DESIGNING AND FABRICATING THE PUNCH CHUCK AND PRECISION HOLE PUNCH DIAMETER 3.0MM, 3.5MM AND 4.0MM FOR TURRET PUNCH MACHINE

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A report submitted in fulfillment of the
requirement for the award of the
Diploma of Mechanical Engineering

Faculty of Mechanical Engineering
University Malaysia Pahang

NOVEMBER 2008

I hereby declare that I have read this project report and in my opinion this project report is sufficient in terms of scope and quality for the award of the Diploma in Mechanical Engineering

Signature : ……

Name of Supervisor : Mr.Hazami Bin Che Hussain

Date : November 2008

I declare that this report entitled "*Designing and Fabricating The Punch Chuck And Precision Hole Punch Diameter 3.0mm, 3.5mm And 4.0mm For Turret Punch Machine*" is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : …….

Name : Prabagar a/l Murukesavan

Date : November 2008

DEDICATION

This report is dedicated to God whose guidance, help and grace was instrumental in making this humble work a reality. To my beloved father and mother, Mr.Murukesavan Thannimalai and Mrs.Bathmavathi Rengasamy and my respected supervisor, Mr.Hazami Bin Che Hussain..

ACKNOWLEDGEMENTS

First of all, the deepest sense of gratitude to the God, who guide and gave me the strength and ability to complete this final year project. Infinite thanks I brace upon Him.

I would like to take this opportunity to express my gratitude and sincere appreciation to all those who gave me the possibility to complete this report. I am very grateful to my supervisor Mr.Hazami Bin Che Hussain for his patience, trust and supporting for guide me finished this project. I also sincerely thanks for the time spent proofreading and correcting my many mistakes.

I would like to acknowledge to all the staffs in Mechanical Laboratory, whom gave me permission to use the necessary tools in the laboratory and guide me the machine's operating system.

I would also like to express my deepest appreciation to my parents whom always support me and motivate me to complete this final year project.

My sincere appreciation also extends to all my colleagues, housemates, and friends whom had provided assistance at various occasions by support and ideas for this final year project.

Finally to individuals who has involved neither directly nor indirectly in succession of this thesis. Indeed I could never adequately express my indebtedness to all of them. Hope all of them stay continue support me and give confidence in my efforts in future. Thank you.

ABSTRACT

Design and fabricating the punch chuck and precision hole punch 3.0mm, 3.5mm and 4.0mm is a conceptual understanding of manufacturing engineering which is not provided in daily lectures room due to the fact that it is advance knowledge in this field. The project is to test and analyze the percentage of failure of punch tool fabricated using mild steel during punching process. As such, it is vital to attain this basic knowledge through this project. The purpose of this project is to design and fabricate the punch chuck and precision hole punch 3.0mm, 3.5mm and 4.0mm. The design must follow the dimensions of the original punch tool so that it could be mounted into the machine. A material test should be done to determine the hardness of mild steel before fabrication. The progress of this project needs documenting, as it can be a good reference for the next student who involve in this project as well as for a research related to the punch tool. This report describes the project development of the first prototype of punch chuck and precision hole punch fabricated using mild steel material.

ABSTRAK

Tujuan utama projek ini adalah untuk mereka dan membuat sebuah pemegang penebuk dan penebuk bersaiz 3mm, 3.5mm dan 4mm. Konsep projek ini adalah amat sukar difahami, dan jarang diberi perhatian ketika dalam kuliah maka projek ini member ilmu yang lebih mendalam tentang projek ini. Projek ini adalah untuk menguji dan menganalisa keupayaan penebuk yang diperbuat daripada besi tuang semasa proses menebuk.Spesifikasi penebuk hendaklah mengikut spesifikasi asal supaya boleh dimuatkan ke dalam mesin. Jenis bahan yang digunakan sebelum proses fabrikasi haruslah diuji kekerasannya. Projek ini memerlukan dokumentasi yang baik kerana ia boleh menjadi panduan kepada pelajar-pelajar selepas ini dan juga kajian berkaitan dengan tajuk ini. Laporan ini menunjukkan projek pertama UMP berkaitan dengan pemegang penebuk dan penebuk bersaiz 3mm, 3.5mm dan 4mm yang diperbuat daripada besi tuang.

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SYMBOL	NAME
kN	Kilo Newton
º	Degree
in	Inches
%	Percentage
kg/m^3	Kilogram per meter cube
lb/in^3	Pound per inches cube
MPa	Mega Pascal
Gpa	Giga Pascal
psi	Pound per square inch
mm	Millimeter
Ø	Diameter
rpm	Revolution per Minute

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CHAPTER 1

INTRODUCTION

As a mechanical engineering student of University Malaysia Pahang (UMP), the final year project gives student a chance to practice all the knowledge and skills that they gain along the academic session in solving problems through a project in order to be an efficient and a good engineer.

1.1. Project Synopsis

This project involves designing and fabricating a punch chuck and precision hole punch. As the Diploma final year project allocates the duration of one semester, this project requires significant number of machining processes such as facing, turning and surface finishing. Basically the main processes that are involved in this project is the fabrication of the turret machine punch chuck and precision hole punch using a lathe machine combining different kinds of cutting process. This project is designed to be compatible with the Trumpf CNC Turret Machine.

1.2. Problem Statement

The CNC Turret Machine is a machine used to process sheet metals using different types of punch tools. The punch chuck and tools are specially made and imported from Trumpf Manufacturers from Germany. Because of frequent use and low maintenance of the punch chuck and tools, the products tend to fail after a certain period of time. After this happens, it takes an amount of time to get approval from higher authorities to purchase a new tool and delay from the suppliers.

This project is purposed to find an alternative tool which is easy to fabricate and using materials which are easily found.

1.3. Scope of Work

In order to finish this project, it requires precise scope of work and proper plan need to be followed because this project must go through various processes before it can be produced. Beside that this project title is a new idea which is from an instructor engineer in lab and as the knowledge isn't entirely covered in classes or lab. So it give us advantages to learn new process to produce this product and absolutely we could find lot of advantages neither we are realized or not. These are scope of work in this project,

These scopes help me to be focused and know about my job. The scopes are:

a) Literature review on punch chuck and precision hole punch
b) Design a punch chuck and precision hole punch using Computer Aided Design (SolidWorks)
c) Test the hardness of mild steel using Rockwell hardness test.
d) Fabricate the punch chuck and precision hole punch from mild steel material using Conventional Lathe Machine.
e) Fit and test run the fabricated tool at the CNC Turret Punch Machine.

The punch tool can be used to punch aluminium sheet metals for thickness less than 1mm.It is time where the soft skill e.g. punctuality, self discipline, time management and problem solving have been practiced because the project highly depend on the effectiveness of all the skill as much as the knowledge we have learnt.

1.4. Objective of Project

i) The main objective of Designing and Fabricating The Punch Chuck And Precision Hole Punch Diameter 3.0mm, 3.5mm And 4.0mm For Turret Punch Machine is to fabricate the alternative Punch Chuck and Precision Hole Punch using mild steel material.

ii) The other objectives of this project is to analyze whether the mild steel material made tool can withstand the turret machine punch force and to determine the percentage of failure using the mild steel made tool on sheet metals such as aluminium of thickness less than 1mm..

1.5. Project Planning

Based on the Gantt chart in Table 1.1, the confirmation of project title was done on Week 1.This project begun with a research and literature review made via internet, catalogs, supervisor, and others relevant academic material that related to the title, this literature review was done on week 2. This continues along the way of this project because there is a lot of knowledge to be learned.

At the same week, some schedule management for this project which included schedule management for the project. This is done by using Microsoft Excel Project using Gantt chart system.

Supervisor gave briefing about the introduction of the project and the usage of the punch chuck and precision hole punch.

The sketching of the model takes about 1 week to be done and done on week 4. The sketching done using manual sketched at A4 size paper and the engineering drawing is done using Solid Work software. This was done from week 5 to week 7. The design of the sketching are deeply discussed and the best design that suits is selected. The design also must be suitable for the Trumpf CNC Turret Machine.

The next task is preparation of progress presentation of the project. In this particular week, the student receives aids from the supervisor about the presentation. The preparation of the presentation requires comments and correction from the supervisor.

On week 8, which is the material testing week where different types of materials are tested for their hardness properties using Rockwell Hardness Tester and the hardness are compared. Then, the material suitable for punching thin sheet metals is chosen.

Next is the fabrication process. The punch chuck and precision hole punch is fabricated using Conventional Lathe machine. The knowledge of manufacturing process is applicable here. This task scheduled to take time about eight weeks and is done from week 8 to week 15.

Finally, the surface finishing process using sandpaper is done. To achieve and analyze the percentage of failure of this tool, it is tested on the Trumpf CNC Turret Machine.

Next task is the final report writing and final presentation preparation. This take about one week to accomplished which is week 16. The report is done with the supervisor’s guidance. All the task is scheduled to take about sixteen weeks overall.

