang sebenar. Selepas itu, lukisan 3D telah dihasilkan dengan menggunakan perisian SolidWorks. Analisa dengan menggunakan perisian SolidWorks SimulationXpress telah dijalankan untuk menentukan ketebalan optimum Pemegang Kad Nama tersebut supaya ia sesuai dengan penampilan fizikal, nilai estetika dan penggunaan harian seperti lenturan. Terdapat empat nilai ketebalan telah digunakan pada Pemegang Kad Nama iaitu 1.0 mm, 1.2 mm, 1.4 mm dan 1.6 mm. Ketebalan sebenar Pemegang Kad Nama adalah 1.6 mm, maka keputusan analisa yang diperolehi antara ketebalan yang berbeza Pemegang Kad Nama tersebut telah dibandingkan dengan ketebalan sebenar. Ketebalan optimum Pemegang Kad Nama telah dipilih berdasarkan keputusan analisa daya yang diperolehi. Hasilnya, Pemegang Kad Nama dengan ketebalan 1.0 mm telah dipilih. Akhir sekali, Pemegang Kad Nama telah ditukar dari lukisan CAD ke dalam produk sebenar dengan menggunakan mesin FDM di dalam peringkat prototaip pantas.

ABSTRACT

This final year project entitled, “Design and Analysis of Polypropylene Plastic Name Card Holder”. The project focused on the design and analysis of the Name Card Holder which to determine the optimal thickness of the Name Card Holder. The design of the Name Card Holder was designed by using SolidWorks software and the analysis of the Name Card Holder was analyzed by using SolidWorks SimulationXpress analysis tool. The material used for the Name Card Holder is polypropylene. This project started by measuring the dimension of the actual size of the Name Card Holder. After that, a 3D drawing was created by using SolidWorks software. SolidWorks SimulationXpress analysis was conducted to determine the optimum thickness of the Name Card Holder so that, it suits the physical appearance, aesthetic wise and usage activities such as bending. There were four values of thickness had been applied on the Name Card Holder which is 1.0 mm, 1.2 mm, 1.4 mm and 1.6 mm. The actual thickness of the Name Card Holder is 1.6 mm, hence the results of analysis obtained between the different thicknesses of Name Card Holder was compared with the actual thickness. The optimum thickness of the Name Card Holder has been selected based on the results of force analysis obtained. As a result, Name Card Holder with 1.0 mm thickness has been chosen. Lastly, the Name Card Holder has been converted from the CAD drawing into real product by using the FDM machine in rapid prototyping stage.

DEDICATION

Very thankful to Allah and special thanks to my beloved supervisor,
my beloved parents and
friends.

ACKNOWLEDGEMENT

First of all, thanks to my bachelor degree final year project supervisor, Engr. Baharudin Bin Abu Bakar for his guide, help and support towards this project. With his advice, this project can be done according to the plan.

Special thanks to my family for their moral support and some advice and financial support. Thanks also to my academic staff in Universiti Teknikal Malaysia Melaka (UTeM) for teaching me a lot, so that I can finish this project. Thanks also to my friend that share the knowledge and idea to finish this project.

Last but not least, thanks to everyone that involve in this project.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

ABS	-	Acrylonitrile Butadiene Styrene
CAD	-	Computer-aided Design
CAM	-	Computer-aided Manufacturing
CNC	-	Computer Numerical Control
FDM	-	Fused Deposition Modeling
J	-	Joule
K	-	Kelvin
kg	-	Kilogram
kgm^{-3}	-	Kilogram per meter cube
Ltd	-	Limited
LOM	-	Laminated Object Manufacturing
m	-	Meter
m^3	-	Meter cube
mm	-	Millimeter
N	-	Newton
Nm^{-2}	-	Newton per meter squared
No.	-	Number
PC	-	Polycarbonate
PP	-	Polypropylene
PVC	-	Polyvinyl Chloride
RP	-	Rapid Prototyping
s	-	Second
SLA	-	Stereolithography
SLS	-	Selective Laser Sintering
UTeM	-	Universiti Teknikal Malaysia Melaka
3D	-	Three Dimension

CHAPTER 1
INTRODUCTION

In this introductory chapter, it contains a brief explanation about this project and the background of the project title, "Design and Analysis of Polypropylene Plastic Name Card Holder". This chapter covers about the problem statement, objectives, and the scope and limitation of this project.

1.1 Project Background

This project is the study of the design and analysis of Name Card Holder which commonly used by all especially students. As it well known there is various types of Name Card Holder with different shape and sizes. The product, Name Card Holder as shown in Figure 1.1, has been measured and drawn using CAD software. Then, the analysis on the product has been conducted using SolidWorks SimulationXpress analysis. All the dimension and the design consideration for the product need to be emphasized and measure in details to ensure the best result in the design of the Name Card Holder. The analysis of the Name Card Holder has been measured in details based on the outcome gained at the end of this project.

