



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

“DESIGN AND FABRICATE OF PNEUMATIC PUNCHING TOOL”

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

by

SITI NOOR AZRIN BINTI SUKIRAN

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 85300 Labis, Segamat,
 Johor.

Cop Rasmi:

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Pensyarah
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Author Name : SITI NOOR AZRIN BINTI SUKIRAN
Date : 20 APRIL 2010

APPROVAL

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

.....
(Mr Wahyono Sapto Widodo)

ABSTRACT

Many machines today are using of electrical, hydraulic and pneumatic component as a source of system. So, to gain skills and knowledge on how to develop machine, this project are recommend. With the title of “Design and Fabricate of Pneumatic Punching Tool”, there are many requirements to know such as function of pneumatic component, capability to use design software and conventional machine to fulfill this project. In design stage, there provide three design that need to be considered and the design was selected using Pugh Method selection. Then, the design was drawing back using SolidWork 2007. For pneumatic circuit, Fuidsim software has been used which is required to see the process of machine before it implemented. For fabrication part, the machining process are only used conventional machine; milling machine and lathe machine. In testing process, compressor with motor 2.5 HP has been using as a source of air and the machine was functioned well where it can punch on 0.7mm of sheet metal with diameter 10mm. At the end of task, the conclusion is making and several recommendations are suggests to make an improvement about the result and the project for future study.

ABSTRAK

Terdapat pelbagai jenis mesin yang menggunakan elektrik, komponen hidraulik dan pneumatik sebagai sumber sistem. Jadi, untuk mendapatkan kemahiran dan pengetahuan tentang bagaimana pembuatan mesin, projek ini disyorkan. Dengan tajuk "Design dan Fabricate of Pneumatic punching Tool" ada banyak keperluan yang perlu diketahui seperti fungsi –fungsi dari komponen pneumatik, kebolehan menggunakan perisian rekabentuk dan mesin konvensional untuk memenuhi projek ini. Pada tahap desain, ada tiga desain mempunyai yang perlu dipertimbangkan dan rekabentuk ini dibuat dengan menggunakan Kaedah pemilihan Pugh. Dan kemudian, rekabentuk itu dilukis kembali menggunakan SolidWork 2007. Untuk litar pneumatik, Fluidsim perisian yang telah digunakan yang diperlukan untuk melihat proses mesin sebelum dilaksanakan. Untuk bahagian fabrikasi, proses pemesinan hanya menggunakan mesin konvensional dan mesin penggilingan mesin larik. Dalam proses ujian, kompresor dengan motor 2.5 HP telah digunakan sebagai sumber udara dan mesin itu berfungsi dengan baik di mana ia boleh membuat pukulan ke atas 0.7mm lembaran logam dengan diameter 10mm. Pada akhir tugas, kesimpulannya adalah dibuat dan juga beberapa cadangan telah dicadangkan untuk membuat perbaikan tentang keputusan dan projek untuk kajian di masa depan.

DEDICATION

Specially dedicated to my beloved family especially my father (Haji Sukiran Bin Haji Sibon) and my mother (Hajah Zaharah bt Ismail); whose very concern, understanding, supporting and patient. Thanks for everything. To all my beloved friends, I also would like to say thanks. The work and success will never been achieved without all of you.

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CHAPTER 1

INTRODUCTION

1.1 Introduction to the Research

This project is study about the design and fabricates of pneumatic punching tool which shows capability to design more than one concept and fabricate the machine using a variety of machine. Other than that, it is important to studies on pneumatic and die for punching tool which are the main topic for this project. So, at the end of this project, student will practicing on how to build and steps to follow to complete the requirement for this project.

This project are also provided to familiarize the student about the technology on sheet metal forming which is used pneumatic concept yet has rapidly grown especially in the automotive and electrical industry. Furthermore, the strong concern is to obtain better product quality with lower cost. Then, cutting and punching are two important processes in the sheet metal industry; the former is flexible in processing whilst the latter is effective in production. To combine the advantages of both, the so-called combination machines that combine the cutting and punching processes are used in sheet metal processing. Using pneumatic systems is economical and environmentally friendly, as air is inexpensive, plentiful and easily compressed and stored in tanks.

1.2 Problem Statement

This project will focus on build of low force punching tool with using a pneumatic system. It is because, in the real industry, most company needs to buy a hydraulic machine whether they only need a small force to punch. Whether hydraulic machine can used for low or high force, high cost of machine and maintenance are needed. Therefore, this pneumatic punch also can help small company to use semi auto puncher than using manual puncher.