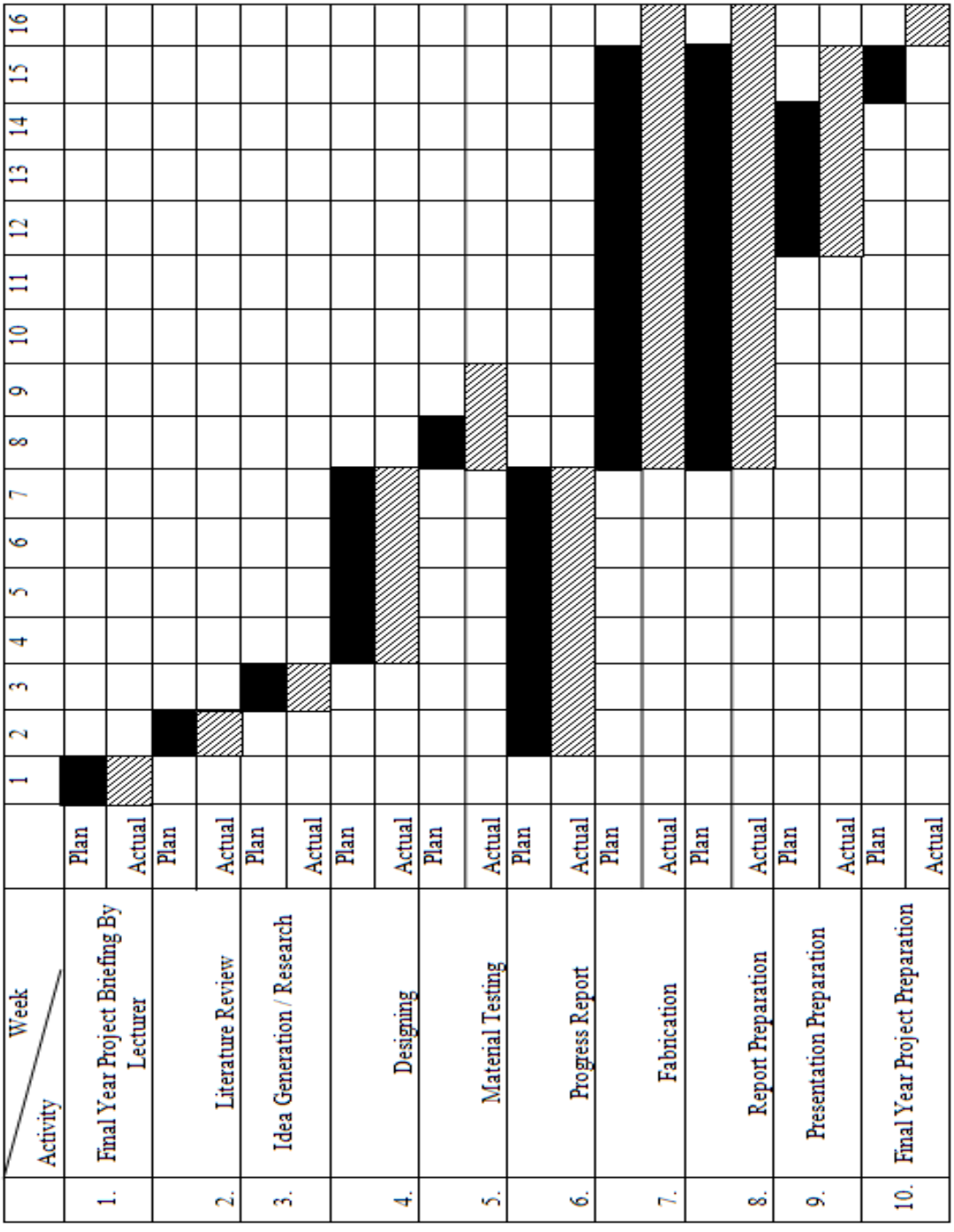

Table 1.1: Gantt Chart of the project

CHAPTER 2

LITERATURE REVIEW

The title design and fabrication of a Punch chuck and Precision Hole Punch requires an amount of good understanding on the knowledge of the CNC Turret Punch Machine. Therefore, executing a research is necessary to obtain all the information available and related to this topic. The information or literature reviews obtained are essentially valuable to assist in the fabrication and specification of this final year project. With this grounds established, the project can proceed with guidance and assertiveness in achieving the target mark.

2.0. Introduction

The machine used in FKM lab is the Trumatic 2020R FMC model from Trumpf Company. Trumatic 2020R FMC is a high-precision coordinate-holing sheet-processing center with numerical program control. It has: high speed of cutting-out and a hydraulic cutting head with 360° rotation as well as an easy-to-use linear tool buffer. A professional in the field of cutting produces parts without scratches and with high accuracy and uniformity. It is manufactured in the year 2005 in Germany. The maximum punch capacity of this machine is 180kN. The tools associated with this machine are usually made from High Speed Steel (HSS) material and from Trumpf Company.

2.1. Terminology

2.1.1. Turret Punch Machine

Turret Punch is widely phrased as CNC Turret Punch Press and commonly known as NCT or punch machine, is a numerical controlled plate processing machine. Diagrams are transformed into CNC programmes through programming or CAD/CAM software can finish the processed items in short time no matter how complicated the plated item is. It is a lot more efficient than the traditional punch machine which requires moulding process. It is also used for bending, punching and forming sheet metals.

Figure 2.1: Turret Punch Machine

2.1.2. Sheet Metal

Sheet metal is simply metal formed into thin and flat pieces. It is one of the fundamental forms used in metalworking, and can be cut and bent into a variety of different shapes. Countless everyday objects are constructed of the material. Thicknesses can vary significantly, although extremely thin thicknesses are considered foil or leaf, and pieces thicker than 6mm (0.25in) are considered plate.

Sheet metal is available as flat pieces or as a coiled strip. The coils are formed by running a continuous sheet of metal through a roll slitter. The thickness of the sheet metal is called its gauge. The gauge of sheet metal ranges from 30 gauge to about 8 gauge. The higher the gauge, the thinner the metal is.

2.1.3. Punching

Punching is performed by moving the sheet metal between the top and bottom tools of a punch. The top tool (punch) mates with the bottom tool (die), cutting a simple shape (e.g. a square, circle, or hexagon) from the sheet. An area can be cut out by making several hundred small square cuts around the perimeter. A punch is less flexible than a laser for cutting compound shapes, but faster for repetitive shapes. A typical CNC punch has a choice of up to 60 tools in a ‘turret’ that can be rotated to bring any tool to the active punching position. A modern CNC punch can take 600 blows per minute.

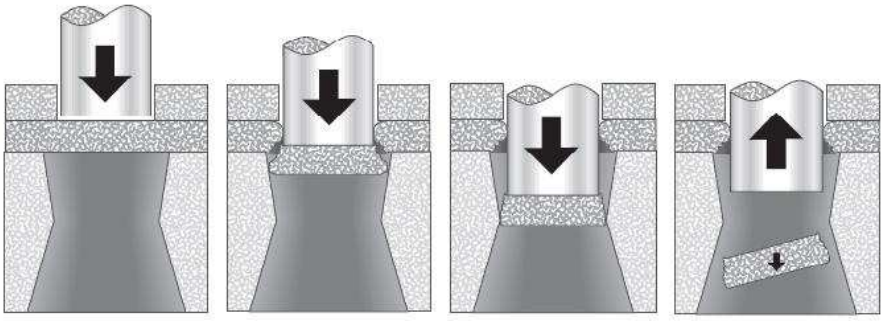

Figure 2.2: Punching Process

2.1.4. Mild Steel

Mild steel is the most common form of steel as its price is relatively low while it provides material properties that are acceptable for many applications. Mild steel has low carbon content (up to 0.3%) and is therefore neither extremely brittle nor ductile. It becomes malleable when heated, and so can be forged. It is also often used where large amounts of steel need to be formed, for example as structural steel. Density of this metal is 7,861.093 kg/m³ (0.284 lb/in³), the tensile strength is a maximum of 500 MPa (72,500 psi) and it has a Young's modulus of 210 GPa.

2.1.5. Tools

2.1.5.1. Punch Chuck

The punch chuck is originally manufactured from Trumpf Company (Germany) and made of High Speed Steel (HSS) material. This punch chuck is designed to hold two different sizes of punch tool. The two types of punch chuck available are the punch chuck for punch size 3mm to 6mm and punch chuck for punch size 7mm to 12mm.

The punch tool can be inserted inside the punch chuck by loosening the nut on top of the chuck and alignment nut beside the chuck. The purpose of the alignment nut is to keep the punch tool straight during punching process. The assembled punch tools must be mounted on a cartridge before it could be inserted into the machine.

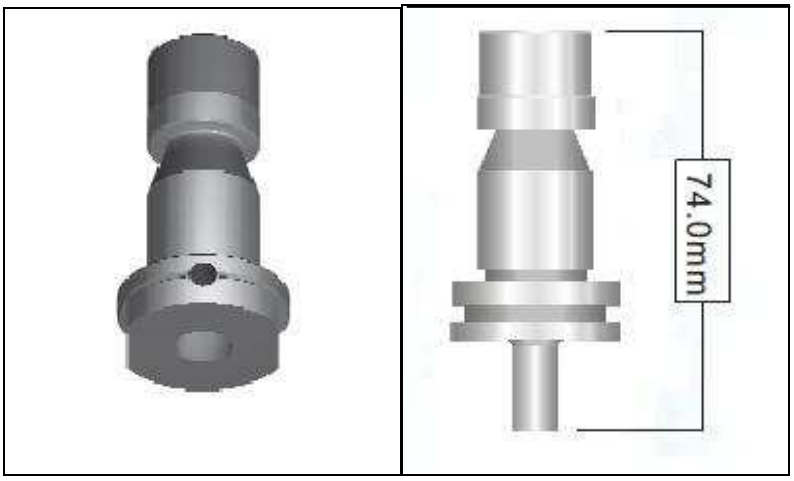

Figure 2.3: Punch Chuck

2.1.5.2. Precision Hole Punch

The punch tool is originally from Trumpf Company (Germany) and made of High Speed Steel (HSS) material. This punch tool is designed to fit into the punch chuck. There are two types of hole punch which is diameter 3mm to 6mm and diameter 7mm to 12mm. It could punch round shaped holes to sheet metals up to 6.35mm of thickness. There are also different types of punch shapes available in the market. The purpose of this shapes are for different types of usage.

