UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN AND ANALYSIS OF THE OPTIMUM GATE SIZE FOR SINGLE CAVITY PLASTIC NAME CARD HOLDER INJECTION MOLD

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

by

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DECLARATION

I hereby, declared this report entitled "Design and Analysis of the Optimum Gate Size for a Single Cavity Plastic Name Card Holder Injection Mold" is the results of my own research except as cited in references.

Signature : …….

Author's Name : …….

Date : …….

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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 follow:

……

(Project Supervisor)

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ABSTRAK

Projek ini bertajuk “Mereka bentuk dan Menganalisis bagi menentukan optimum saiz satu gate untuk acuan Pemegang Kad Nama Plastik dalam pengacuan suntikan. Rekabentuk Pemegang Kad Nama Plastik ini telah direka bentuk dengan menggunakan perisian SolidWorks dan CATIA dan analisa Pemegang Kad Nama Plastik ini telah dianalisa dengan menggunakan perisian Autodesk Simulation Moldflow Adviser 2014. Bahan yang digunakan untuk Pemegang Kad Nama Plastik adalah Polipropilena, Polietilena, Akrilonitril-ButadienaStirena dan Polietilena Ketumpatan Tinggi. Projek ini telah dimulakan dengan mengambil ukuran Pemegang Kad Nama Plastik yang sebenar. Selepas itu, lukisan 3D telah dihasilkan dengan menggunakan perisian SolidWorks dan CATIA. Analisa dengan menggunakan perisian Autodesk Simulation Moldflow Adviser 2014 telah dijalankan untuk menentukan ketebalan saiz gate yang optimum dan bahan yang sesuai bagi Pemegang Kad Nama Plastik tersebut. Ketebalan optimum saiz gate Pemegang Kad Nama Plastik telah dipilih berdasarkan keputusan analisa yang diperolehi. Selepas analisa telah selesai, keputusan analisa menunjukkan saiz gate yang sesuai adalah berukuran 1 mm x 3 mm x 1 mm dan bahan yang terbaik adalah jenis Polipropilena.

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ABSTRACT

This final year project entitled, “Design and Analysis of the Optimum Gate Size for A Single Cavity Plastic Name Card Holder Injection Mold”. The project focused on the design and analysis of a simple cavity Plastic Name Card Holder. The design of the Name Card Holder was designed by using SolidWorks and CATIA software and the analysis of the Name Card Holder was analyzed by using Autodesk Simulation Moldflow Adviser 2014 software. The material used for the Plastic Name Card Holder is Polypropylene (PP), Polyethylene (PE), Acrylonitrile-butadiene-styrene (ABS) and High Density Polyethylene (HDPE). This project started by measuring the dimension of the actual size of the Plastic Name Card Holder. After that, a 3D drawing was created by using SolidWorks and CATIA software. Autodesk Simulation Moldflow Adviser 2014 analysis was conducted to determine the optimum gate size of the Plastic Name Card Holder mold. The optimum gate size of the Plastic Name Card Holder mold has been selected based on the results of force analysis obtained. After the analysis was done, the resulted shown the optimum gate size is 1 mm x 3 mm x 1 mm and the best material is Polypropylene (PP)

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DEDICATION

Especially to my beloved parents and whole my family thank you very much to give me fully support, and also for my respective lecture and my Supervisor Associate Tn. Hj Baharudin Bin Abu Bakar, thank you so much for teaching and guided me. Last for my friends, I appreciate for your support. And all people involved also thank you very much.

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"In the name of Allah, Most Gracious, Most Merciful"

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

3D	-	3 Dimensional
2D	-	2 Dimensional
FKP	-	Fakulti Kejuruteraan Pembuatan
CAD	-	Computer Aided Design
PSM	-	Projek Sarjana Muda
PVC	-	Polyvinyl Chloride
PP	-	Polypropylene
PE	-	Polyethylene
ABS	-	Acrylonitrile-butadiene-styrene
HDPE	-	High Density Polyethylene
s	-	Seconds
Mpa	-	Megapascal
Mm	-	Milimeter

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CHAPTER 1

INTRODUCTION

In this chapter, it contains a brief explanation about this project and the background of the project title, "Design and Analysis of the Optimum Gate Size for Single Cavity Plastic Name Card Holder Injection Mold". This chapter covers about the problem statement, objectives, and the scope of this project.

