UNIVERSITI TEKNIKAL MALAYSIA MELAKA

AUTOMATED DEFLASHING SYSTEM FOR BLOW MOLDING PROCESS

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Manufacturing Engineering Technology (Process and Technology) with Honours.

by

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I hereby, declared this report entitled “AUTOMATED DEFLASHING SYSTEM FOR BLOW MOLDING PROCESS” 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 Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering Technology (Process and Technology) with Honours. The member of the supervisory is as follow:

…….

SALLEH BIN ABOO HASSAN

(Project Supervisor)

ABSTRAK

Barang yang dapat dihasilkan melalui mesin acuan penyemperitan ialah dari sekecil kecil barang sehingga barang yang paling besar. Kebanyakan hasil barang daripada proses acuan ini ialah botol, tetapi ia juga mampu menghasilkan komponen automotive , barang mainan dan alat alat perubatan.Bahan mentah yang biasa digunakan dalam proses ini biasanya polietilena ketumpatan rendah (LDPE) dan polietilena ketumpatan tinggi (HDPE) . Masalah yang sering dihadapi semasa proses ini dijalankan ialah lebihan bahan mentah yang terkeluar di leher botol kerana tekanan acuan yang tinggi. Metadologi projek ini menerangkan tentang proses proses yang diperlukan seperti penyediaan pengapit dan pemotong untuk menghasilkan satu unit mekanisma pemotong lebihan plastik tanpa menggunakan tenaga manusia . Aluminium digunakan sebagai bahan mentah utama dalam menyediakan mekanisma ini, manakala besi pula digunakan untuk membuat unit tapak bagi pengapit.

ABSTRACT

Extrusion Blow molded part can be from very small to extremely larger part. Most of blow molded product are bottle, but it also can be used to produce items such as automotive component, toys, and medical item. The raw material used in this process is usually High Density Polyethylene (HDPE), and Low Density Polyethylene (LDPE). Problems that exist in blow molding process is excessive pre-blow air pressure cause material called flash at the neck of the bottle. The project methodology that was used describes the process required including the preparation of clamping and cutting design to fabricate the deflasher mechanism, then project was set out to fabricate a unit of clamping and cutting mechanism that able to remove excessive flash at the neck of the bottle without using manpower. Aluminum is used as main material to fabricate the deflasher while base unit used mild steel material to attach the clamping unit.

DEDICATION

I want to thanks to my dear family, lecturers and friends who have given a lot of help and encouragement to me to complete this project.

ACKNOWLEDGEMENT

In the name of Allah S.W.T, the most gracious and merciful, praise to Allah the lord of universe and may blessing and peace of Allah be upon his messenger Muhammad S.A.W. First, and foremost thank to Allah for giving me wellness and ideas to do this project. Without any of it, I surely cannot complete this project in the time given.

I would like to express my deepest gratitude towards to my project supervisor Mr.Salleh bin Aboo Hassan ,every lecturer and technician who has help and guide me by giving advices encouragement and patience during the time period to completing this project.

Last but not least, I like to express my very thankful and send our grateful to my entire friends and my family for the moral and financial support. Their views and this are useful definitely. Without all these people encouragement, support and advices this thesis project might not be successfully carried out. To those that I forget to mention, please forgive me. I do appreciate all the things you have done for me.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

mm	millimetre
CAD	Computer Aided Design
CAM	Computer Aided Manufacturing
CNC	Computer Numerical Control
EDM	Electrical Discharge Machining
NC CODE	Numerical Control
HDPE	High Density Polyethylene
LDPE	Low Density Polyethylene
PVC	Polyethylene Chloride
PP	Polypropylene
s	Second

CHAPTER 1
INTRODUCTION

1.0 Introduction

This chapter, discussed about the framework of the project which including background of the study, objective, problem statement, scope of the project and significant/important of study.

1.1 Background of Study

Blow molding product is the most common method used to produce hollow product out of thermoplastic material. Today it is a leading plastic manufacturing process because of the wide range of plastic resin that can be blow molded and the many possible methods of blow molding. Blow molded part can be from very small to extremely larger part. Most of blow molded product are bottle and container, but it also can be used to produce items such as automotive component, toys, medical item and double molded cases. The raw material used in this process is usually High Density Polyethylene (HDPE), Low Density Polyethylene (LDPE), Polypropylene (PP), Polyethylene Chloride (PVC) and Polyethylene terephthalate. This blow molding process start with a heated thermoplastic tube also known as parison. The parison has a hole in one end to allow compressed air to enter into the mold to conform the shape of mold cavity. Then the mold plastic will be left cool depend on the time that set at the machine. Once release from the mold, the product can be past processed to have the excessive part trimmed.