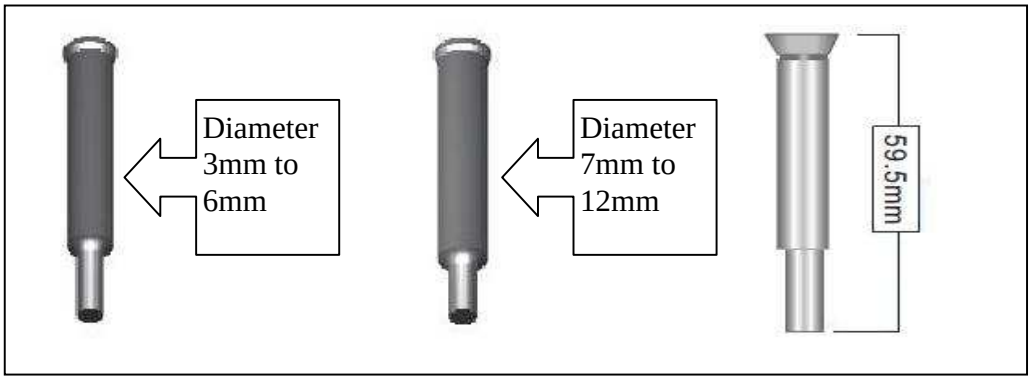

Figure 2.4: Precision Hole Punch

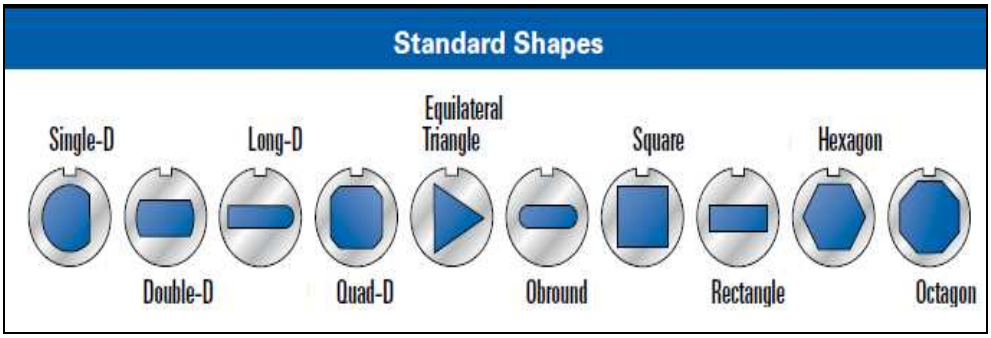

Figure 2.5: Punch shapes available in markets

2.1.5.3. Machine cartridge

The machine cartridge is a tool which is mounted into the machine after equipping with the required punch tool. The assembly of this cartridge is done by a assembly machine using compressed air. The punch tool must be associated with suitable parts to be compatible with the cartridge.

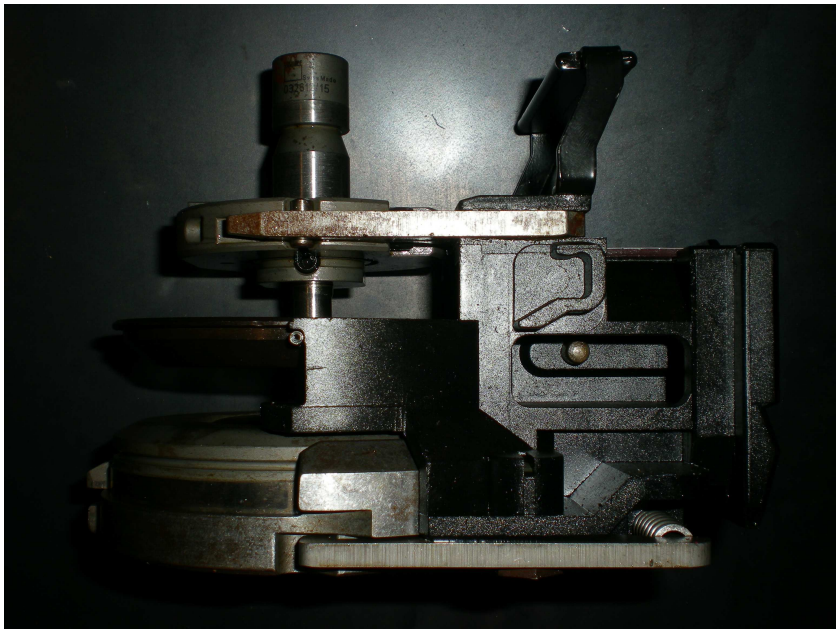

Figure 2.6: Turret machine punch cartridge

2.2. Material Testing

To choose the proper material for the punching tool, a material test was done. Different types of materials are tested for their hardness properties using Rockwell Hardness Tester and the hardness is compared. Then, the material suitable for punching thin sheet metals is chosen.

Figure 2.7: Before testing

Figure 2.8: After Testing

Number Of Tests	Hardness Number
Test 1	7.19
Test 2	7.19
Test 3	7.18
Final Average	7.187

Table 2.1: Material Hardness Test Results

Based on the test, the material which is mild steel can withstand less than 147.1kN. If the punch force is more than 147.1kN, the tool will deform and tend to fail. So after discussion with the supervisor, we decided to use mild steel as the fabrication material and the punch tool can only be used to punch on thin aluminium sheet metals.

CHAPTER 3

PROJECT METHODOLOGY & PROCEDURE

3.0. Introduction

In designing and fabricating this project, a flow of methods had to be used to design and fabricate the project. First of all, a process planning had to be charted out. This acts as a guideline to be followed so that, the final product meets the requirement and time could be managed. This would determine the efficiency of the project to be done. Regulating and analyzing these steps are very important as each of it has its own criteria to be followed. The designing process is the backbone of the product, therefore using appropriate precise method is imperative to this project. Intense study of the designing phase proved to be essential for the next step. Only with this determination on the designing procedure to be successful, then the fabrication development of the project can be carried out. The fabrication process carried out has to be accurate with the design. Once this is established, modification grounds can be made to triumph during the testing of the punching tool. Finally, the analysis of the whole project can be concluded in the next chapter.

3.1. Process Flowchart

In fabrication of the Punch Chuck and Precision Hole Punch, there is a planning of the overall progress to assure the project can be finish on schedule.

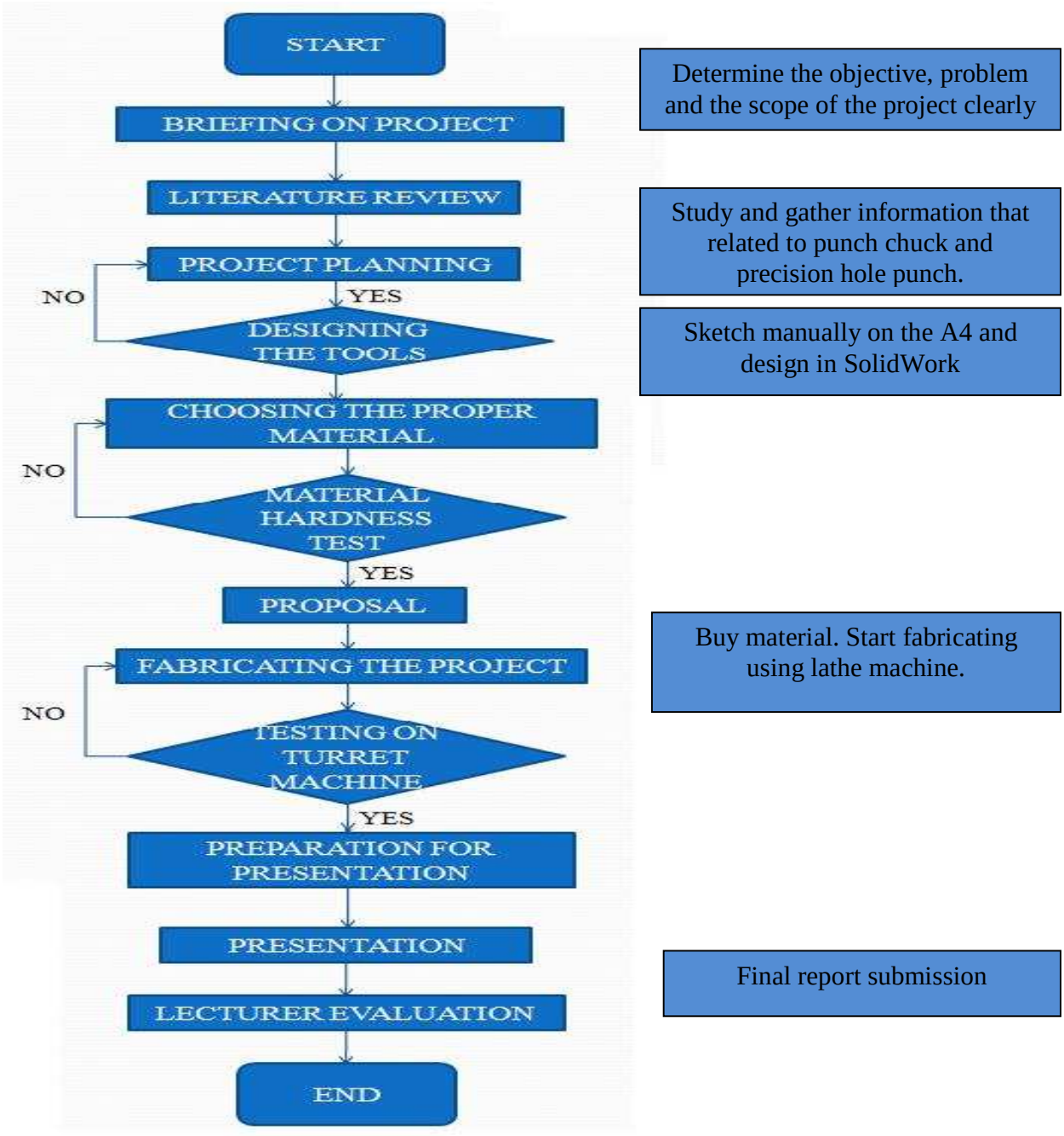

Figure 3.1: **Project Flow Chart**

At the early stage of the flow chart, the project's objectives, problem and the scopes of the project. This process is quite significant because the main goal, that is the objective, have to be understood carefully. As this is a new project, a few changes required, so the scopes and the problem occurred have to be determined.

After determining the objectives, scopes and the problems, research or literature reviews have to be done. This is to collect information about punch chuck and punch tool. Get all the information about the project from the internet, brochures, books, lecturer, supervisor and available tools to complete my proposal.

Brain storming session will be held, to gather some ideas for the design and early stage sketching. The ideas will be transferred into papers as rough sketching. A few designs were made and the supervisor will choose the best design that suits the project objectives and scopes. The design then designed in SOLIDWORKS software and should be following the original tool dimensions.

After designing stage, the material testing stage is done to choose the best material compatible for punching process. Next, the fabricating process will begin. Before any parts are fabricated, the items purchase list will be done. After this list is created, then the fabrication process using conventional lathe machine will begin.

