



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**DEVELOPMENT OF A NEW DIE FOR THE MANUFACTURING  
OF TELEKOM MALAYSIA BERHAD (TM) METAL BASED  
PRODUCTS**

This report submitted in accordance with requirement of the Universiti Teknikal  
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Technology (Maintenance Technology) with Honours

by

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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 Mechanical Engineering Technology (Maintenance Technology) (Hons.). The member of the supervisory is as follow:

.....  
(Aludin b. Mohd Serah)

## ABSTRAK

*Kajian ini telah dijalankan di Subsea Supplies Sdn Bhd, Sepang. Baru-baru ini, Subsea Supplies Sdn Bhd telah memulakan pengeluaran bagi produk berasaskan logam Telekom Malaysia Berhad (TM). Terdapat 38 jenis produk yang boleh dibahagikan kepada lima kategori; aksesori tiang, paip GI, tupang tiang, pengikat kabel keluli tahan karat dan tiang keluli. Tujuan kajian ini adalah untuk mereka bentuk dan membuat alat acuan yang baru bagi pembuatan pengapit tiang. Pembuatan alat acuan bermula dengan mengkaji spesifikasi pengapit tiang berdasarkan beberapa dokumen seperti bil bahan (BoM) dan lukisan produk. Kemudian alat acuan telah direka melalui lakaran tangan dan dengan menggunakan perisian CAD/CAM Solidworks 2015 diikuti dengan penyediaan BoM untuk alat acuan. Alat ini diperbuat daripada 8 komponen utama; plat asas (atas), pemegang untuk acuan, plat sandaran (atas), acuan atas, penghenti, acuan bawah, plat sandaran (bawah) dan plat asas (bawah). Secara keseluruhannya, alat acuan untuk pengapit tiang terdiri daripada plat asas atas dan bawah yang melindungi alat acuan, acuan berbentuk V diatas dan acuan bawah yang menghasilkan lengkung 45 darjah pada kepingan logam. Terdapat banyak proses semasa membuat komponen acuan termasuk memotong, pengasahan permukaan, penggerudian, pengerasan, penorehan dan pengimpalan. Acuan atas dan bawah juga menjalani rawatan haba untuk memastikan ia kuat dan mempunyai ketahanan yang tinggi untuk menyerap daya penginjakan. Bahan utama yang digunakan sebagai komponen acuan adalah keluli XW41 dan DH2. Selepas acuan dipasang sepenuhnya, ia telah dipasang pada mesin penginjak 200 tan untuk menguji prestasinya menghasilkan produk sebenar, iaitu pengapit tiang. Saiz V-bentuk bagi produk telah diperiksa didapati nilainya antara 140,1-140,5 mm iaitu kurang  $\pm 5\%$  variasi dan menepati spesifikasi TM. Pemeriksaan lanjut telah dijalankan melalui pemeriksaan visual terhadap produk termasuk bunga skru untuk memastikan keadaan penggalvanasi yang baik dan bol mempunyai bunga penuh. Pemeriksaan visual juga telah dijalankan dengan memeriksa sama ada semua aksesori muat kepada 61 mm tiang besi gantian. Sumbangan utama kajian ini kepada syarikat ini ialah membuat alat acuan baru untuk pengapit tiang dan penyediaan beberapa dokumen penting terutamanya dalam penubuhan BoM dan lukisan kejuruteraan.*