1.1 Project Background

Injection molding is the most important plastics manufacturing process. Injection molding can be utilized to develop a broad variety of items. In producing product by injection molding process, the quality of the product is very important. The product should be good in physical and mechanical properties in order to have a good performance for consumer. Clearly, more manufacturers only care about appearance of the product, but to have long usage in term of life of that product, the mechanical properties such as tensile strength, hardness and materials are also important.

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1.2 Problem Statement

Starting point to this final project, we are concentrating on just how to discover an appropriate gating size for a solitary gate in injection molding device to create the rest outcome or item. The project that we had selected to investigate is the Plastic Name Card Holder Mold. Mostly, in manufacturing industries, the parameter and feeding system in plastic injection molding normally is by trial and error method. The problem occurs when they do not have any parameter or references to be guide. So, this problem will get an improper gating size and parameter of the mold that will cause defect on the product. Relating to the project, we will likely to resolve an issue base to the current item that we had choose to investigate and to optimize the plastic injection molding gate size besides to fit the method or the procedure that will be read quickly. Additionally, we will likely to do some experimental in purchase to discover in terms of area texture, general product, quality defects and any issues during processing.

Base to the product that we had selected, Plastic Name Card Holder mold, we find there is a great deal of issue to be considered the parameter such as time, temperature, force and pressure. But for this project, we just concentrate to the gating size for experimental. Furthermore, we require to select the best material for our product. Selection material is additionally crucial in purchase to attain the quality product. Finally, we operate the confirming gate size that obtain from the analyzing result.

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1.3 Objectives

The main objectives for this project are:

a) To identify the optimum gate size for single Plastic Name Card Holder injection mold.

b) To find the best material for the Plastic Name Card Holder.

c) To find the best gate location of the best plastic material using Autodesk Simulation Moldflow Adviser.

1.4 Scope of Project

The scope of this project is to design, draw, and analyze the optimum single gate size of Plastic Name Card Holder. The material for the product that has been use is Polypropylene (PP), Polyethylene (PE), Acrylonitrile-butadiene-styrene (ABS) and High Density Polyethylene (HDPE)

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CHAPTER 2
LITERATURE REVIEW

Literature review 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 Plastic Name Card Holder. With this literature review, the product formed can be capable of accomplishing existing demand exclusive of any uncertainty.

2.1 Introduction

Injection molding is a fantastic process, capable of economically making complex parts to tight tolerances. Before any parts can be molded, however, a suitable injection mold must be designed, manufactured, and commissioned. The injection mold is itself a very complex system comprised of multiple components that are subjected to many cycles of temperatures and stresses. Engineers should design injection molds that are “fit for purpose”, which means that the mold should produce parts of maximal quality at minimal cost. An Injection molding machine, additionally understood as an injection press, is a machine for manufacturing plastic items by the injection molding procedure. It consists of two primary components, an injection product and a clamping product. Injection molding devices can fasten the molds in either a horizontal or vertical place. (David, 2007)

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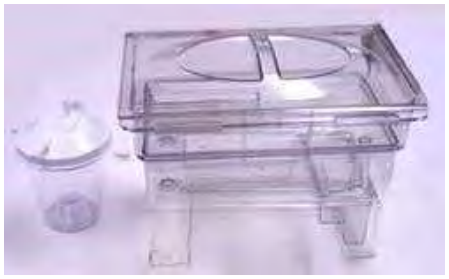
There are some example products using injection molding in Figure 2.1

A Variety of Industries & Applications



Medical equipment

Small Intricate Parts

Small and Large Enclosures

Experienced Clear Part Molder

Vinyl Over-Molded Knobs

Figure 2.1: Sample of product from plastic injection molding

(Source: R & D Engineering, 2009)