1.2 Problem Statement

In blow molding process, there is a problem has been identified which is excessive pre- blow air pressure caused material called flash at the neck of the bottle. Generally, there are five steps of the blow molding process. Firstly, plasticizing or melting the resin, the hollow tube of plastic melt extruded from the die head, and expanded within the mold cavity by air pressure to produce the molded part. Air blown into the parison forces it against the mold walls where it is then cooled. Next, the ejection of the part and lastly trimming and finishing of the part to become a complete product. The last step of blow molding process is the main problem because it is remove manually. This will cause time for finish a complete product become longer and productivity of mass production also be affected. Besides, an accuracy of the product also may affect due to removing flash manually.

1.3 Objectives

The objectives of this project are design and develop clamping and cutting dies for blow molding process.

1.4 Scopes of Project

This study was carried out to design and develop clamping and cutting dies (deflashing) for Blow Molding process focus on Extrusion Blow Molding Machine located at the plastic laboratory as shows in figure 1.1 below. In this project, type of die molded product will be specified into one type of product which is bottle.

Figure 1.1 Extrusion Blow Molding Machine

1.5 Significant / Importance of Study

There are some potential benefits that can be gained after the completion of this project such as:

1. Excessive of flash can be removed automatically.
2. Reduce the cost of manufacturing
3. Uniform cutting quality
4. Non-hazard compared to manually cut the flashes by using knife.

CHAPTER 2
LITERATURE REVIEW

2.0 Introduction

This chapter reviews the fundamental and general knowledge regarding the blow molding process and conceptual design automated deflashing system for blow molding process. The main part of this chapter is related to excessive plastic part in blow mold product. This part would cover and discuss the importance and functions of each component in deflashing unit such as fixture and clamping dies. Lastly, the subtopic about the cutting method used in this machine.

2.1 Blow Molding Development History

According from book of Understanding Blow Molding (2000,pg2) The first patent issued in the 1850s for blow molding with a material other than glass was issued to Samuel Armstrong. These early items were made from natural latex, mainly novelty items that were unique because of their soft feel. The next major advancement came in 1869 with the commercialization of celluloid, which is considered to be the first thermoplastic material. In the 1880s, cellulose nitrate was introduced and was used to produce novelties and toys. This material was softened by steam; the disadvantages was its high volatility, which kept it from being widely used. In the early 1930s, Plax Corporation developed the first blow molding machine. This was crude and produced only small quantities. However, from this early beginning a machine to make 25000 bottles a day was developed. A photograph of the first blow molding machine can be seen in figure below.

