



**Faculty of Mechanical and Manufacturing Engineering  
Technology**

**DESIGN IMPROVEMENT OF THE DEFLASHER MECHANISM FOR  
BLOW MOLDING MACHINE**

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**Bachelor of Manufacturing Engineering Technology (Process and Technology)**

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**DESIGN IMPROVEMENT OF THE DEFLASHER MECHANISM FOR  
BLOW MOLDING MACHINE**

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**A thesis submitted  
in fulfillment of the requirements for the degree of Bachelor of Manufacturing  
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## DECLARATION

I hereby, declared this report entitled “DESIGN IMPROVEMENT OF THE DEFLASHER  
MECHANISM FOR BLOW MOLDING MACHINE”  
is the results of my own research except as cited in references.

Signature : .....

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Date : .....

## **APPROVAL**

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering Technology (Process & Technology) with Honours. The member of the supervisory is as follow:

Signature : .....

Supervisor Name: Ts. SALLEH BIN ABOO HASSAN

Date : .....

## **DEDICATION**

Specially dedicated to my beloved father and mother,

Suhaimee Bin Hassan & Bazlin Binti Asiken

And my little sister,

Elza Nareesya Binti Suhaimee

Thanks for the guidance and sacrifices....

To all my friends especially Muhammad Alif Farhan Bin Daud who has supported me,  
gave their best in providing me the ultimate moral support, cooperation, encouragement  
and understandings.

Thank you so much, this is for you.

## **ABSTRAK**

Tujuan projek ini adalah untuk menyingkirkan lebihan plastik di leher botol 0.5L dengan menggunakan unit mekanisme pemotongan. Ini kerana udara yang berlebihan yang telah ditiup ke dalam bentuk rongga dan plastik berlebihan akan berlaku di leher botol. Pada mulanya, lebihan plastik disingkirkan secara manual oleh juruteknik dengan memotong menggunakan pisau. Oleh itu, dengan kewujudan projek ini akan menyelesaikan masalah untuk menyingkirkan plastik berlebihan dengan mekanisme automasi serta meningkatkan jumlah botol produk. Bahan keluli tahan karat dengan saiz 1mm ketebalan untuk membentuk pisau dengan hasil reka bentuk yang berbeza hasilnya untuk menghilangkan lebihan plastik pada leher botol. Berdasarkan hasilnya, dari tujuannya untuk menghilangkan lebihan plastik di leher botol itu berjaya tetapi dari segi kualiti tidak memuaskan kerana proses penyingkiran. Ini adalah kerana reka bentuk dan pisau yang tidak dapat menyingkirkan lebihan plastik dengan tanpa mendatangkan kecacatan pada leher botol. Sebagai kesimpulan, untuk masa depan kerja kaedah pemotongan adalah dalam penyenaian untuk cadangan menghapuskan lebihan plastik di leher botol. Selain itu, memilih bahan untuk membuat pisau boleh meningkatkan kecekapan dengan menyingkirkan tanpa sebarang kecacatan pada botol. Akhirnya, laluan saiz pemotongannya boleh dibesarkan supaya botol dengan mudah dapat melalui proses penyingkiran.

## **ABSTRACT**

The purpose of this project to remove the flash at the neck of the bottle 0.5L by using a unit cutting mechanism. The flash exists because of the excess pre-blown air into the form of cavity and plastic excessive will occur. Initially, the flash was removed manually by the technician with trimming the excess material. Therefore, the existence of this project will solve to eliminate the excess plastic with automation mechanism plus increase the amount of the product bottle. Fabricate the stainless steel material 1mm thickness to form a blade with different design outcome the result to eliminate the flash at the neck of the bottle. Based on the result, from the objective that to eliminate the flash at the neck of the bottle was achieved but in term of quality was unsatisfactory due to the trimming process. This is due to the design and material of the blade that unable to trimming the flash without defect at the neck of the bottle. As a conclusion, for the future work the cutting method be the in listing for recommendation to eliminate the flash at the neck of the bottle. Other than that, selecting material for making blade can improve the efficient to trimming the flash without any defect on the bottle. Finally, the size path of the deflasher can enlarge so that when the trimming process, the bottle easily can go through when the trimming process execute.

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## LIST OF ABBREVIATIONS

HDPE	-	High Density Polyethylene
PP	-	Polypropylene
PVC	-	Polyvinylchloride
BC	-	Before Century
Kg	-	Kilogram
DOF	-	Degree Of Freedom
3D	-	3 Dimension
BOM	-	Bill Of Material
mm	-	Milimetre
HOQ	-	House Of Quality
CNC	-	Computer Numerical Control

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.0 Introduction**

In this chapter, the context of the project will brief about the background of the study, objective, problem statement, scope of the project and importance of the study.

#### **1.1 Background of Study**

Blow molding is a molding process in which air pressure is used to inflate soft plastic into a mold cavity. The first automatic blow molding machine was developed by Plax (Courtesy of Innopak Corp) and introduced the first LDPE bottle (Whelum, T. 1998 ).