## ABSCTRACT

This study was conducted at Subsea Supplies Sdn Bhd, Sepang. Recently, Subsea Supplies Sdn Bhd has started the production of Telekom Malaysia Berhad (TM) metal-based products. There are 38 types of products which can be divided into five categories; pole accessories, GI pipes, strut pipe, stainless steel cable tie and steel pole. The purpose of this study is to design and make a new die for manufacturing of clamp pole step for iron pole. The die making started with the study of clamp pole step specification based on several documents such as bill of material (BoM) and product drawing. Then die was designed by making hand-sketching and by using Solidworks 2015 CAD/CAM software followed by establishment of BoM for the die. The die was made of 8 main components; base plate (upper), die holder, backup plate (upper), upper die, stopper, lower die, backup plate (lower) and base plate (lower). As overall, the die for clamp pole step consists of upper and lower base plate that housing the die, and the V-shape upper and lower die that produces the 45<sup>0</sup> degrees bending shape on flat bar. There were many processes involved in making the die components which include cutting, surface grinding, drilling, hardening, tapping and welding. The upper and lower die also underwent heat treatment to ensure the die is strong and has high resistance to extreme absorption of stamping forces. The main materials used as die components were XW41 and DH2 steel. After the die completely assembled, it was installed at 200 tons stamping machine to test its performance in producing actual product, that is clamp pole step. The dimension of the V-shape of product was inspected. The length was ranged between 140.1 to 140.5 mm which was less  $\pm 5\%$  variation and within TM specification. Further inspection was conducted by visual inspection to the product including on the thread to ensure good galvanization conditions and the bolt have full thread. The visual inspection was also conducted by checking whether all the accessories were fit to a dummy 61 mm iron pole. The main contribution of this study to the company was the making of new die for clamp pole step and the establishment of several important documentation particular BoM and engineering drawing.

## **DEDICATION**

To my beloved parents, Mr. Che Mat b Hj Hassim and Mdm. Halimatul Azmah bt Mohd Arif, thank you for your support until this situation which will lead to success in my life.

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## LIST OF SYMBOLS AND ABBREVIATION

TM		Telekom Malaysia Berhad
TNB		Tenaga Nasional Berhad
O&G		Oil and Gas
BoM		Bill of Material
IB		Integral Bearer
CADCAM		Computer Aided Design and Computer Aided Manufacturing
AISI		American Iron and Steel Institute

# CHAPTER 1

## INTRODUCTION

### 1.0 Introduction

This section describes the general background of the company that provide the opportunity to conduct this research and their main products. In this section also includes the problem statement, objectives and scopes of the research.

### 1.1 Background

Subsea Supplies Sdn Bhd is one the medium-sized of company that supplies metal-based products for many industries including metal-based component for Tenaga Nasional Berhad (TNB). This company organization consists manager, three engineers, two administrators and clerk.

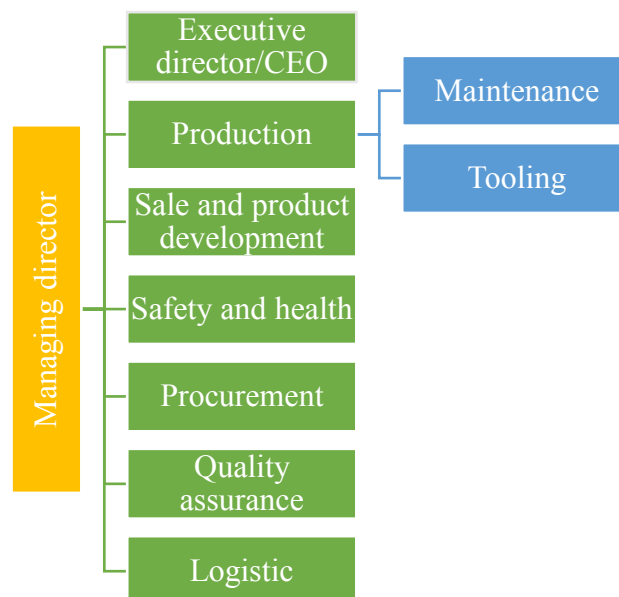


Figure 1.1 Subsea Supplies Sdn Bhd organization chart

At production line, there are three supervisors and ten labour workers. In order to make sure this company run smoothly, all the staffs have work together. Figure 1.1 and Table 1.1 shows the organization chart of company and background of the company in brief. Total staffs in this company is 20 peoples.

