UNIVERSITI TEKNIKAL MALAYSIA MELAKA

AUTOMATION DEFLASHING SYSTEM FOR BLOW MOULDED PRODUCT

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

by

MUHAMAD HAFIZ BIN ABDUL WAHAB

B071310801

921130-07-5155

FACULTY OF ENGINEERING TECHNOLOGY

2016

© Universiti Teknikal Malaysia Melaka

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: Automation Deflashing System for Blow Moulded Product

SESI PENGAJIAN: **2016/17 Semester 1**

Saya **MUHAMAD HAFIZ BIN ABDUL WAHAB**

mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (✓)

☐ SULIT (Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia sebagaimana yang termaktub dalam AKTA RAHSIA RASMI 1972)

☐ TERHAD (Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

☐ TIDAK TERHAD

Disahkan oleh:

_____ _____

Alamat Tetap:

No 41, Kampung Seri Rahmat,

31500 Lahat,

Perak Darul Ridzuan

Cop Rasmi:

** Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh laporan PSM ini perlu dikelaskan sebagai

© Universiti Teknikal Malaysia Melaka

DECLARATION

I hereby, declared this report entitled “Automation Deflashing System for Blow Moulded Product” is the results of my own research except as cited in references.

Signature	:	…….
Author’s Name	:	MUHAMAD HAFIZ BIN ABDUL WAHAB
Date	:	9 DECEMBER 2016

© Universiti Teknikal Malaysia Melaka

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:

……

(EN SALLEH BIN ABOO HASSAN)

(Project Supervisor)

© Universiti Teknikal Malaysia Melaka

ABSTRAK

Pada masa ini, sumber-sumber sistem untuk mesin banyak menggunakan komponen elektrik, hidraulik dan pneumatik. Untuk mendapatkan kemahiran dan pengetahuan mengenai bagaimana untuk membangunkan sistem, projek ini adalah dicadangkan dengan gelaran "Sistem Automasi deflashing untuk Blow Moulded Produk", terdapat banyak keperluan diperlukan seperti fungsi komponen pneumatik dan sistem litar Arduino UNO. Mesin pengacuan tamparan di makmal pada masa kini dikendalikan secara manual untuk mengeluarkan berkelip botol. Produk siap akan berkelip di bahagian bawah dan leher. Selepas proses pengacuan tamparan, pisau digunakan untuk memotong berkelip botol. Projek ini adalah untuk membuang berkelip botol dengan operasi sistem automatik sepenuhnya. Projek ini juga akan mengatasi masalah ini dalam proses penyingkiran berkelip botol. Oleh itu, sistem automasi deflashing untuk produk tamparan teracu dicadangkan dalam tesis ini. Silinder pneumatik mempunyai alat elektronik yang menggunakan litar Arduino Uno, halangan inframerah sensor mengelakkan terletak di mesin pengacuan tamparan semasa proses penyejukan. Ini kerana halangan inframerah sensor mengelakkan digunakan dalam litar ini untuk mengesan objek apabila sensor telah disekat oleh objek dan litar Arduino Uno akan mengaktifkan injap solenoid yang dipasang di sebelah mesin pengacuan tamparan. Injap solenoid akan membekalkan tekanan udara untuk memberi kuasa untuk silinder pneumatik memanjangkan. Bagi litar pneumatik, perisian FluidSim telah dikehendaki untuk melihat proses sistem pneumatik sebelum ia dilaksanakan.

© Universiti Teknikal Malaysia Melaka

ABSTRACT

Currently, the sources of a system for many machines are using the electrical, hydraulic and pneumatic component. To gain skills and knowledge on how to develop the system, this project is recommended with the title of "Automation Deflashing System for Blow Moulded Product", there are many requirements is required such as the pneumatic component and Arduino UNO circuit system. The blow molding machine at the laboratory nowadays is manually operated for removing the bottle flashes. The finished product will have to flash at the bottom and neck. After blow moulding process, the knife is used to cut the bottle flashes. This project is to remove the bottle flashes with fully automated system operation. This project will also overcome the problem in the removal process of bottle flashes. Hence, an automation deflashing system for blow moulded product proposed in this thesis. The pneumatic cylinder has an electronic device that uses the Arduino Uno circuits, infrared obstacle avoidance sensor located on the blow molding machine during the cooling process. This is because infrared obstacle avoidance sensors used in this circuit to detect the object when the sensor have been blocked by the object and the Arduino Uno circuit will activate the solenoid valve that is installed on the side the blow molding machine. The solenoid valve will supply the air pressure to give force for the pneumatic cylinder extends. For the pneumatic circuit, FluidSim software has been required to see the process of the pneumatic system before it implemented.