1.3 Objectives

The main objectives of this project study are to design and fabricate a simple punching tool that used pneumatic system. The outcomes of this project study will be:

- i. To design mechanical system of a punching tool.
- ii. To design a pneumatic system of a punching tool.
- iii. To fabricate a pneumatic punching tool machine through several fabrication techniques.

1.4 Scope and Key Assumptions

In order to develop a pneumatic punching tool, the design should have an actuator as a main component and then puncher as a tool to make a hole. Besides, there is only need a simple die design for this machine. The punching tool is designed to perform a hole in a sheet metal with 0.5-0.7mm thickness. The design will consists of pneumatic system design, die design (piecing process) and stress analysis of the punching tool.

1.5 Aim of the Project

This project is aimed to design and develop a pneumatic punching tool. The important is the machines that will provide are fulfilling the requirement of the study. For the fabrication, there have a choice whether to use conventional machine or CNC machine but the point is the fabrication will finish on time.

1.6 Project Planning

The planning of this project is based on the Gantt chart that was design in order to organize the time that must be taken to complete the project Table 1.1, shows all the steps taken in the chart. By using this chart, the researcher can estimate time that must be taken to complete such of task.

Table1.1: Gantt Chart For The Project

No	Detail/Week No	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38
1	Selection of Project Topic	■																		
2	Preliminary Research Work (Report)																			
	<i>Introduction</i>	■																		
	<i>Objective & Scope of Project</i>	■	■																	
	<i>List of references/literature</i>	■	■	■																
	<i>Project Planning</i>	■	■																	
3	Progress Work (Report)																			
	<i>Literature Review</i>	■	■	■	■	■	■	■	■											
	<i>Methodology</i>	■	■	■	■	■	■	■	■											
4	Studying Configurations																			
	<i>Design sketching</i>			■	■	■	■	■	■											
	<i>Pneumatic diagram</i>				■	■	■	■	■											
	<i>Drawing used CAD</i>					■	■	■	■											
5	Project Work (Practical)																			
	<i>machining</i>								■	■	■	■	■	■						
	<i>assembly</i>													■	■	■				
6	Progress Work (Report) Continue																			
	<i>Development & Implementation</i>												■	■	■	■	■			
	<i>Result & Discussion</i>												■	■	■	■	■			
	<i>Conclusion & Recommendation</i>												■	■	■	■	■			

CHAPTER 2

LITERATURE REVIEW

This chapter will cover all the information related to this project, such as die design, piercing punches, pneumatic function and tolerances.

Using this information, the element in the project will be presented to give more understanding about the title, objective, problem statement and the scope of project. The source that may be taken is either from book, journal, patent, conference paper, research paper and website.

2.1 Pneumatic System

Pneumatic systems use pressurized gases to transmit and control power. As the name implies, pneumatic system typically use 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).

There are several reasons for considering the use of pneumatic systems instead of hydraulic systems. Liquids exhibit greater inertia than do gases. Therefore, in hydraulic systems the oil is a potential problem when accelerating and decelerating actuators and when suddenly opening and closing valves. Liquids also exhibit greater viscosity than do gases. This results in larger frictional pressure and power losses. Also, since hydraulic system use a fluid

foreign to the atmosphere, they require special reservoirs and no leak- system designs. Pneumatic systems use air that is exhausted directly back 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 applications 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 pneumatics is confined to low power application (Majumdar, 1995).

2.1.1 Principles and Maintenance

The technology of pneumatics has gained tremendous importance in the field of work place rationalization and automation from old fashioned timber works and coal mines modern machine shops and space robots. Certain characteristics of compressed air have 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 pneumatic system, air operated tools and other accessories, including a thorough and clear concept of the physical principles that govern the behavior of compressed air (Majumdar, 1995).

2.1.2 Application of Pneumatic

With the introduction of pneumatics in the manufacturing process, the industry is benefited with a cheaper medium of industrial automation which s judiciously used, may bring down the cost of production to a much lower level. A few decades ago, maximum application of pneumatics was probably in the field of construction where 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.

Advantageous of pneumatic:

1. Wide availability of air.
2. Compressibility of air
3. Easy transportability of compressed air in pressure vessels, containers and in long pipes
4. Fire proof 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 reasonably reliable remote controlling
8. Easier maintenance
9. Explosion-proof characteristic of the medium
10. Comparatively cheaper in cost than other systems

Compared to hydraulic system, pneumatic system has better operational advantages but it cannot replace hydraulic system so far as power requirement and accuracy of operations are concerned. In areas of hazards, probably air will be a better medium of power than 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