Table 1.1 Company background

Subsea Supplies Sdn Bhd	
Background	<ul style="list-style-type: none"> <li>• Subsea Supplies Sdn Bhd</li> <li>• Mid-size steel factory</li> </ul>
Business	<ul style="list-style-type: none"> <li>• Currently major customer is Telekom Malaysia (TM)</li> <li>• Supplies product such as pipes for oil and gas companies</li> <li>• Production base on TM requirement</li> </ul>
Location	<ul style="list-style-type: none"> <li>• Jalan Besar Salak Sepang, Kampung Lembah Paya, 43900, Sepang, Selangor</li> <li>• In the proximity of the old Salak Tinggi town</li> </ul>
Product	<ul style="list-style-type: none"> <li>• Currently produce 38 types of metal-based product for TM</li> <li>• Machine used in this company are stamping, cutting, milling and lathe machine.</li> </ul>

This factory consists various types of metal for production of metal-based product as shown in Figure 1.2 the environment of factory. The machine used to fabricate and manufacture metal-based product are mainly stamping machine. For manufacture die, mainly use milling machine that can perform drilling and boring operation.



Figure 1.2 Factory front environment

This company manufactures various type of metal-based products for their customers such as Telekom Malaysia Berhad (TM) and oil and gas companies. The TM metal based products can be divided into five different categories; i.e., GI pipes, pole strut, pole accessories, stainless steel cable tie and pole.

## 1.2 Telekom Malaysia (TM) Pole accessories

Pole accessories are the accessories that equipped at utility pole. The accessories consist of pole head, pole step, integral bearer (IB) clamp, pole clamp, and many other accessories. Figure 1.3 shows the basic structure of a utility pole.

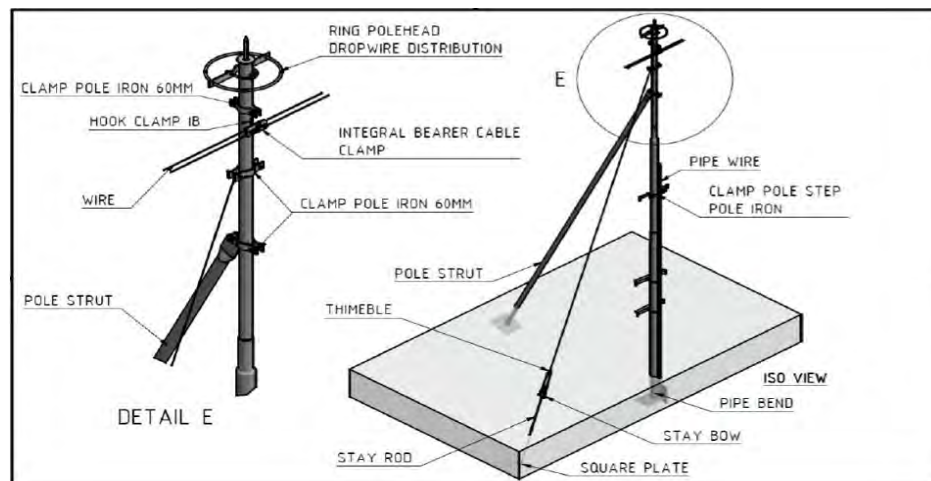




Figure 1.3 Basic structure of a utility pole

The primary purpose of pole accessories is to secure the cable and associated aerial plant facilities to poles and to help facilitate necessary plant rearrangements. An aerial plant network requires high-quality reliable hardware to structurally support the distribution cable plant and transition cable plant from the aerial network to underground and buried plant. Mostly the accessories are made from metal and finished with galvanized layer in order to prevent it from corrosion and prolong the life time of accessories. The pole accessories that are listed in Table 1.2 below.



Table 1.2 Pole accessories component

Pole accessories item	Description
<p>1. Support hook</p> 	<ul style="list-style-type: none"> <li>• To suspend the aerial cable clamps.</li> <li>• Act as ‘mechanical fuses’ to protect the cable from damage due to object falling on cable.</li> </ul>
<p>2. Stay bow</p> 	<ul style="list-style-type: none"> <li>• To support the weight of pole.</li> <li>• Made from metal rod.</li> </ul>