© Universiti Teknikal Malaysia Melaka

DEDICATION

I want to thanks to my family, lecturer and friends that give me extra spirit to continue develop this project.

© Universiti Teknikal Malaysia Melaka

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 and every lecturer 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.

© Universiti Teknikal Malaysia Melaka

TABLE OF CONTENT

© Universiti Teknikal Malaysia Melaka

© Universiti Teknikal Malaysia Melaka

© Universiti Teknikal Malaysia Melaka

LIST OF TABLES

© Universiti Teknikal Malaysia Melaka

LIST OF FIGURES

© Universiti Teknikal Malaysia Melaka

© Universiti Teknikal Malaysia Melaka

LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

AC	-	Alternating Current
USB	-	Universal Serial Bus
MHz	-	Mega Hertz
ICSP	-	In Circuit Serial Programming
DC	-	Direct Current
Cm	-	Centimeter
LDPE	-	Low-Density Polyethylene
HDPE	-	High-Density Polyethylene
PP	-	Polypropylene
PVC	-	Polyvinyl Chloride
PET	-	Polyethylene Terephthalate
I/O	-	Input/Output

© Universiti Teknikal Malaysia Melaka

CHAPTER 1
INTRODUCTION

1.0 Background

Blow moulding is a producing manner extensively used to create hollow thin-wall plastic items including bottles, cases, bins, and bellows. A regular blow moulding procedure starts off evolved with a heated hollow thermoplastic tube, additionally called preform or parison. The plastic tube has a hollow in a single quit, allowing compressed air to enter. It's far then inflated into the closed chamber of a divided mould to comply with the form of the mold cavity. The molded plastic may be left to cool and harden. As soon as launched from the mould, the plastic part can be put up-processed to have the holes rimmed or residues rimmed. Not all plastics are suitable for blow moulding. The most frequently used materials in blow moulding are Low-Density Polyethylene (LDPE), High-Density Polyethylene (HDPE), Polypropylene (PP), Polyvinyl Chloride (PVC), and Polyethylene Terephthalate (PET). The products manufactured by blow moulding, although limited to hollow shaped plastics, are widely used in many industrial fields and everyday lives. The following are the products that see a lot of blow moulded parts: Automobile, consumer, electronics, fuel oil tanks, furniture, and packaging. According to LyondellBasell Technical Tip, Common Blow Molding Problems and Their Solutions showed that the during a normal blow molding operation a number of blow molding problems commonly occur, including parison curl, uneven pinch-offs, excessive flash and incomplete handle. Have three factors excessive flashes can be due to any of the following. The Factor is a resin displaying excessive swell,

© Universiti Teknikal Malaysia Melaka

excessive pre-blow air pressure and a misaligned mold assembly. A typical example of a bottle with excessive flash can be seen in Figure 1.1. Reduce pre-blow air pressure slightly to determine if problem diminishes. If not, loosen the platen adjusting bolts and nudge the mold assembly a few hundredths of an inch towards the handle. Re-tighten the bolts and restart the machine. Usually, the problem disappears. If not, call your resin supplier for further assistance. For factor the incomplete handles is a typical example of a bottle with an incomplete handle is shown in Figure 1.2. When the flash ends high on the handle, the likelihood of a blowhole occurring at the base of the handle is very high

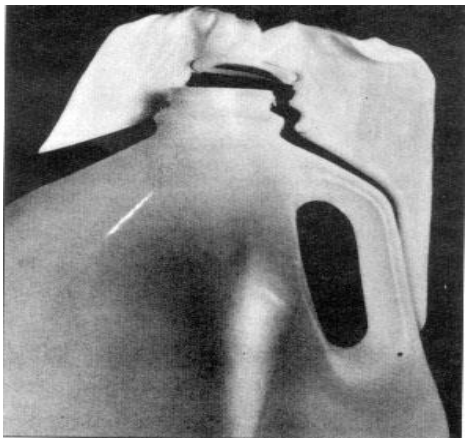

Figure 1.1: Bottle with flash down the entire handle.