The assembly process will be done after the fabrication process. After assembling all the parts, the trial session, that is the test run session will beginning. If the parts assembled suits the machine cartridge and machine head, then this stage is successful, if not the part that is not suitable will be modified and assembled again.

Finally, the report preparation session will be beginning. The final report will be finished before week 16.

3.2. Designing

The design of the punch chuck and precision hole punch must be compliance to several aspects. The aspects that must be considered in designing the tool is machine compability, overall dimension, ease of design, and machining process.

3.2.1. Proposed Design

(a) Design A

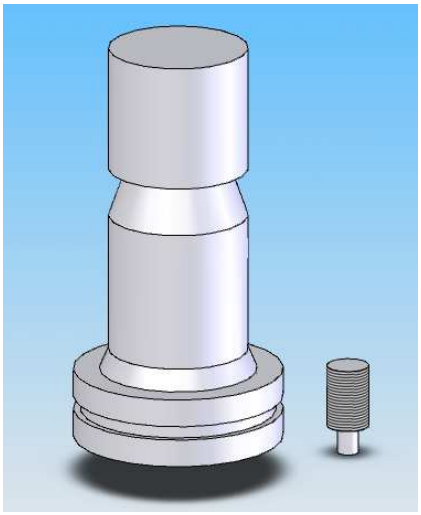

Figure 3.2: First Design

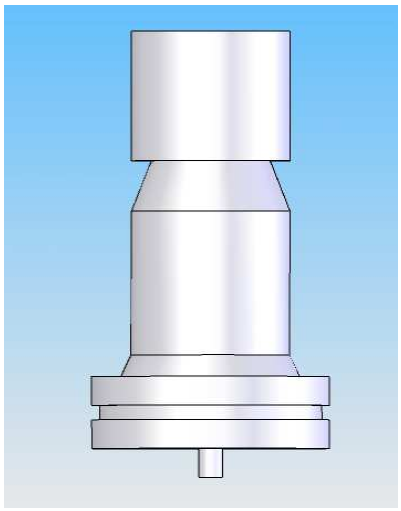

Figure 3.3: First Design Assembly

This design has the same dimension as the original punch chuck and the only difference is the precision hole punch is short in length and is associated with the punch chuck using threads as the screw concept.

(b) Design B

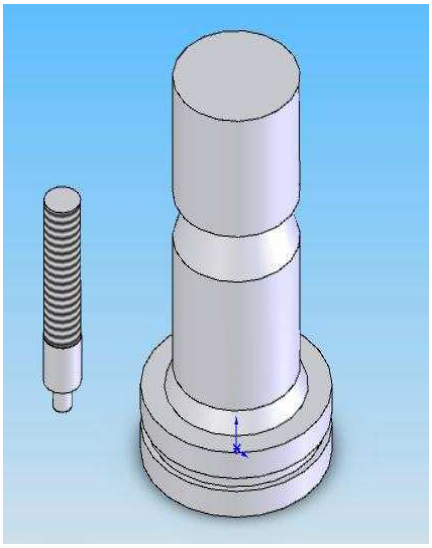

Figure 3.4: Second Design

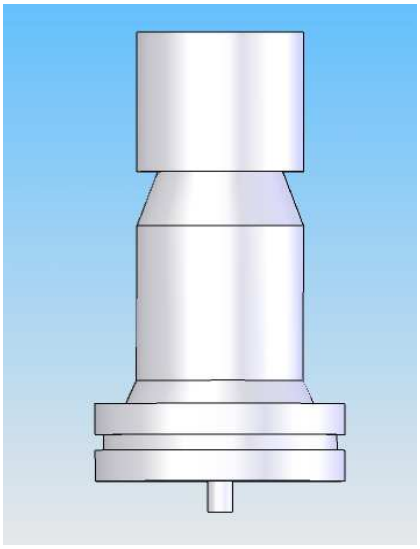

Figure 3.5: Second Design Assembly

This design has the same dimension as the original punch chuck and the only difference is the precision hole punch is long in length and is associated with the punch chuck using threads as the screw concept.

3.2.2. Design Analysis

The design analysis for the two proposed designs is shown below:-

Features	First design	Second design
Punching Stability	High	Intermediate
Tool Size	Small	Large
Tool Storage	Intermediate	Easy
Vibration during punching process	Low	Intermediate
Fabrication Process	Easy	Easy

Table 3.1: Data analysis for the two proposed designs

From the data, the first design is easy to fabricate. The punching stability is high because the precision hole punch is small and will not vibrate during punching. The disadvantage of this design is the hole punch is very small and could lost. It will be also difficult for storage.

The second design is easy to fabricate. The punching stability is intermediate because the precision hole punch is long and could vibrate during punching. It is also easy for storage because the hole punch is long and hold able.

3.2.3 Finalized Design

After some discussion with the supervisor about the compability and design, we decided to choose second design as our finalized design based on the design analysis.

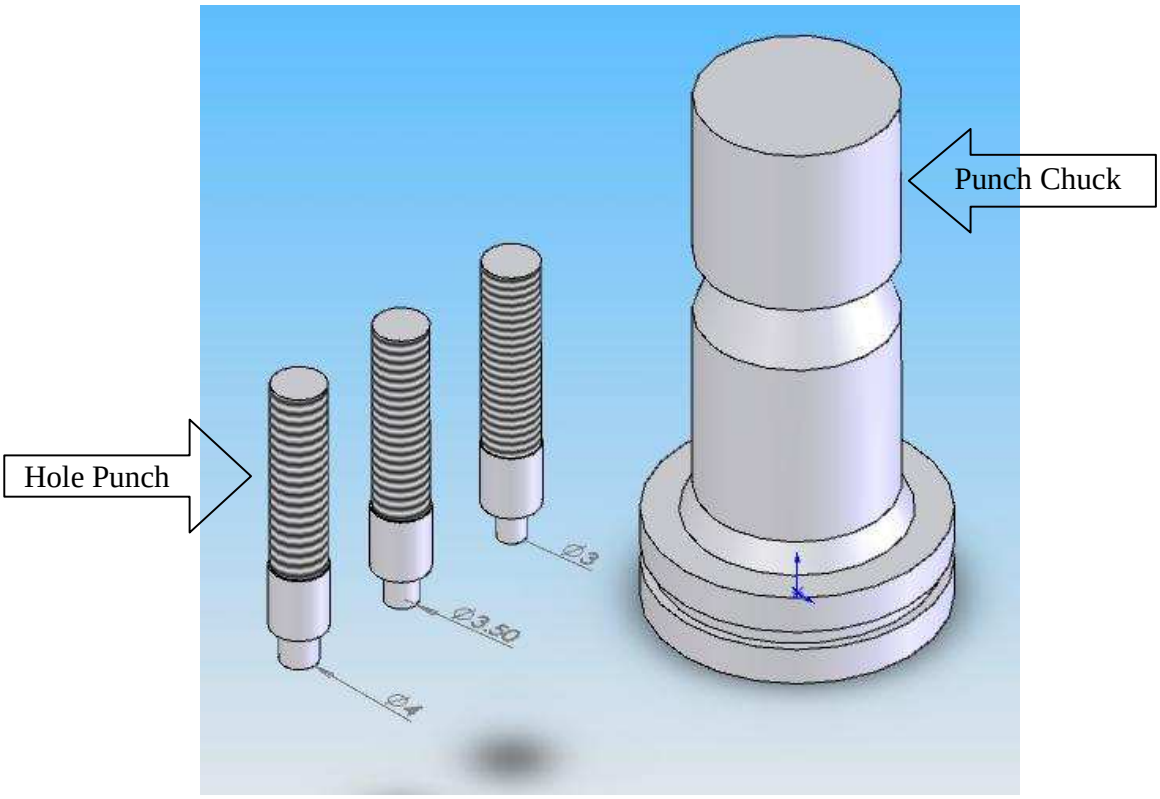

Figure 3.6: Finalized Design

3.2.1. Three Dimensional Drawings

The three dimensional drawings includes part drawings and assembly drawings. The drawings are made using the SolidWorks software. Here are the part drawings and assembly drawings of the punch chuck and precision hole punch.

3.2.1.1. Part Drawings

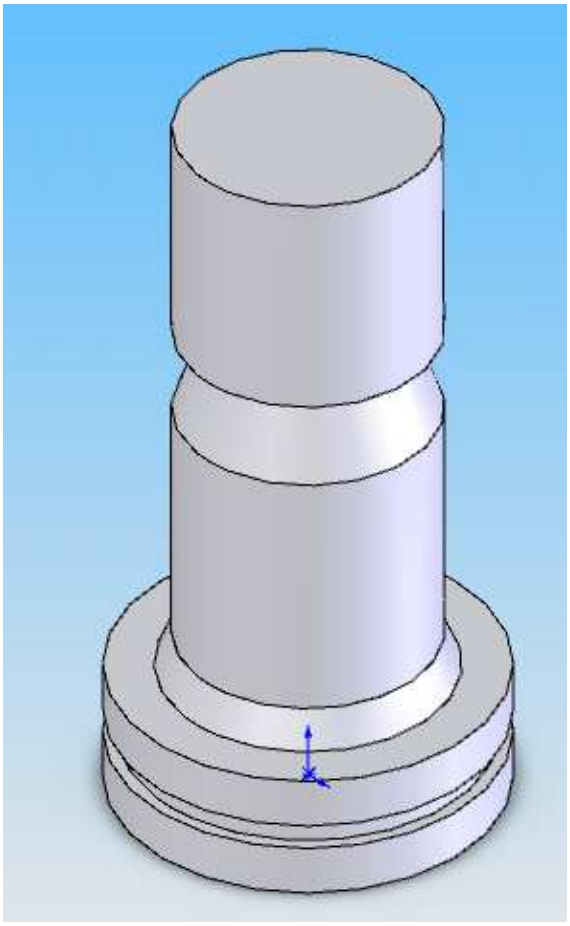

Figure 3.7: Punch Chuck (Isometric View)