### 3. Stay plate



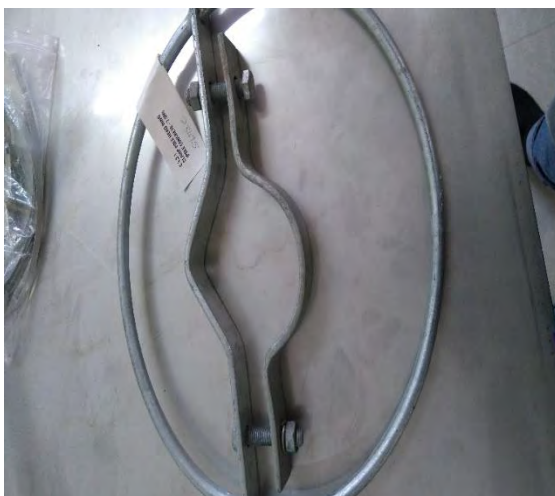
- Base for the stay bow.
- Made from metal plate and the plate is galvanized to protect from corrosion.

### 4. Integral bearer cable clamp



- Each cable clamp consists of a pair of aluminium plates secured by two mild steel galvanized bolts

### 5. Clamp pole head ring



- Consist of three components U-Bolt, clamp and ring.

## 6. Brackets



- Consists of two halves bolted together with two bolts, two spring washers and two nuts.

## 7. Clamp pole step (iron pole)



- As a ladder in order the maintenance worker to climb up the pole. Usually designed in 45 degrees angle in order to clamp the iron pole.

8. Clamp pole step (concrete pole)



- Same as iron pole step but the different type of pole.
- It is round shape clamp because it is clamped on concrete pole

9. Eyebolt



- Eyebolt has an eye which is hot formed and welded.

10. Thimble



- Metal ring, concave design on the outside, around which a loop of rope is spliced.

### **1.3 PROBLEM STATEMENT**

Subsea supplies Sdn Bhd recently has receive a new tender to supply metal-based product for Telekom Malaysia Berhad (TM). The problems faced by this company are, the company first time develop and manufacture the TM metal-based product. The company must find the ways to overcome this problem by design and manufacture new die or tooling for produce the pole accessories product for the concrete and iron pole massively. Before receive TM tender, the die design only sketch on a sheet of paper and the design has never recorded for the future reference. In this study, more focus on clamp pole step for iron pole die manufacture. This study was contribute to this company such as 3D design of new die and tooling and the establishment of bill of material of die.

### **1.4 GENERAL OBJECTIVE**

To develop a new die for the manufacturing of Telekom Malaysia Berhad (TM) clamp pole step.

#### **1.4.1 SPECIFIC OBJECTIVE**

1. To study the manufacturing processes of clamp pole step
2. To make a new die for manufacturing of clamp pole step
3. To measure the die performance by checking the products quality

### **1.5 SCOPE**

1. Development a new die by using XW41 and DH2 steels
2. Test the quality of die produced by checking the product quality
3. Conduct dimensional test and visual inspection to check the quality of clamp pole step.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.0 Introduction**

This chapter introduces the previous study on die manufacturing including about function of die itself and describe in detail about component and type of stamping die. This section also covers the step to design new die, the description about bill of material, the characteristic of die steel and the type of steel have been used to manufacture die and the history of stamping process.

#### **2.1 Die**

Nearly all of the preceding press-working operations are performed with conventional punch and die tooling (Groover, 2011). The tooling is referred to as die. It is custom designed for the particular part to be produced. The term stamping die is sometimes used for high production dies. Die is very important tool for making the product in massive production. The die material must be hard compare to product material and must have high resistance with shock absorption because basically die have long life span. The die is specially design to develop extremely high hardness level and heat abrasion resisted when heat treated (D. Jarvis et al., 2000). Typical materials for stamping dies are tool steel types D, A, O and S. Products made with dies range from simple paper clips to complex pieces used in advanced technology. The die design and manufacturing process begin from receiving a customer's purchased invoice to the accomplishment of development through die design, die fabrication, assembly, and verification of die validity (Choi et al., 2013).

### 2.1.1 Components of a Stamping Die

Component of a stamping die to perform a simple blanking operation (G. Mikell P, 2011). Figure 2.1 illustrates the components of a punch and die for a blanking operation. The working components are the punch and die, which perform the cutting operation. They are attached to the upper and lower position of the die set, respectively called the punch holder (or upper shoe) and die holder (lower shoe). The die set includes guide pins and bushing to ensure proper alignment between the punch and die during the stamping operation. The die holder is attached to the base of the press, and the punch holder is attached to the ram. Actuation of the ram accomplishes the press-working operation.