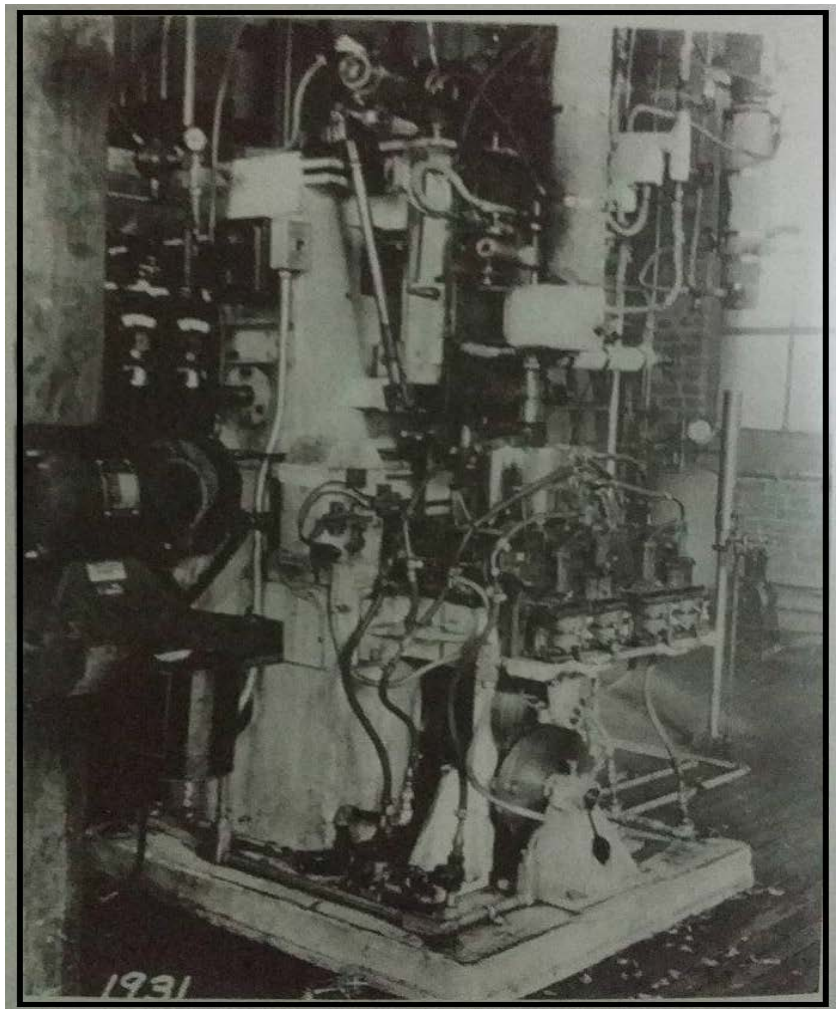


Figure 2.1 First Blow Molding Machine Developed by Plax in the early 1930s. Courtesy of Innopak Corp

The beginning of blow molding industrial can be said to have started in 1953 with the development of high density polyethylene. This material was developed simultaneously by Philips Petroleum Co. In the United State by Professor K. Ziegler in Germany.

2.2 Extrusion Blow Molding

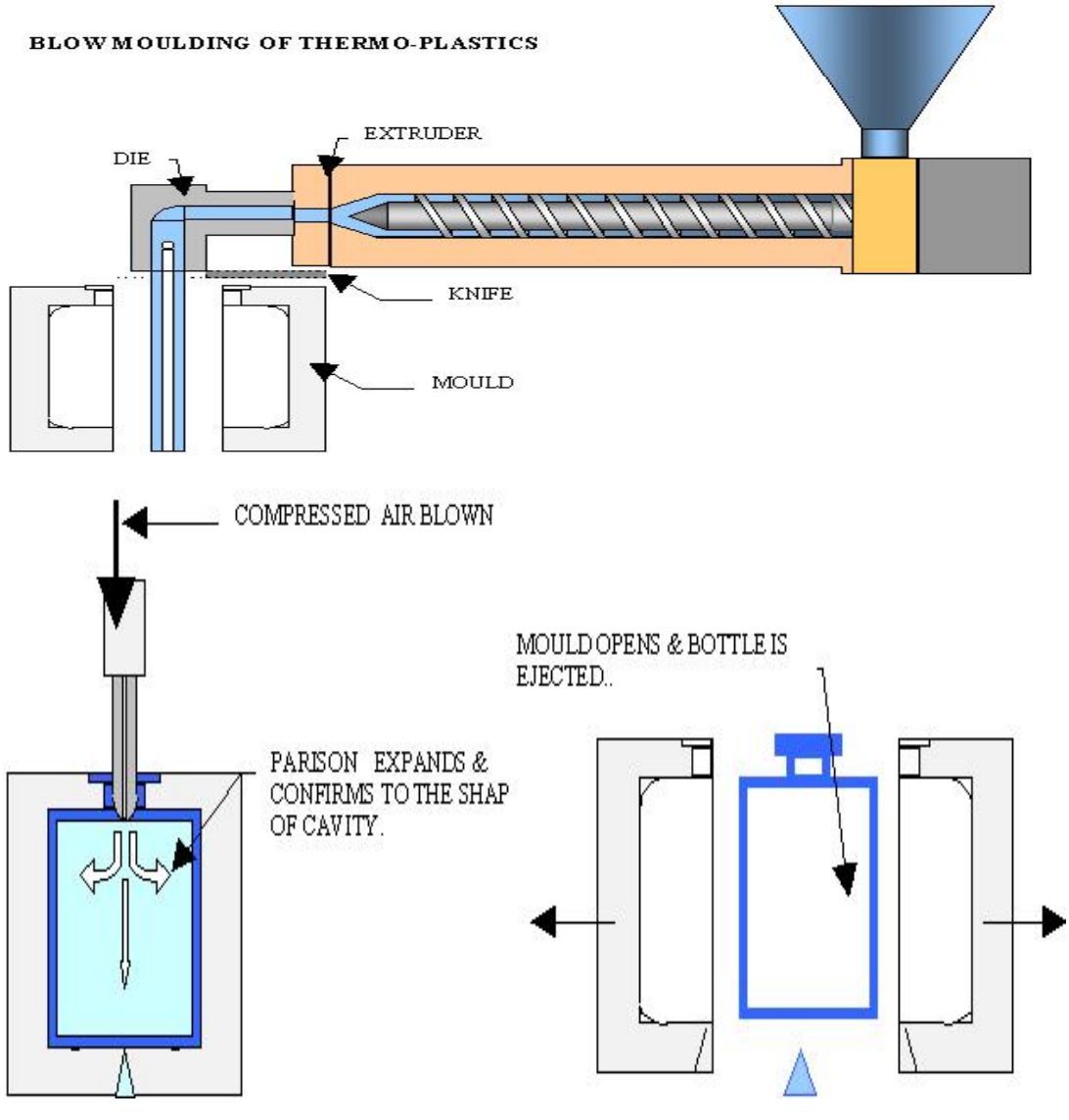
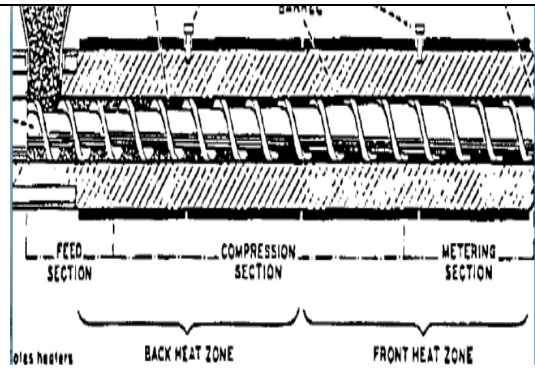