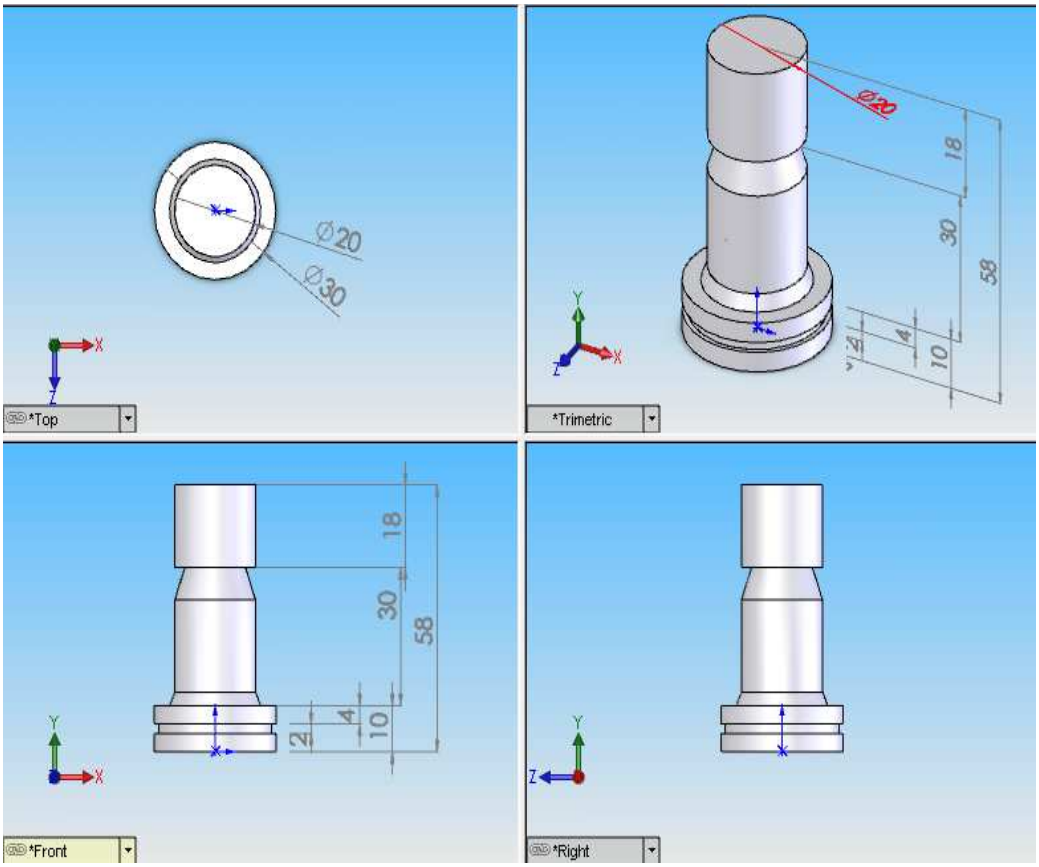

Figure 3.8: Engineering Drawing of Punch Chuck

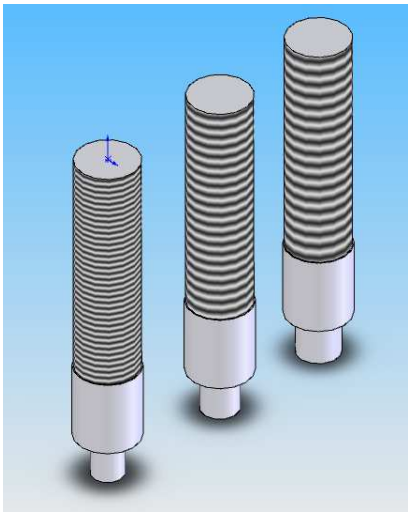

Figure 3.9: Precision Hole Punch (Isometric View)

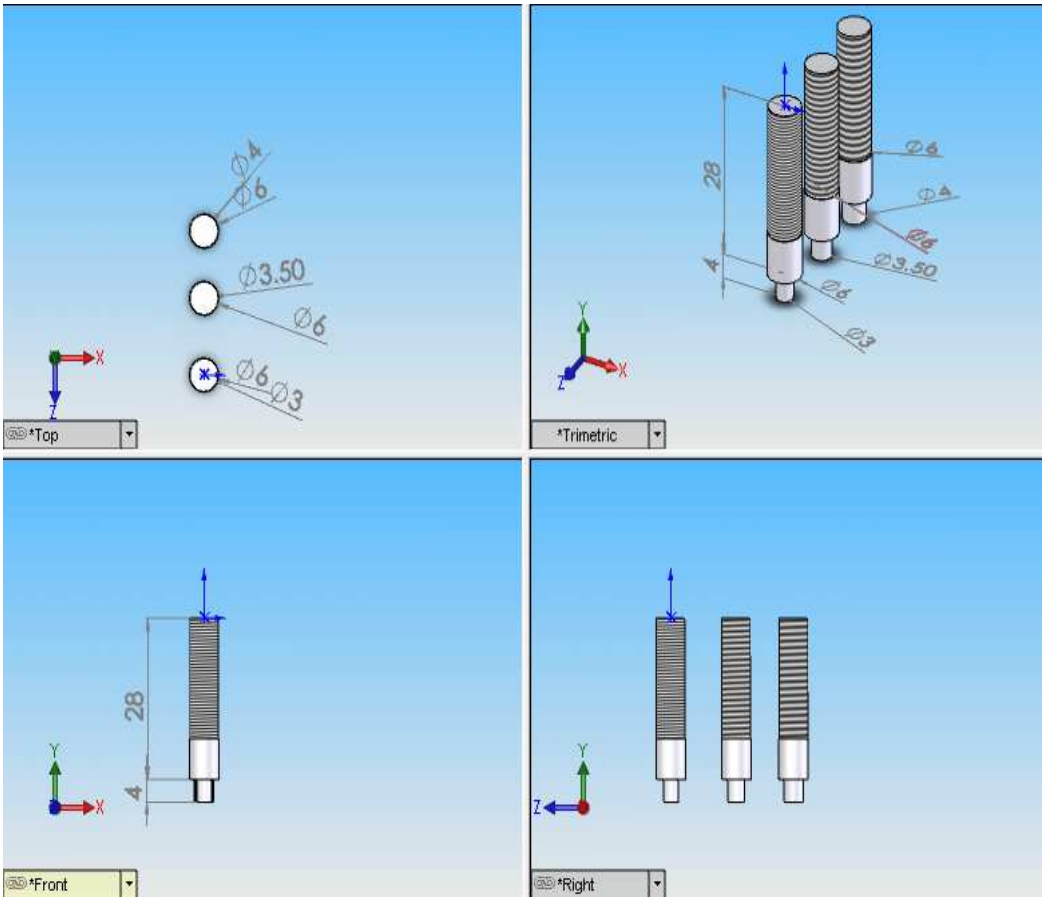

Figure 3.10: Engineering Drawing Of Precision Hole Punch

3.2.1.2. Assembly Drawings

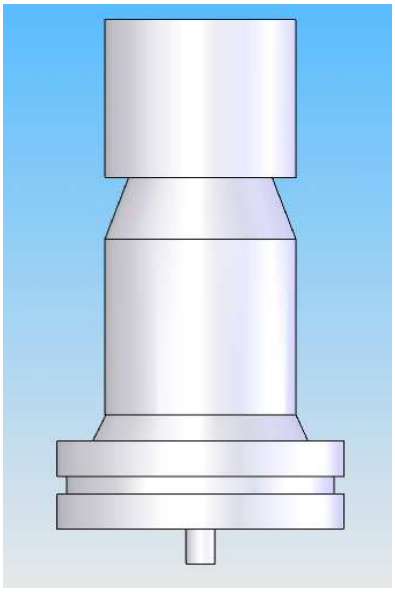

Figure 3.11: Assembly Drawing

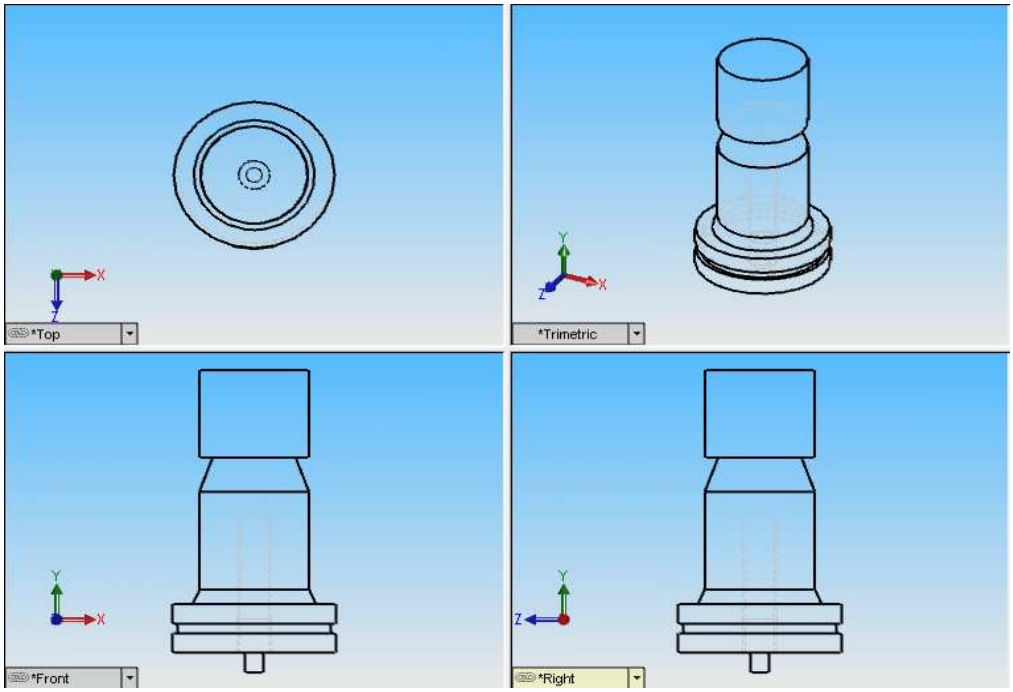

Figure 3.12: Engineering Drawing

3.3. Material Selection

The mild steel material was available in Mechanical faculty lab and a raw material request letter was sent to the person-in-charge of the lab. After receiving the permission, I used the bend-saw machine to cut the materials into needed dimension.