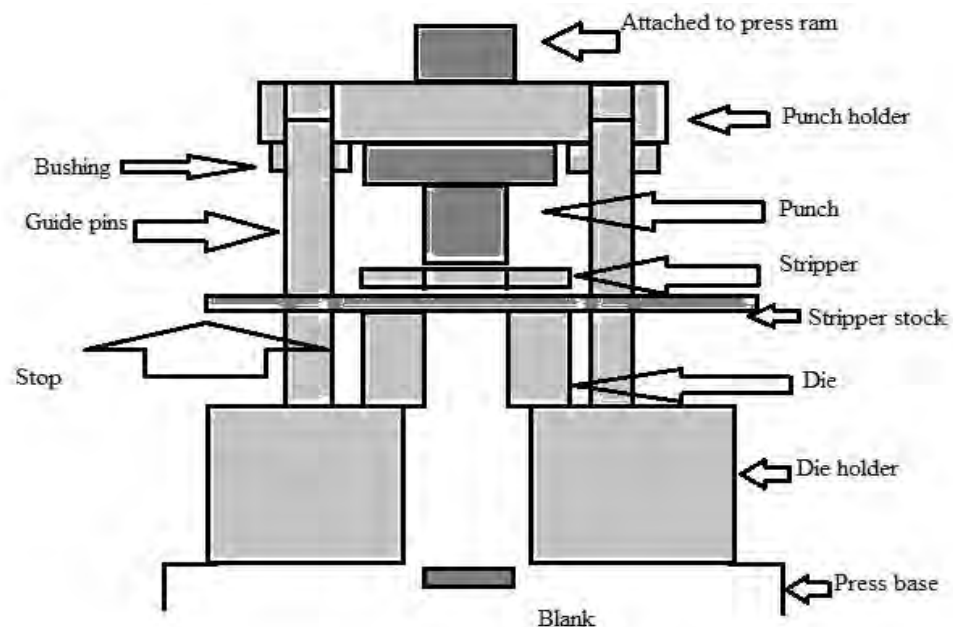


Figure 2.1 Components of a punch and die for a blanking operation.

In addition to these components, a die used for blanking or hole-punching must include a means of preventing the sheet metal from sticking to the punch when it is retracted upward after the operation (Groover, 2011). The newly created hole in the stock is the same size as the punch, and it tends to cling to the punch on its withdrawal. The device in the die that strips the sheet metal from the punch is called a stripper. It

is often a simple plate attached to the die in Figure 2.1, with a hole slightly larger than the punch diameter.

For dies that process strips or coils of sheet metal, a device is required to stop the sheet metal as it advances through the die between press cycles. That device is called a stop. Stop range from simple solid pins located in the path of the strip to block its forward motion, to more complex mechanisms synchronized to rise and retract with the actuation of the press.

### **2.1.2 Type of Stamping Die**

The operation that stamping die that classified in cold stamping tool type was able to perform for example bending, cutting, piercing, blanking and etc. (Hu et al., 2016). Other differences deal with the number of separate operation to be performed in each press actuation and how it accomplished.

The type of die considered above performs a single blanking operation with each stroke of the press and is called a simple die. More complicated press-working dies include compound die, combination die, and progressive die. Compound die is a one type of die that able to performs two process at single station for example blanking and punching process or blanking and drawing process (Oberger, 2012). A good example is a compound die that blanks and punches a washer (Groover, 2011). Combination die which combines two or more different operations, such as cutting with forming or drawing operation. The combination dies are variation action dies with one process succeeding the other within die using actuated die and punch assembly (Khan et al., 2011). A progressive die performs two or more operations on sheet metal coil or two more stations with each press stroke. The part is fabricated progressively. The coil is fed from one station to the next and different operations (e.g., punching, notching, bending and blanking) are performed at each station. When the part exits the final station, it has been completed and separated (cut) from the remaining coil. Design of a progressive die begin with the layout of the part on the strip or coil and the