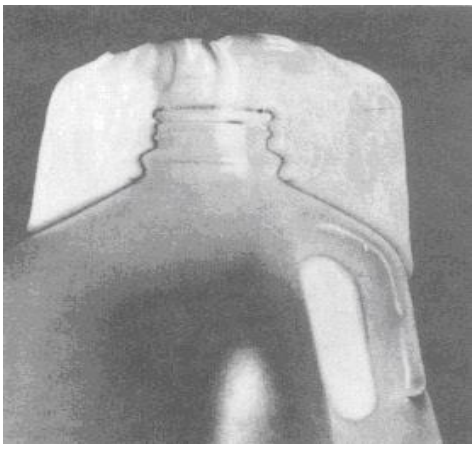

Figure 1.2: with the flash ending far too high on the handle, a blowout and a useless bottle result.

© Universiti Teknikal Malaysia Melaka

Automation deflashing system for blow moulded product is one unit of automation deflashing system which automatically operated using the pneumatic system to remove the bottle flashes. This system is a safety device in a blow molding machine. The system used a pneumatic system such as the electrical circuit, sensor, solenoid valve and pneumatic cylinder. The automation deflashing system used one sensor, Arduino infrared obstacle avoidance sensor to detect the object. After the blow moulding process finished, eventually the sensor will detect the object when the sensor have been blocked by the object and the solenoid valve will automatically open the air. This caused the pneumatic cylinder moves forward to push the cutter mold and the bottle flashes can be completely removed from the bottle. By using this system, it is expected that the bottle flashing is must easier to remove and very safe than the manually operated.

1.1 Problem Statement

Currently, the blow molding machine at the laboratory is manually removed the bottle flashes. This manually process of flashes trimming consumes an operator to perform this task which is costly for production. In order to improve the process efficiency, the development of deflashing machine should be considered for a feasibility study.

1.2 Objective

The Objective of this project is to develop commissioning and testing one unit of the pneumatic system for automation deflashing system.

© Universiti Teknikal Malaysia Melaka

1.3 Scope

To achieve the project objectives, there is one area of scope that being considered:

1.3.1 Circuit Design for Sensor and Pneumatic System.

Automation deflashing system is used for removing the bottle flashes. It used electrical circuits, An Arduino Uno circuit is developed which will compare the voltage input from a sensor. After the blow moulding process finished, eventually the sensor will detect it when the sensor have been blocked by the object and the solenoid valve will automatically open the air. This caused the pneumatic cylinder extend and the bottle flashes can be completely removed from the bottle.

© Universiti Teknikal Malaysia Melaka

CHAPTER 2
LITERATURE REVIEW

2.0 Introduction of Automation Deflashing System.

This chapter covered all the information related to this project, such as pneumatic function and electrical component. The pneumatic function and electrical component used in the automation deflashing system are double acting pneumatic cylinder, Arduino board and circuit, infrared obstacle avoidance sensor, timer relay and the 5/2-way solenoid valve.

Using this information, the element in the project will be presented to give more clarification about the title, objective, problem statement and the scope of a project. All the sources are either from book, journal, research paper and website.

2.1 Pneumatic System

The pneumatic system uses pressurized gasses to transmit and control power. As the name implies, the pneumatic system typically uses air (rather than some other gas) as the fluid medium because air is safe, low cost and readily available fluid. It is particularly safe in environments where an electrical spark could ignite leaks from system components (Majumdar, 1995).

© Universiti Teknikal Malaysia Melaka

There are several reasons for considering the use of pneumatic system instead of hydraulic systems. Liquids exhibit greater inertia than do gasses. Therefore, in a hydraulic system, the oil is a potential problem when accelerating and decelerating actuators and when suddenly opening and closing valves. Liquid also exhibits greater viscosity than do gasses. This results in large frictional pressure and power losses. Also, since the hydraulic system uses a fluid foreign to the atmosphere, they require special reservoirs and no leak-system design. Pneumatic systems use air that is exhausted directly buck into the surrounding environment. Generally speaking, pneumatic systems are less expensive than hydraulic systems (Majumdar, 1995).

However, because of the compressibility of air, it is impossible to obtain precise, controlled actuator velocities with pneumatic systems. Also, precise positioning control is not obtainable. In an application where actuator travel is to be smooth and steady against a variable load, the air exhaust from the actuator is normally metered. Whereas pneumatic pressures are quite low to explosion dangers involved if components such as air tanks should rupture (less than 250psi), hydraulic pressure can be as high as 12000psi. Thus hydraulic pressure can be high-power systems whereas pneumatic is confined to low power application (Majumbar, 1995).