Material	Dimension	Quantity
Mild Steel	Ø 45mm x 150mm	1
Mild Steel	Ø 15mm x 270mm	1

Table 3.2: Material Listing

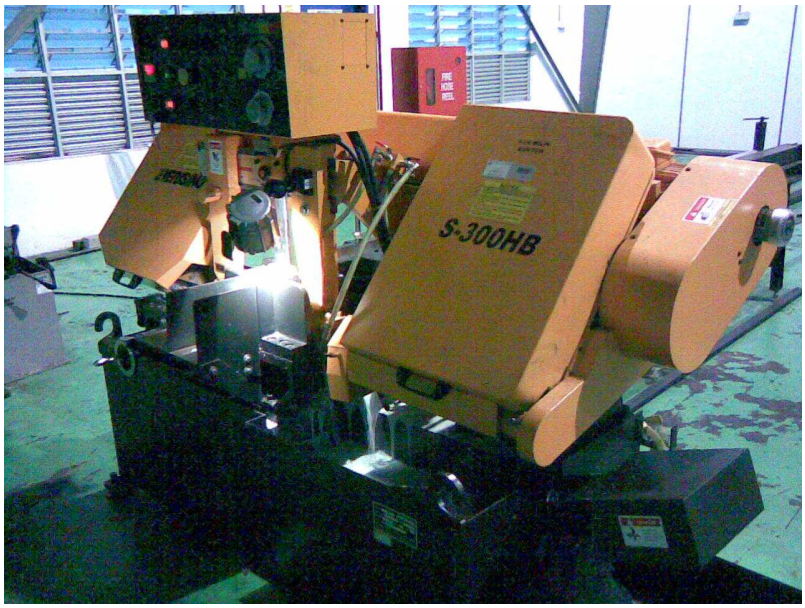

Figure 3.13: Bend-saw machine

3.4. Fabrication

3.4.1 Fabrication and Machining Concept

Fabrication is a value added process that involves the construction of machines or structures by using various types of materials, usually based on the engineering drawings.

Machining is something that relate with the using of power tool such as power drill and welding. Machining is an important manufacturing process in almost metal products.

3.4.2. Fabrication of Punch Chuck

3.4.2.1. Gathering information.

Take a dimension of the punch chuck from Trumpf Company by using calipers and update the sketching with the dimension.By using all the information, transfer the sketching to the detail drawing by using Solid Work 2006.

3.4.2.2. Raw Materials.

The fabrication of punch chuck should meet the requirement based on the original punch chuck manufactured from Trumpf Company so it will be compatible with the Turret machine. A measuring tape or vernier caliper is used to measure the required length of mild steel. Use the bend saw to cut the required length of raw materials by referring to the detail drawing.

3.4.2.3. Turning Process using Lathe Machine

The fabrication process is started with doing the turning process using Lathe machine. The facing process is done on the mild steel rod and the diameter of the original rod is 45mm. Based on figure 3.14, the raw mild steel rod is reduced until diameter 30mm. A live center is used to hold the workpiece so that it won't vibrate. Then, a length of 58mm of the workpiece is reduced to diameter 20mm. The cutting speed used for this process is 600 rpm. The cutting tool used is carbide insert.

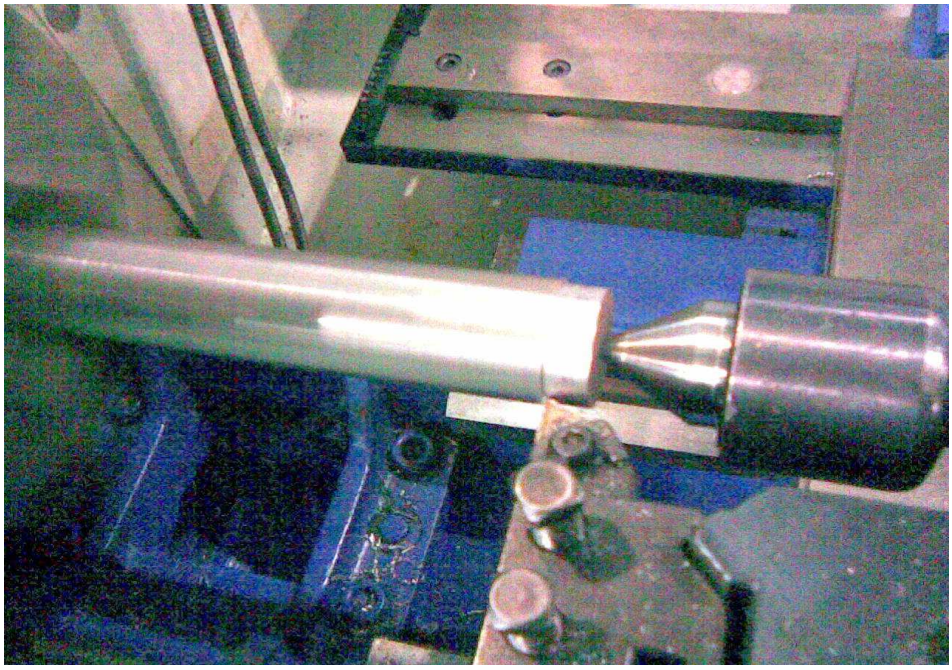

Figure 3.14: Facing Process

After that a taping process of the chuck using a 30º High Speed Steel (HSS) 2mm cutting tool on the head of the workpiece is done. This process uses a cutting speed of 200 rpm.

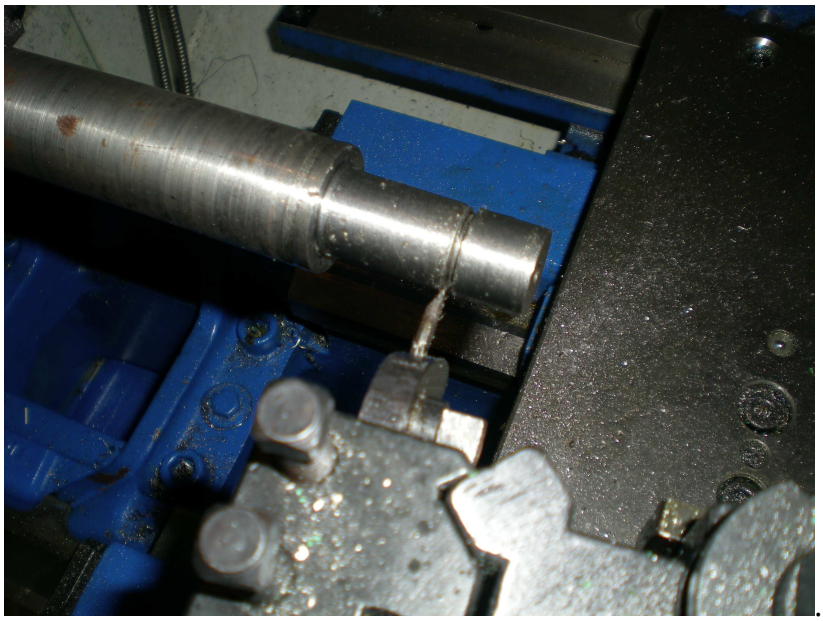

Figure 3.15: Taping Process

Next after the punch chuck is shaped, the punch chuck is cut-off from the workpiece. This process should be done in a low cutting speed of the machine. This is to prevent the fabricated punch chuck from being damaged.

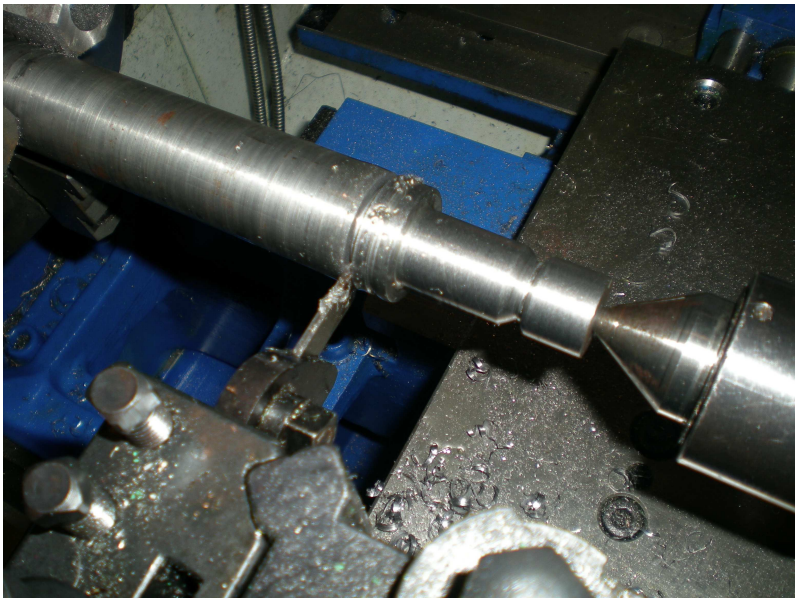

Figure 3.16: Cutting off process

Next, the workpiece is clamped on the machine and drilling process is done using a diameter 5mm drill tool. A center drill should be used first before drilling to guide the drill through. To make the process easier, a 4mm drill is used before using a 5mm drill. This would less the drill force applied on the workpiece. The whole fabrication process must be done precisely so that the original dimension does not change. The cutting speed for this process is 80 rpm.

Figure 3.17: Drilling Process

Finally, the threading process is done. Using a hand tap and alloy cut thread taps M5 x 0.8, the thread for the punch chuck is made. The workpiece is clamped on the benchwork clamp and the threading process should be done from 90º. This must be made carefully to get a perfect thread.