The blow molding process is limited to the thermoplastic resin for an example High Density Polyethylene (HDPE), Polypropylene (PP), Polyvinylchloride (PVC) and Polyethylene Terephthalate (PET). Bottle container is the most common product produced by blow molding. However, due to the technology of advancement huge products such as the household product (water storage tank), fuel tank and vehicle part component for automotive industries are able to be produced by using blow molding process technology. (Mansor and Sapuan, 2017)

Generally, the process of blow molding started from the extrusion of parison process. This parison is injected with high air pressure to inflate so that it takes the shape of the mold cavity. Once the part is solidified in mold cavity it will be released out. There are three main types of the process involved, which is Extrusion Blow Molding, Injection Blow Molding and Stretch Blow Molding (WHELAN, A, and GOFF, 1986).

Usually, the blow molded parts require trimming process for the flash at a neck of the bottle and the bottom parties line (Thielen, 2014) (Rosato and Alberghini, 1989). Removal of these flashes is done manually or mechanically controlled by the automation system. Any manual work operation has a chance of damaging the product quality besides time consuming (Tacher, 1988). Minimizing the risk of defect product by using deflashing automation machine is highly recommended. Nowadays, deflasher automation machine such as spin trimming method is widely used in plastic industries. The knife is positioned on an angle so that as the bottle turns against it, the knife will automatically cut further into the neck. (Alan J. Thatcher, 2019).

Recently, one unit of deflasher automation system was developed and fabricated by Syafiq & Hafiz (2016). However, there is still excessive or ragged flash visually appearance on the products and need for further improvement. This is due to the existing design was a failure where the flash still occurred after deflashing and may defect the bottle neck.

This project is a continuous work from the previous PSM Project was conducted by Syafiq & Hafiz (2016). In this automation deflasher equipment project which aims to further improve the efficiency of the cutting die mechanism using blade made up from sheet metal with size 1mm stainless steel material for deflasher automation mechanism unit.

## **1.2 Problem Statement**

The excess plastic material along the parting line of a blown product is called flash for an example product bottle at Plastic Laboratory, Faculty Of Manufacturing Engineering Utem. The bottle with size 0.5L as a product that produce by Extrusion Blow Molding. Usually, the critical part has been found during the blow molding process which is flash at a neck and the bottom of the product bottle caused by the material where excessive of the blow air pressure. Initially, the flash was removed manually by technician with tearing or trimming the excess material. Therefore, a straight metal blade was designed to shear the excessive material from the required height of the blown plastic finish (L.Belcher, 1994). The existing design that was developed and fabricated by Syafiq and Hafiz (2016) which is cutting automation created a major problem where the defect occurred at a neck of the bottle product during the trimming process. In addition, the quality of the product was affected by the bottle's flash trimming.

## **1.3 Objective**

- To improve the design of cutting unit deflasher mechanism.
- To eliminate the excessive plastic at the top of the bottle product.

## **1.4 Scope of Project**

This research was located at the Plastic Laboratory, Faculty Of Manufacturing Engineering in UTEM to improve the existing design of cutting mechanism (deflashing) for a blow molding machine. This research will focus on a deflasher to remove the excessive part of the plastic bottle after molded or the die produces a flash after the blow molding process. The mechanism or design for deflashing component system is pattern based on the design of the blow molding product. An aluminium one of a ductile material that suitable for

manufacture process of the jig and fixture. The material that hard and brittle used to fabricate are not suitable and can cause fracture during the machining process. Besides, the priority of the cutting component (deflasher) to improve the product, it also gives expediency in terms of the straightforward design, increases the quantity of the product and improves the precise machining. The cutting mechanism (deflasher) will result in precise cutting when applied through the blow molding machine. The parameter of the blow molding machine must be precise during the process of trim the bottled product. This feature will help to certify the cutting component to be more efficient than the previous automation cutting setup by Syafiq & Hafiz (2016). The outcome result of the product will be compared with the existing design. Finally, the type of die molded product in this project will become exact to one product type that is precise bottle shape.

## **1.5 Significant / Importance of Study**

The contribution of this study will be an advantage that can be earned by UTeM FTK once this innovation idea was complete. The improvement of cutting unit (deflasher) can help to overcome the defect of the product and can be used inside the blow molding machine. Other than that, the long period implications of this study will reduce the time to produce the product by using the blow molding machine. Finally, the findings of this study will improve the safety precaution because the existing the deflasher automation cutting, the operator or student must remove flash at the top of the product by using a knife and it can contribute to injury. So with this innovation will overcome the unfortunate accident and increase the amount of product with rapidly.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.0 Introduction**

In this section reviews the major and also basic knowledge about the blow molding machine and the operation the method of trimming the blow molded product.

#### **2.1 History of Blow Molding Machine**

Glass, plastics, and aluminium are three classes of raw materials existing today which are blown to form molded parts. The techniques of modern blow molding plastics grew from the art of glass blowing. The method is attributed to Syrian glass workers in the first century BC, who realized that a glass bulb at the end of a blowpipe could be shaped into many useful the shape of hollow, with holders feet and decorated attachments additional at will. During the middle ages, chiefly in Great Britain and elsewhere in Europe, the process was refined and becoming an important commercial industry. In 1869, introduced of celluloid which is state the first of thermoplastic. The material cellulose nitrate was familiarized to produce toys and it was softened by the steam and it has limitation to volatility which is high. In a 1919 cellulose acetate which is more constant and an ability for a squeeze bottle in 1930. The first blow molding machine was created in 1930 by Plax Corporation and it created a