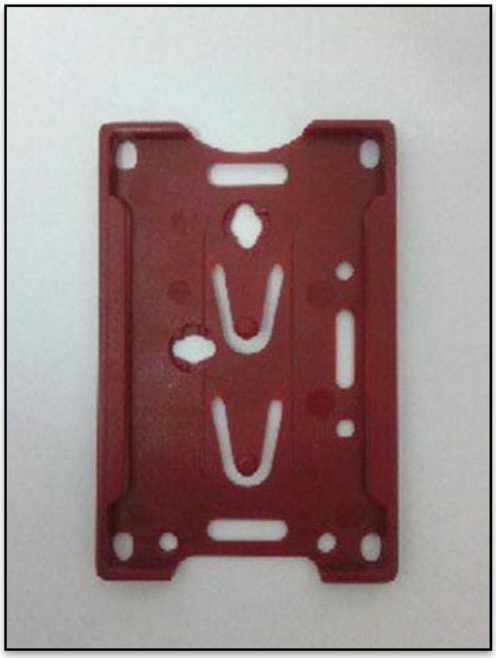

Figure 1.1: Name Card Holder

1.2 Problem Statement

The thickness of the product is very thin and always subject to bending and hence breaks easily. The analysis of the product using SolidWorks SimulationXpress has determined the minimum thickness that can withstand bending during the operation of the Name Card Holder when slotting a name card into the holder.

1.3 Objectives

To fulfill the requirement needed for this project, the objectives to be achieved at the end of this project are as below:

a) To redesign the Name Card Holder using Solidworks.
b) To analyze the thickness of the Name Card Holder using SolidWorks SimulationXpress.
c) To determine the optimal thickness of the Name Card Holder so that it suits the economic scale of the product.

1.4 Scope and Limitation

1.4.1 Scope

The scope of this project is to measure, draw and analyze to determine the optimal thickness of the Name Card Holder. The material for the product is polypropylene.

1.4.2 Limitation

The limitation is to optimize the thickness so that it suits the physical appearance, aesthetic, usage activities such as bending during the operation and the economic scale of the product. Likewise, limitation of the software results in the thickness which is less than 1.0 mm cannot run the data needed and unable to analyze the required data.

CHAPTER 2
LITERATURE REVIEW

Literature review or academic study is one of the earlier exploration processes to facilitate in the process of introducing the new technique for the course of action of the development of a Name Card Holder. Through this manner, near the beginning of repossession on a project weak point and advantage will be attainable through the learning process and judgment with current technique and apparatus. With this literature review, the product formed can be capable of accomplishing existing demand exclusive of any uncertainty.

2.1 Introduction to Reverse Engineering

In today's intensely competitive global market, product enterprises are constantly seeking new ways to shorten lead times for new product developments that meet all customer expectations. In general, product enterprise has invested in CADCAM, rapid prototyping, and a range of new technologies that provide business benefits. Reverse engineering (RE) is now considered one of the technologies that provide business benefits in shortening the product development cycle. Figure 2.1 below depicts how RE allows the possibilities of closing the loop between what is "as designed" and what is "actually manufactured" (Raja, 2008).

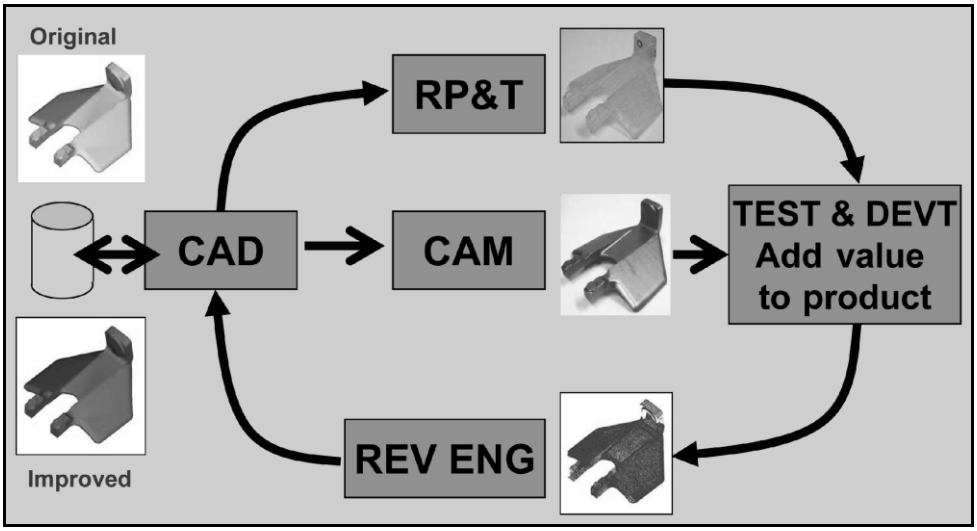

Figure 2.1: Product Development Cycle (Raja, 2008)

Engineering is the process of designing, manufacturing, assembling, and maintaining products and systems. There are two types of engineering, forward engineering and reverse engineering. Forward engineering is the traditional process of moving from high level abstractions and logical designs to the physical implementation of a system. In some situations, there may be a physical part or product without any technical details, such as drawings, bills-of-material, or without engineering data. The process of duplicating an existing part, subassembly, or product without drawings, documentation, or a computer model is known as reverse engineering (Raja, 2008).

Reverse engineering is also defined as the process of obtaining a geometric CAD model from 3D points acquired by scanning or digitizing existing parts or products. The process of digitally capturing the physical entities of a component, referred to as reverse engineering (RE), is often defined by researchers with respect to their specific task (Motavalli and Shamsaasef, 1996). Abella *et al.* (1994) described RE as, "the basic concept of producing a part based on an original or physical model without the use of an engineering drawing". Yau *et al.* (1993) define RE, as the "process of retrieving new geometry of a manufactured part by digitizing and modifying an existing CAD model".