Figure 2.2: Common Elements of a Blow Molding System

Extrusion is a process of applying heat and pressure the resin to melt and force it through an accurately dimensional die to produce the desired shape. For blowing purpose this a shape from which the parison is cut. There are several main parts to an extrusion blow molding machine, which are:

Screw and Barrel	
Hopper	
Feed section,Compression section and Matering section	

Screen pack	
Die head	
Die and Mandrel	

Figure 2.3 Main Part Extrusion Blow Molding

2.2.1 Feeding

According from book of Understanding Blow Molding (2000,pg22) Extruders size are given by bore sizes and the ratio of bore diameter of screw's length. To feed the barrel, first feed the resin into the funnel shaped hopper, which could be done by hand from 22kg bags or by using an automatic vacuum device. The hopper is kept filled with the resin. An observation window is on one of its sides to view the resin levels. A lid is kept on the apex of the hopper to keep out contamination from dust, dirt, or other foreign matter, as well as preventing any damages to the equipment. The base of the hopper has a device to control the flow of the resin so it can be stopped and emptied. The hopper throat and part of the feed section are containing water or air cooled to prevent resin from melting too soon and sticking together which incur bringing in the hopper throat before reaching the screw. Bridging will cause problems, such as shutting down of the production and oxidating of the resin in the barrel, requiring cleaning of the extruder screw and die. From the hopper throat the resin enter the extruder screw's channel.

2.2.2 Melting and Mixing

According from book of Understanding Blow Molding (2000, pg22) The screw is driven by an adjustable speed drive and rotates within the hardened linear of the barrel. The resin is forced forward by the rotating screw flights. As the screw turns the resin will be heated, mixed and compressed inside the screw channels. A long, well-engineered screw and barrel are used for better melting and mixing of the resin. These provides better appearance and standardized wall thickness in the parison. Improve the production rate and easier to control the melt temperature. The screw recommended is at least 20 times longer that its diameter and have a compression ratio of 3:5:1 to 4:1. Since the rotating of the screw creates