2.1.1 Principle and Maintenance

The technology of pneumatic has gained tremendous importance in the field of workplace rationalization and automation from old-fashioned timber works and coal mines modern machine shops and space robots. Certain characteristic of compressed air has made this medium quite suitable for use in modern manufacturing and production plants.

It is, therefore, important that technicians and engineers should have a good working knowledge of the pneumatic system, air operated tools and other

© Universiti Teknikal Malaysia Melaka

accessories, and including a through and clear concept of the physical principles that governs the behavior of compressor air (Majumbar, 1995).

2.1.2 Application of Pneumatic

With the introduction of pneumatic in the manufacturing process, the industry is benefited with a cheaper medium of industrial automation which judiciously used, may bring down the cost of production to a much lower level. A few decades ago, maximum application of pneumatic was probably in the field of construction where the main source of power for tools like power hammer drills and etc. was compressed air only. Now, compressed air is used in every walk of industrial life starting with pneumatic cranes to the use of air in the brake systems and so on.

The advantage of pneumatic:

1. Wide available of air.
2. Compressibility of air.
3. Easy transportability of compressed air in pressure vessels, containers and in long pipes.
4. Fireproof characteristic of the medium.
5. Simple construction of pneumatic elements and easy handling.
6. High degree of controllability of pressure, speed and force.
7. Possibility of easy but reasonable reliable remote controlling.
8. Easier maintenance.
9. Explosion-proof characteristic of the medium.
10. Comparatively cheaper in cost than other systems.

Compared to the hydraulic system, the pneumatic system has better operational advantages but it cannot replace hydraulic system so far as power

© Universiti Teknikal Malaysia Melaka

requirement and accuracy of operations are concerned. In areas of hazards, probably air will be a better medium of power than the electrical system, hydraulic system, and steam power system. It may not be necessary at this stage to dwell further on the multitude of advantages that may be derived from applying pneumatic energy on production plants and systems except what has been already mentioned earlier (Majumdar, 1995). Figure 2.1 shows the differential features of electrical, hydraulic and pneumatic power.

	Electrical	Hydraulic	Pneumatic
Energy source	Usually from outside supplier	Electric motor or diesel driven	Electric motor or diesel driven
Energy storage	Limited (batteries)	Limited (accumulator)	Good (reservoir)
Distribution system	Excellent, with minimal loss	Limited, basically a local facility	Good, can be treated as a plant wide service
Rotary actuators	AC and DC motors, Good control on DC motors. Ac motors cheap	Low speed. Good control. Can be stalled.	Wide speed range. Accurate speed control difficult
Linear actuators	Short motion via solenoid. Otherwise via mechanical conversion	Cylinders. Very high force	Cylinders. Medium force
Points to note	Danger from electric shock	Leakage dangerous and unsightly. Fire hazard	Noise
Energy cost	Lowest	Medium	Highest

Figure 2.1: Comparison features of electrical, hydraulic and pneumatic (Majumdar, 1995)

© Universiti Teknikal Malaysia Melaka

2.1.3 Basic System

In modern industries, the pneumatic system is used as a means of workplace mechanization and automation where a major part of manual and tedious work may be supplemented controls for quick and economic production. The average investment in this field may not be too high as the system components are not very costly and automation could be affected in stages too. The basic system requirements for the introducing pneumatic are one plants are listed below (Parr, 1991).

1. Compressor plants the production plant using pneumatic tools; etc. should be equipped with the compressed air plant of appropriate capacity to meet the compressed air need of the systems.
2. Pipeline a well-laid compressed air pipeline should be drawn from the compressor plant to the consumption point of pneumatic energy in various sections of the plant where pneumatic gadgets and systems are to be introduced.
3. Control valves various types of control valves are used to regulate, control and monitor the air energy, for control of direction, pressure, flow, etc.
4. Air actuator various types of a cylinder or air motor are used to perform the useful work for which the pneumatic system is designed like using cylinders for linear movement of the jig, fixtures, raw materials feeding, etc.
5. Auxiliary appliances various types of auxiliary equipment may have to be used in a pneumatic system for effecting better performance, easy controllability, and highest reliability.

© Universiti Teknikal Malaysia Melaka