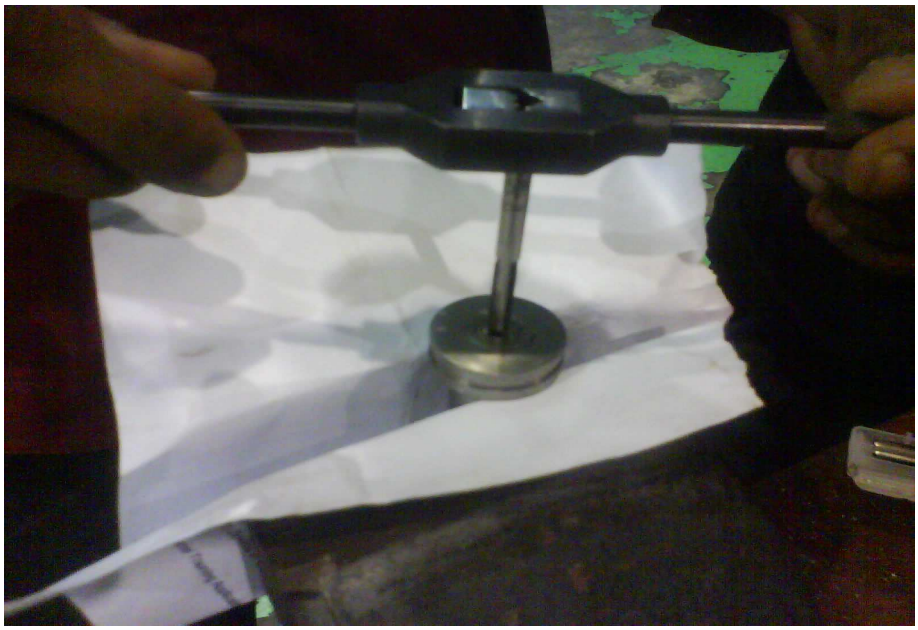

Figure 3.18: Threading Process

3.4.3. Fabrication of the punch tool

3.4.3.1. Gathering information.

Take a dimension of the punch tool from Trumpf Company by using calipers and update the sketching with the dimension. By using all the information, transfer the sketching to the detail drawing by using Solid Work 2005.

3.4.3.2. Raw Materials.

The fabrication of punch tool should meet the requirement based on the original punch chuck dimension manufactured from Trumpf Company so it will be compatible with the Turret machine.A measuring tape or vernier caliper is used to measure the required length.Use the bend saw to cut the required length of raw materials by referring to the detail drawing.

3.4.3.3. Turning Process using Lathe Machine.

A 12mm mild steel rod is clamped on the lathe machine chuck and the facing process is done to reduce the diameter to 5mm. The cutting speed used for this process is 600 rpm. The cutting tool used is carbide insert.

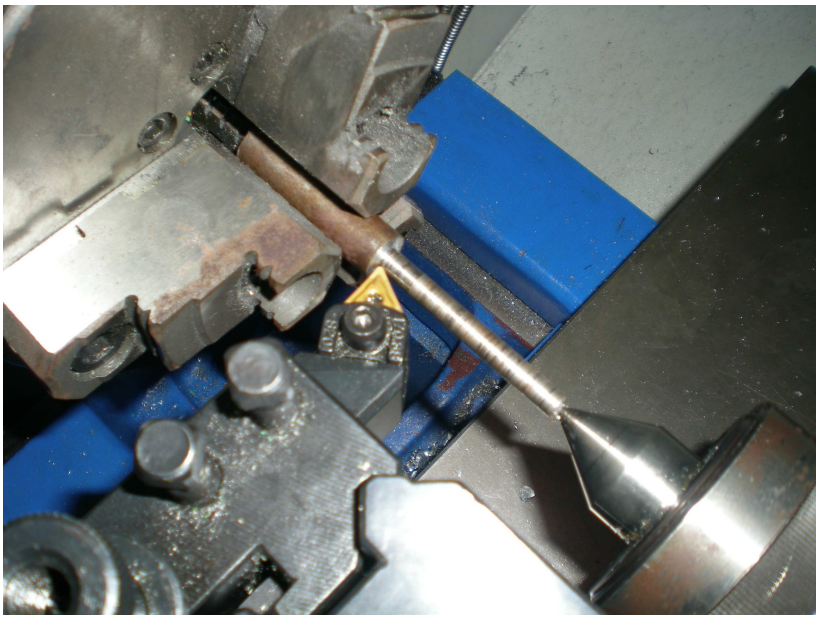

Figure 3.19: Facing Process

Three different types of punch tool head are done which is diameter 3.0mm, 3.5mm and 4.0 mm punch tool using facing process. After that the punch tool is cut off from the workpiece.

Next, the threads for each punch tool are made. Using a wrench and die M5 x 0.8, the thread of the hole punch is made. This must be made carefully to get a perfect thread. The punch tool must perfectly fit into the punch chuck.

Figure 3.20: Threading Process

Finally, the punch tool is inserted into the punch chuck and clamped on the lathe machine spindle. A bastard flat type file is used to reduce the diameter of the hole punch to required diameter which is diameter 3mm, 3.5mm and 4mm

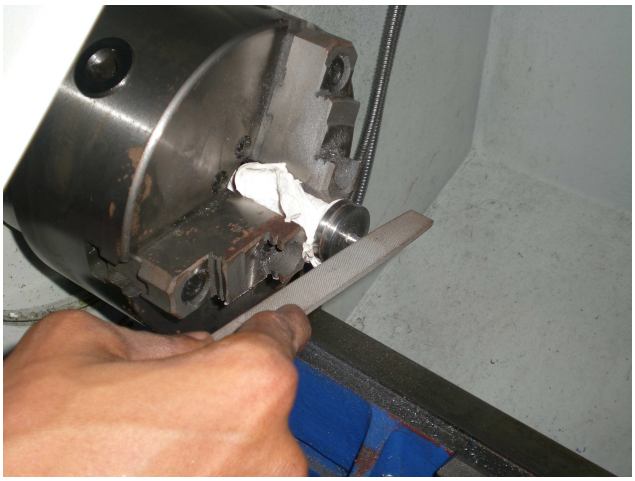

Figure 3.21: Filing Process

3.5. Surface Finishing

The surface finishing of the punch chuck and precision hole punch can be done using different grades of sand paper. The grade size 80, 240 and 320 is used for this project. The purpose it is done is to make it look shining and prevent rust.

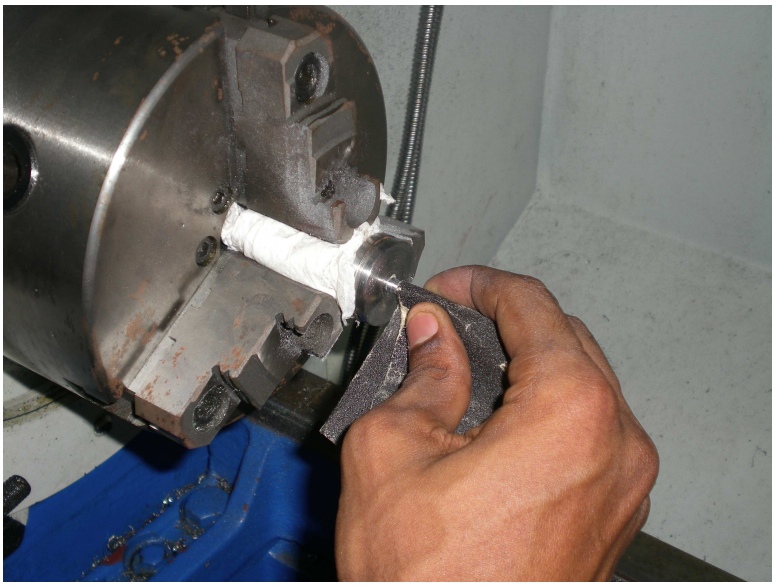

Figure 3.22: Surface Finishing

CHAPTER 4

RESULT AND DISCUSSION

4.1. Introduction

The result and discussion function as the achieving the target of the final year project. However, if the target is not met, it means there were problems faced during the process and will be discussed. If the result proves the objective is accomplished, the process is discussed too. This part of the project is about understanding the outcome of the testing process. The outcomes of the testing resolves in the performance of the punch chuck and punch tool. The performance will prove the design was appropriate and alteration was accurate during the fabrication process. Basically, this analysis is a must for the project because it shows how well the prototype of the punch tool was operated. The focus of this is solely on the product of this project. Once the target is met, then only the whole project process and outcome can be concluded in the next chapter.

4.2. Final Product

The product after fabrication is checked for defects before the assembly and testing process is done.

Figure 4.1: Punch Chuck

Figure 4.2: Precision Hole Punch Diameter 3mm, 3.5mm and 4.0mm

4.3. Assembly

The assembling processes begin with assembling all the parts in the detail drawing by following the drawing drawn using Solid Works 2006. By using this method, we can find any problems before the real assembling process in being conducted.

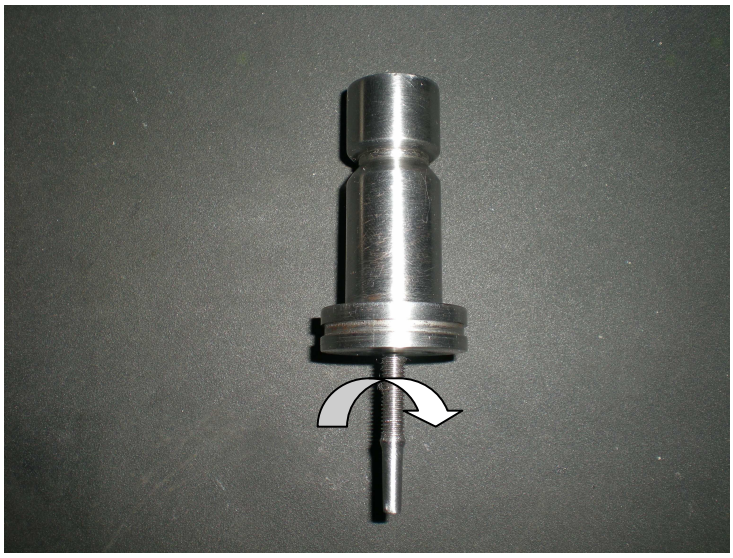

Figure 4.3: Assembly process

Figure 4.4: Final Assembly

4.4. Testing Procedure

Once the punch chuck and punch tool is fabricated and surface finished, prepare for testing the prototype. For testing the prototype, the part has to integrate with the machine cartridge. This is the purpose this project should be done precisely following the original dimension.

