



**STANDARD MINIMUM THICKNESS OF A COMMERCIAL
AVAILABLE POLYPROPYLENE AND POLYCARBONATE OF A
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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DECLARATION

I hereby, declared this report entitled “Standard Minimum Thickness of a Commercial Available Polypropylene and Polycarbonate of a Name Card Holder” is the results of my own research except as cited in the references.

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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 members of the supervisory is as follows:

.....

(Project Supervisor)

ABSTRAK

Projek ini memberi tumpuan kepada reka bentuk dan analisis Nama Pemegang Kad untuk menentukan ketebalan standard minimum yang Nama Pemegang Kad. Reka bentuk Nama Pemegang Kad telah direka dengan menggunakan perisian CATIA dan analisis Nama Pemegang Kad telah direka dengan menggunakan perisian Moldflow. Bahan yang digunakan untuk Nama Pemegang Kad adalah polipropilena dan polikarbonat. Projek ini bermula dengan mengukur dimensi saiz sebenar yang Nama Pemegang Kad. Selepas itu, lukisan 3D telah dicipta dengan menggunakan perisian CATIA. analisis Moldflow telah dijalankan untuk menentukan hasil bagi tiap-tiap ketebalan berdasarkan beberapa parameter yang masa kitaran, keyakinan isi, ramalan kualiti, tekanan suntikan maksimum dan diri tentera semasa mengisi. Terdapat tujuh ketebalan yang berbeza telah digunakan pada Nama Pemegang Kad yang merupakan 1.0 mm, 1.5 mm, 2.0 mm, 2.5 mm, 3.0 mm, 3.5 mm dan 4.0 mm. Akhir sekali, untuk mendapatkan keputusan akhir ketebalan standard minimum yang Nama Pemegang Kad untuk kedua-dua polipropilena dan bahan polikarbonat, kedudukan kaedah telah digunakan. Akibatnya, untuk polipropilena, Nama Pemegang kad dengan 3.5 mm telah dipilih manakala bagi polikarbonat, Nama Pemegang kad dengan 4.0 mm telah dipilih sebagai ketebalan standard minimum yang Nama Pemegang Kad. Hasil yang diperolehi boleh digunakan oleh industri sebagai ketebalan minimum standard daripada polipropilena komersil yang terdapat dan polikarbonat pemegang kad nama plastik.

ABSTRACT

The current thickness of the plastic name card holder is not standardize and most of the name card holder's thickness are range from 2.0mm to 5.0mm. The project focused on the design and analysis of the Name Card Holder which to determine the standard minimum thickness of the Name Card Holder. The design of the Name Card Holder was designed by using CATIA software and the analysis of the Name Card Holder was designed by using Moldflow software. The material used for the Name Card Holder is Polypropylene and Polycarbonate. 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 CATIA software. Moldflow analysis was conducted to determine the result for every thickness based on several parameters that are cycle time, confidence of fill, quality prediction, injection pressure and maximum clamp force during filling. There were seven different thickness had been applied on the Name Card Holder which was 1.0 mm, 1.5 mm, 2.0 mm, 2.5 mm, 3.0 mm, 3.5 mm and 4.0 mm. Lastly, to obtain the final result of standard minimum thickness of a Name Card Holder for both material Polypropylene and Polycarbonate, ranking method had been used. As the result, for Polypropylene, Name Card Holder with 3.5 mm had been chosen while for Polycarbonate, Name card Holder with 4.0 mm had been chosen as the standard minimum thickness of the Name Card Holder. The result obtained can be use by industry as the standard minimum thickness of a commercial available Polypropylene and Polycarbonate of a plastic name card holder

DEDICATION

Dedicated to my beloved parents Norizan Bin Madun and Nurhakimah Binti Mansur.

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LIST OF ABBREVIATIONS

SMA	-	Simulation Moldflow Adviser
PP	-	Polypropylene
PC	-	Polycarbonate
ABS	-	Acrylonitrile butadiene styrene
SAN	-	Styrene-acrylonitrile resin
PVC	-	Polyvinyl Chloride

CHAPTER 1

INTRODUCTION

In this first chapter, with the project title of “Standard minimum thickness of a commercial available polypropylene and polycarbonate of a name card holder” contains a brief explanation about this project. This chapter covers problem statement, objectives, and the scope and limitation of this project.

1.1 Project Background

Name card holder regularly used by students and workers and there are various types of name card holder with different shape, sizes and thickness (Fatin,2013). Most of the industries who manufacture name card holder does not have maximum and minimum standard thickness of the product. ID card's holder thickness is measured in millimeters (thousandths of an inch), ranging from 2.0 mm to 5.0 mm (Jing Wei Industry, 2012). This project is to determine the standard minimum thickness of a commercial available polypropylene and polycarbonate of name card holder that usually used by students and employers. With the help of CATIA and Moldflow analysis, the name card holder was designed and analysis on the product been conducted. The process of manufacture the name card holder is by injection molding. Simulation Moldflow is use in the infinite

elemental analysis of finding the minimum thickness of both polypropylene and polycarbonate.

