



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DESIGN AND ANALYSIS OF A PLASTIC BOOK MARK
INJECTION MOULD**

This report is submitted in accordance with requirements of 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 “Design and Analysis of a Plastic Book Mark Injection Mould” is the results of my own research except as cited in references.

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APPROVAL

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

.....
(Official Stamp of Supervisor)

ABSTRAK

Projek tahun akhir ini adalah mengenai "Rekabentuk dan Analisis Penanda Buku Plastik menggunakan Acuan Suntikan". Projek ini lebih fokus kepada reka bentuk penanda buku dan kemudian mengoptimumkan ukuran saiz pintu dan menentukan bahan plastik terbaik bagi mereka bentuk Penanda Buku Plastik. Reka bentuk Penanda Buku Plastik dan acuan dua rongga yang digunakan telah dilukis dalam bentuk 3 dimensi menggunakan perisian CATIA V5R20. Kemudian, perisian "Autodesk Simulation Moldflow Adviser" (SMA) digunakan untuk menganalisis saiz pintu optimum untuk Penanda Buku Plastik menggunakan acuan dua rongga. Sebahagian daripada bahan plastik yang digunakan untuk menentukan salah satu yang terbaik adalah Polyvinyl chloride (PVC), Polypropylene (PP), High-Density Polyethylene (HDPE), Low-Density Polyethylene (LDPE) dan Polyethylene (PET). Projek ini bermula dengan menganalisis beberapa ukuran saiz pintu yang dicadangkan dengan menggunakan perisian SMA untuk reka bentuk yang sedia ada. Kemudian, kedudukan lokasi pintu, ukuran saiz pintu optimum dan bahan yang sesuai, ditentukan mengikut analisis SMA.

ABSTRACT

This final year project is about “Design and Analysis of a Plastic Book Mark Injection Mould”. This project is focused on the design of the book mark and then optimize the dimension of the gate and determine the best plastic material for the design of a Plastic Book Mark. The design of the Plastic Book Mark and the two cavity mould that used were designed using CATIA V5R20 software. Then, the Autodesk Simulation Moldflow Adviser (SMA) software is used to analyse the optimum gate size for the two cavity Plastic Book Mark. Some of the plastic material used for determining the best one is Polyvinyl chloride (PVC), Polypropylene (PP), High-Density Polyethylene (HDPE), Low-Density Polyethylene (LDPE) and Polyethylene (PET). This project can start with analysing the suggested of several dimensions of the gate size by using the SMA software of existing design. Then, the optimum gate size dimension and the suitable material, are determined according to the SMA analysis.

DEDICATION

All the hard work is only for you:

Zakaria bin Saad

Norlia Binti Taib

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First and foremost, all praise to The Almighty, who made this accomplishment possible. I seek his mercy, favour and forgiveness. Thousands of thanks to my great supervisor, En Baharudin bin Abu Bakar for the help, encouragement and guidance from the beginning until of the research until the end of this writing project. For my parents who always provides me with love and support all the time in order for me to complete this work. For my friends, I appreciate the present of being there with me through thick and thin. Thank you.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

PVC - Polyvinylchloride

PP - Polypropylene

HDPE - High density polyethylene

LDPE - Low density polyethylene

PET – Polyethylene

PSM - Projek Sarjana Muda

3D - 3 Dimensional

SMA - Simulation Moldflow Adviser

MPI- Moldflow plastic insight

CMMs - Coordinate measuring machine

CHAPTER 1

INTRODUCTION

1.1 Project Background

This project is about studying the design and analysis of a Plastic Book Mark which is commonly used by students and also someone that obviously like reading and need something to mark their reading page. There are various types of Plastic Book Mark which is different in size and shape. The chosen design of a Plastic Book Mark as shown in Figure 1.1 will be designed by freehand sketching and then estimate its dimensions and drawn by using Catia V5R20 software. Then, the analysis for the product has been conducted by using Autodesk Simulation Moldflow Adviser software. The position of the gate, the optimal dimension of the gate, and also the best material for the product need to be identified in the design and analysis of a Plastic Book Mark.