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2.2 Injection Molding Machine

For thermoplastics, the injection molding device converts pelleted or granular natural plastic into last molded components via a melt, inject, pack, and cool period shows at Figure 2.2. A typical injection molding device comprises of the following major elements:

a) Injection system
b) Hydraulic system
c) Mold system
d) Clamping system
e) Control system

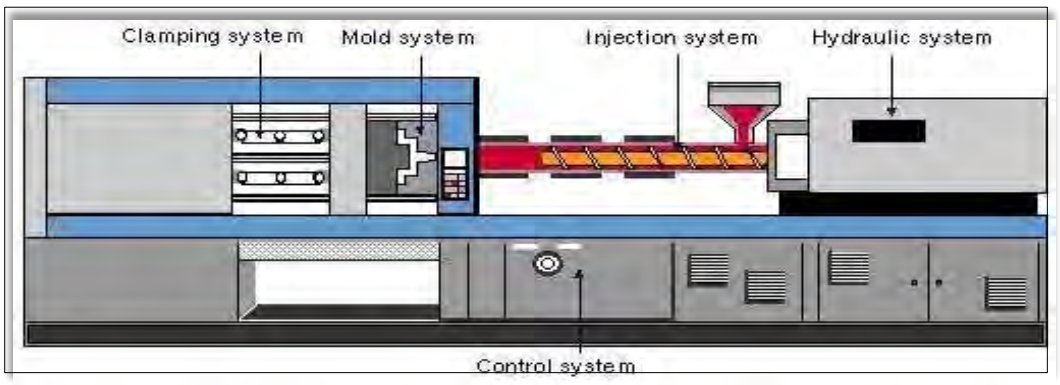

Figure 2.2: Injection molding machine for thermoplastics ource:
(Source: http://www.capetronics.com>20/11/14)

For the machine requirements, the clamping tonnage and shot size are commonly utilized to quickly determine the size of the injection molding device for thermoplastics. Other parameters consist of injection price, injection stress, screw design, mildew depth, and the length between link pubs. The major gear auxiliary to an injection molding device includes resin dryers, materials-managing gear, granulators, mold-temperature controllers and chillers, component-removal robots, and part handling gear. Injection molding devices be generally categorized into three groups, based on the function which are:

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a) General-purpose machines

b) Precision, tight-tolerance machines

c) High-speed, thin-wall machines

2.2.1 Injection System

The injection system consists of a hopper, a reciprocating screw and barrel assembly, and an injection nozzle, as shown in Figure 2.3. This system confines and transports the plastic as it progresses through the feeding, compressing, degassing, melting, injection, and packing stages.

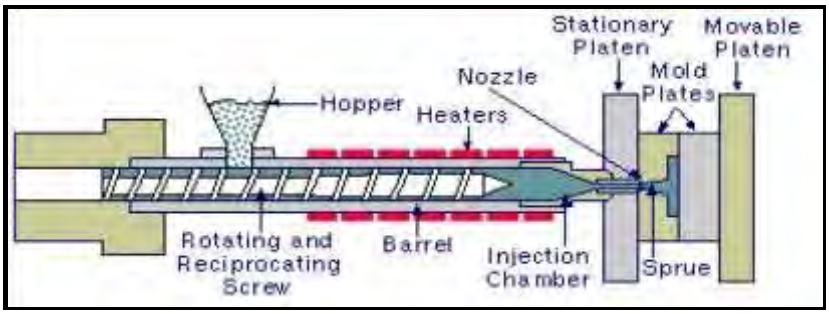

Figure 2.3: A single screw injection molding machine

(Source: http://www.capetronics.com>20/11/14)

a) The hopper

Thermoplastic material is provided to molders in the type of tiny pellets. The hopper on the injection molding device keeps these pellets. The pellets are gravity-fed from the hopper through the hopper neck into the barrel and screw installation.

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