1.2 Problem Statement

The current thickness of the plastic name card holder is not standardize, and as mention earlier, most of the name card holder's thickness are range from 2.0mm to 5.0mm. This research was conducted to obtain minimum thickness of the name card holder , so that manufacturer would know that name card holder with thickness lower than the result obtain by this project research are not be able to be accepted due to quality issues or defect. The plastic chosen are polypropylene and polycarbonate due to its characteristics and capability.

1.3 Objectives

The objectives to be achieved at the end of this project are as below:

- a) To measure and redesign the existing name card holder.

- b) To analyze the thickness of the existing name card holder using Moldflow software .

- c) To redesign the name card holder for the minimum thickness that produce by using plastic polypropylene and polycarbonate.

1.4 Scope

The scope of this project is to redesign the name card holder and analyze the minimum thickness of name card holder using a commercial available plastic material of polypropylene and polycarbonate. Plastic was chosen as the material for the name card holder due to its features that are relatively easy to mold into complex shape and their versatility. Plus, plastic material properties can literally be “tailored” to meet the requirements of a specific request (Robert,1994).

1.5 Limitation

The limitation of this project are the analysis and testing of minimum thickness of redesign and existing name card holder will only be determined by using analysis of Simulation Moldflow Adviser(SMA) with the use of Polypropylene or Polycarbonate only.

CHAPTER 2

LITERATURE REVIEW

Literature review is one of the earliest investigation way to facilitate in the process of introducing the new method for the course of action of determining the name card holder minimum thickness. Through this chapter, description, summary and evaluation of each related topic will be presented.

2.1 General Concerns

Industry of injection molding has develop from year to year in manufacture products for many industries including automotive, medical, aerospace, consumer products, toys, plumbing, packaging, and construction (Bryce and Doughlas, 1996). Injection molding process can widely be apply to produce many things such as automotive parts, mechanical parts and most of the plastic product that available nowadays including name card holder. It is the modern method of manufacturing plastics parts that usually applied in industries as it is suitable in producing mass volumes of product.

The end part that have short product cycles with good surface finish and excellent dimension accuracy could be produce by using injection molding process. Plus, this process also give benefits of high production rate and low labor cost. Figure 2.1 below show the overview of injection molding process. As mentioned by Drake in 1998, that costs can be lessen further by the integration of components, while there is the potential for weight savings over metal counterparts. Furthermore, parts with complex geometry are easily obtained, but it will be very challenging for a manufacturer in controlling the injection molding machine and designing the mold. Common problems in the injection molding process such as warpage and shrinkage will tend to occur in the production of plastic parts if there is lack of knowledge about those issues (Behzad et al, 2016).

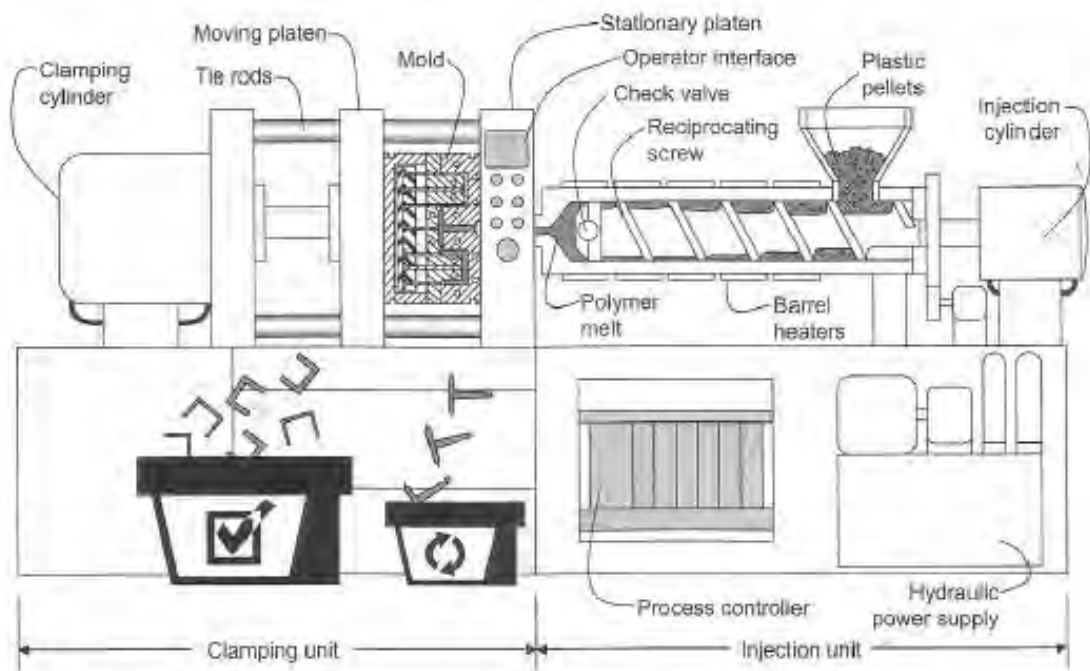


Figure 2. 1: Overview of Injection Molding Process (David, 2007)