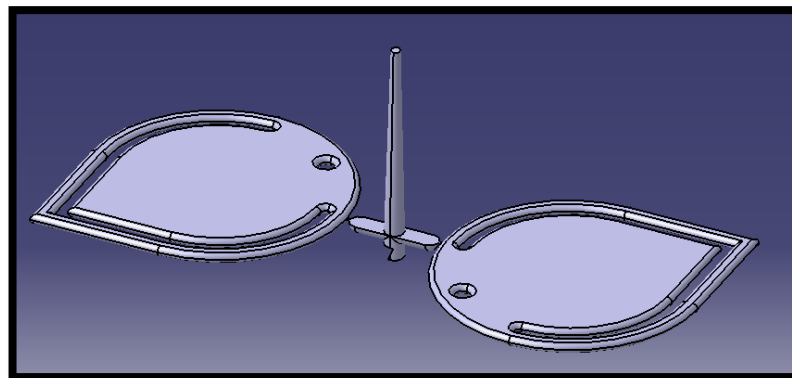


Figure 1.1 Plastic Book Mark

1.2 Problem Statement

The thickness of the product is very thin and easy to bend and damage. The production of the product will lead to defect due to the position of the gate, the optimal dimension of the gate, and the plastic material usage is wrong. This will result the waste in time and also money. Hence, the analysis by using Moldflow software need to be done to optimize the dimension of the gate and determine the best plastic material for the design of a Plastic Book Mark and also predict the effects on the quality of the product. Moldflow is one of the most helpful software to get the statistical data that will be used in production of the actual Plastic Book Mark. This will help the designer to prevent from making a mistake during the design of the mould.

1.3 Objectives

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

- a) To optimize the dimension of the gate.
- b) To determine the best plastic material for the design of a Plastic Book Mark.

1.4 Scope and Limitation

1.4.1 Scope

The scope for this project will cover on the analysis of a Plastic Book Mark by using Autodesk Simulation Moldflow Adviser software. The main objective is to optimize dimension of the gate, and determine the best plastic material for the product.

1.4.2 Limitation

The limitation of this project is the analysis for a Plastic Book Mark is only conducted by using a two cavity mould. The software use for analysis the effect on the quality of the product is only Autodesk Simulation Moldflow Adviser software.

CHAPTER 2

LITERATURE REVIEW

In this chapter there will consist about the primary study of the previous person or researcher about some topic that they are working on. The literature review has been done in order to understand the process and get any idea or knowledge of the on-going issues. Through this manner, it will be able to help in the design and analysis of a Plastic Book Mark by using Injection Mould for this project.

2.1 Introduction to Plastic Injection Moulding

In injection process, it uses heated plastic as a main material that will be injected into the mould cavity by using a plunger or auger device. Then, the plastic material that injected is allowed to cool and solidify in the cavity before the mould is opened and then eject the product. Many numbers of people require controlling the process and parameters to ensure the product that will establish have high quality and at a reasonable cost (Bryce, 1998).

The Figure 2.1 below shows the difference between the core and cavity. In mould actually there are two sides. The core has actually been located at the upper position and the cavity is in the lower position.

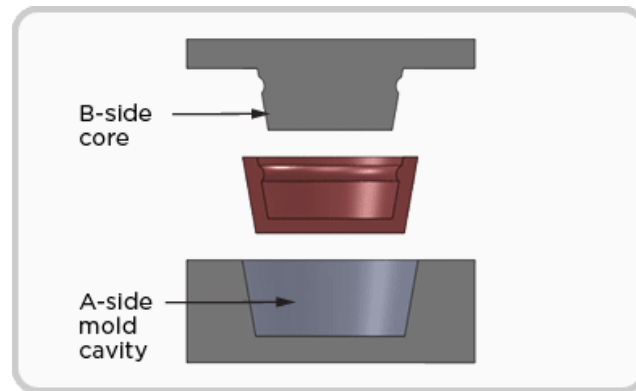


Figure 2.1 Different between core and cavity

(Source: <<http://www.makepartsfast.com>> 12/11/2015)

Figure 2.2 below shows the two plate mould. This mould is used for parts that are typically gated on or around the edge. The runner is stick together with the cavity in the same mould plate as the cavity.

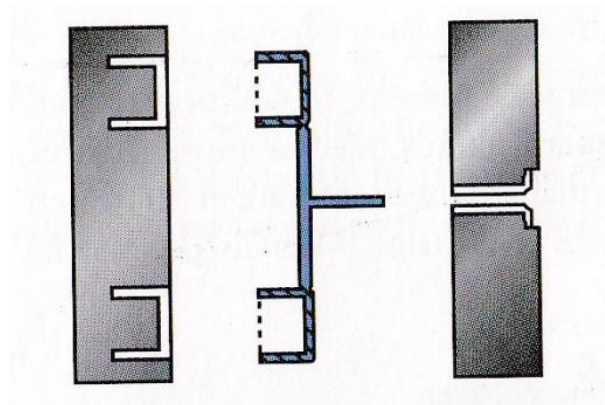


Figure 2.2 Two plate mould (Shoemaker, 2006)