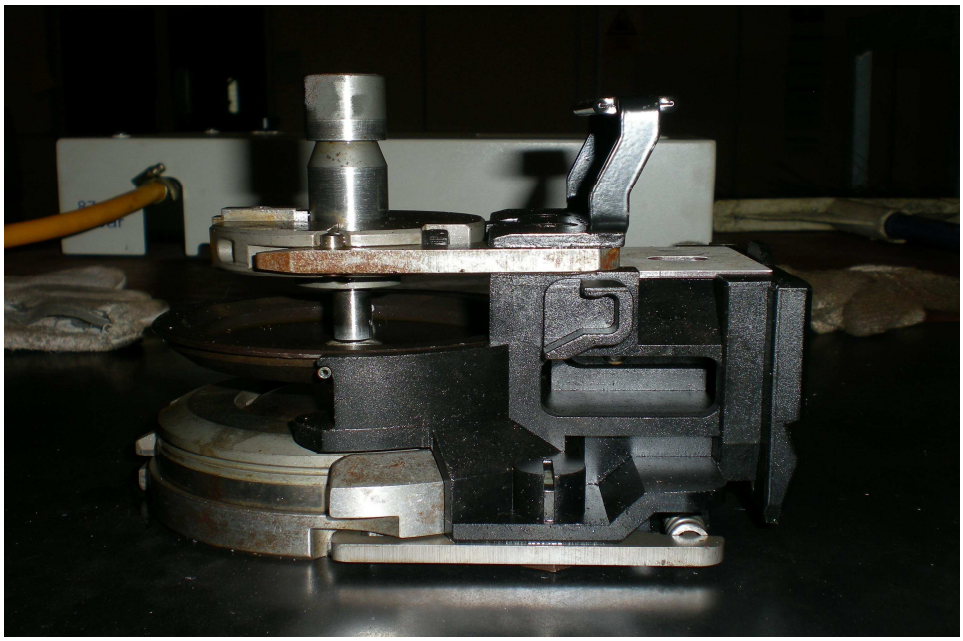

Figure 4.5: Punch Tool Inside the cartridge

4.5. Result

4.5.1. Testing Outcomes

a) The punch chuck including the punch tool fits perfectly into the machine cartridge. It is suitable to be mounted on the machine.

b) The punch chuck equipped with the punch tool could punch sheet metals less than 1mm thickness.

Figure 4.6: Testing Process

4.6. Discussion

During the design and fabrication process of the punch chuck and precision hole punch project, many obstacles were faced. The first was obtaining the knowledge of the punch tool and turret machine operating principles. This knowledge is not through in any lectures and not in the syllabus of studies. Therefore, internet and brochure from the company was the main source of information.

The next problem faced was the limited usage of lathe machine. During the semester this project was done, many first year students from mechanical faculty and manufacturing faculty had to use the lathe machine. This makes the lathe machine fully occupied most of the time.

Other than that, there are some small events that happen which made the testing process delayed such as turret machine maintenance process.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

In this chapter, a summary is established to conclude the whole final year project. However there were problems faced during the course of this project. The measures taken to rectify these problems have been identified and applied. There will be recommendations for future project of the same kind to improve it. Therefore a more complete understanding and enhanced application steps can be attained. In addition, the interest on the knowledge of the manufacturing engineering can be spread to a larger population not only in the engineering field but also for public.

5.1. Conclusion

In conclusion, the project objectives were achieved. The first objective is to design and fabricate the punch chuck and precision hole punch using mild steel material. The simplest and best design was choose. Then, fabricate punch chuck and precision hole punch. The design was easier to fabricate and maintenance too. The fabrication process required many skills that have learnt in previous mechanical laboratory such as material measuring, manufacturing process and surface finishing. The fabrication process gives student to experience and develop the skills and the ways to operate the machines to complete the project. Besides that, the student also learnt to solve the problems during the designing and fabrication process. It was motivated the student to face the challenges as a professional engineer in this global era.

5.2. Recommendations

My recommendations related to this project are;

a) If the project duration is 2 semesters:
   i) Material hardness test on different types of material.
   ii) Running heat treatment on mild steel to increase the hardness.
b) Use surface grinding machine for better surface finishing.
c) Use CNC Lathe Machine for more precision.

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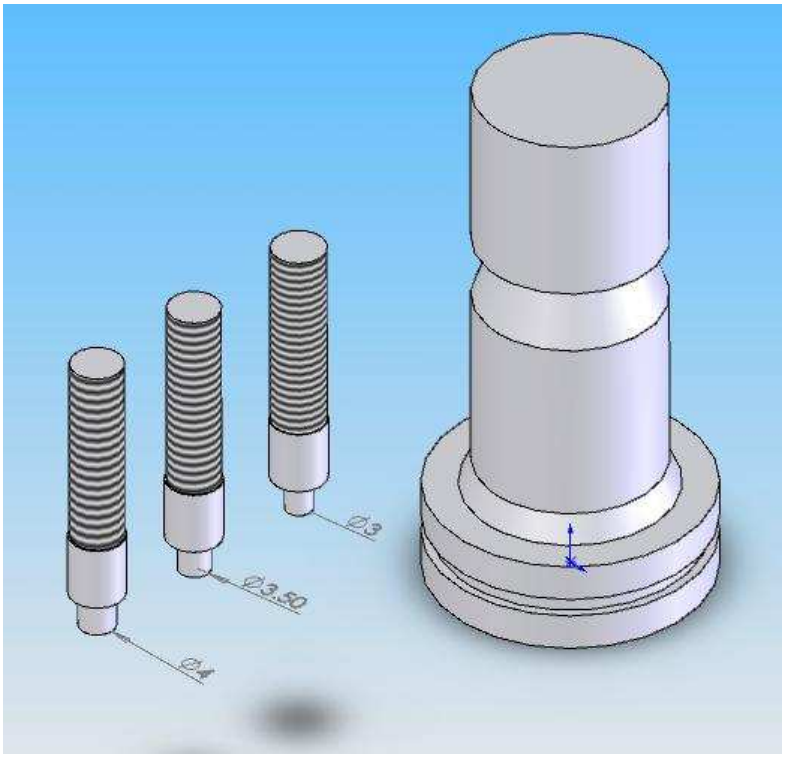
3. Internet

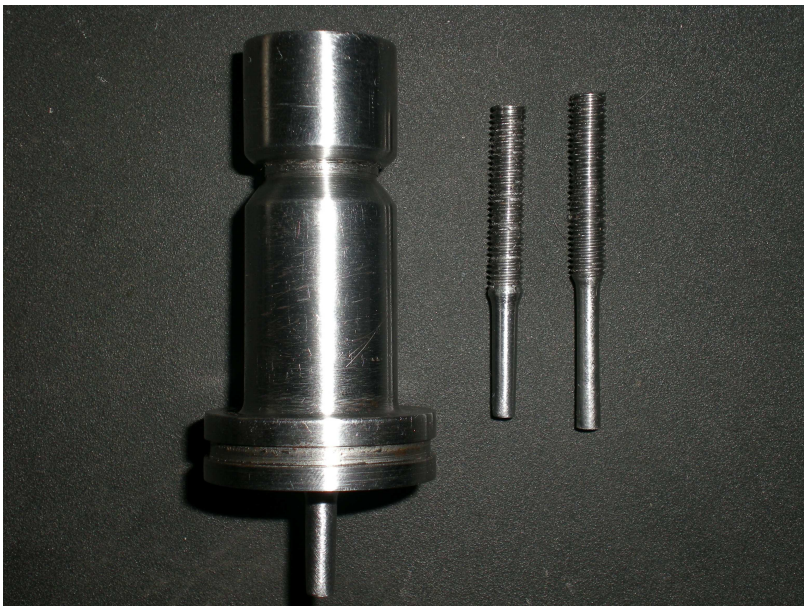
   - Trumpf Group. 1998. Turret Machine Punching Tools Overview (online) http://www.trumpf.com/3.punching-tools_overview_v1.html (4 August 2008)
   - Wikipedia. 2001. Punching Process (online) http://en.wikipedia.org/wiki/Punching (4 August 2008)
   - Wikipedia. 2001. Sheet Metal (online) http://en.wikipedia.org/wiki/Sheet_metal

4. Trumpf Tools Catalog

APPENDIX A

FABRICATION PART



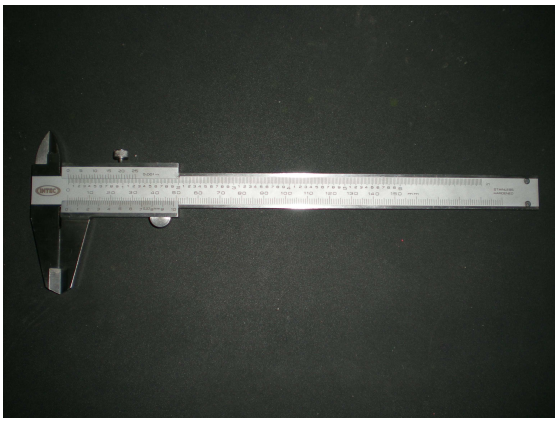


APPENDIX B

TOOLS AND MACHINE USED

LATHE MACHINE

BEND-SAW MACHINE

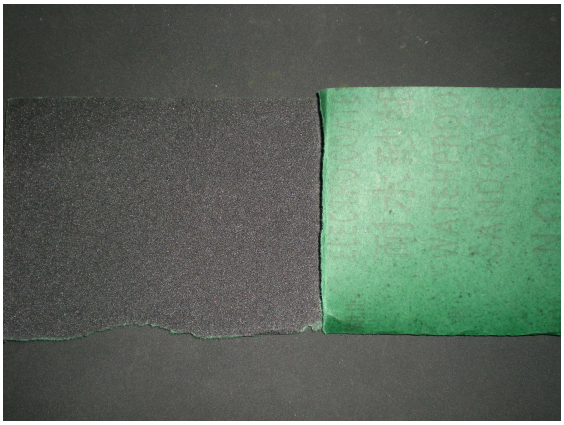


VERNIER CALIPER

Ø4.5mm DRILL

ALLOY CUT THREAD TAPS M5 X 0.8

SANDPAPER GRADE NO.320



SANDPAPER GRADE NO.240

SANDPAPER GRADE NO.80