2.2 Plastic Injection Molding

Nowadays, plastic injection moulding is in charge of for the manufacture of products for all industries such as electronic, automotive, medical and so on. Plastic injection molding has ease for modern invention and design with the versatile and useful process that it have, and is something the world today could not function without . An injection molding machine, raw material, and a mold are need to run the injection molding process. Injected into the mold are the melted plastic material, where it cools and solidifies into the end part. Plastic injection molds are suitable for producing mass volumes of plastic parts, due to the capability of making multi-cavity injection molded parts, where multiple parts are made with one cycle.

2.3 Injection Molding Machine

There are many advantages that offers by injection moulding machine to other possibility manufacturing methods, including less losses from scrap, since scrap pieces can be melted and recycled, and less finishing requirements. Kwong and Smith,1998 said that injection moulding machine differs from metal die casting, in that molten metal's can simply be poured, and plastic resins must be injected with force. The most frequent method used for mass production of plastic articles is injection molding (Niebel et al,1989)(Oyentunji,2010). Injection moulding machine divided into two unit that is injection unit and clamping unit as shown in Figure 2.2.

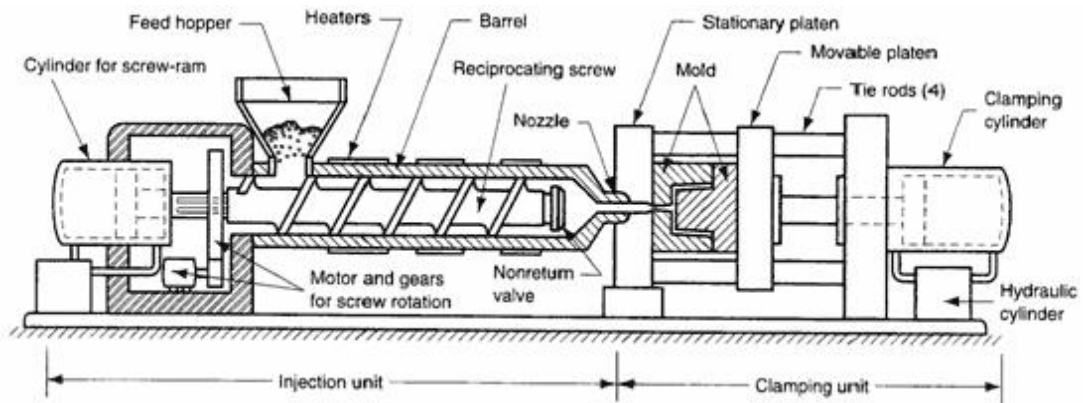


Figure 2. 2: Injection and clamping process section (Jones, 2008)

2.3.1 Injection unit

The part of the injection moulding machine that keep and heats the material preceding to injecting it into the mould tool (Jones,2008). Below are several function that are perform by injection unit:

- amount of material need for each shot are measure.
- Material's softening
- Transport the material by rotating an internal screw via its screw flights to the front of the cylinder.
- Push forward the injection carriage so that the nozzle into contact with the mould sprue bush.
- Creating force between the injection cylinder and the mould tool to avoid leakage.
- Preparing multiple speed of injection.
- To give space for volumetric shrinkage of the material in the mould tool after initial mould filling has taken place by maintaining a hold on pressure.

2.3.2 Clamping unit

In order to push forward the movable platen so that the two halves of the tool can be brought into smooth contact, there are several types of machine clamping unit designs. The two halves of the tool are kept closed under pressure when the full lock is applied, while the molten plastic is injected into the mould (Kamal, 1993).

Methods of machine clamping that commonly used are toggle mechanism, direct hydraulic lock and combined mechanical-hydraulic systems (David, 2007).

2.3.2.1 Toggle mechanism

A toggle joint is a system that help the clamp achieve the force needed by multiplies the power that is applied to them. It is divided into two types that is single toggle joint clamp and double toggle joint clamp (David, 2007).

2.3.2.2 Single toggle joint clamp

The single toggle joint clamp made up of a set of links that are directly actuated by a hydraulic cylinder through the central axis of the injection mould tool. When the mechanical locking of the toggles in straightened position, mould clamping as achieved as shown in Figure 2.3. The tie bars are designed to stretch slightly as the mould is locked, to maintain the clamped condition during the injection phase. There is a tendency for the platen to tilt as forced are exerted on the platens during mould mechanism.