



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

OPTIMISATION AND ANALYSATION OF LINEAR POSITIONING TABLE FOR DRILLING MACHINE

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

by

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2017

DECLARATION

I hereby, declared this report entitled Optimisation and Analysation of Linear Positioning Table for Drilling Machine is the results of my own research except as cited in references.

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APPROVAL

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

.....

(Dr. Norfariza Binti Ab Wahab)

ABSTRAK

Penggerudian adalah proses pemesinan berterusan. Penggerudian adalah proses pemotongan yang menggunakan bit gerudi untuk memotong lubang salib di sekeliling pepejal dalam bahan pepejal. Ini memaksa keunggulan ke atas sekeping kerja, memotong cip (swarf) dari lubang kerana ia digerudi. Pelbagai alat pemotong boleh didapati untuk penggerudian, tetapi yang paling biasa adalah gerudi twist. Pelbagai jenis proses gerudi disediakan untuk tujuan yang berbeza seperti penggerudian, penambahan, membosankan, membosankan kaunter, tenggelam kaunter, kehadiran tempat, pengambilan dan pemotongan. Objektif projek ini adalah untuk mengoptimumkan dan menganalisis jadual kedudukan linear untuk mesin penggerudian untuk menjadikannya lebih berkesan dan sempurna berfungsi. Selain itu, kaedah yang boleh digunakan ialah dengan memasang skru pada bahagian berasaskan linear linear untuk mesin penggerudian. Untuk jadual kedudukan linier ini mudah digunakan, pembacaan skala akan direkabentuk di atasnya supaya pengendali dengan mudah dapat menandakan pengukuran yang diinginkan untuk menjadi gerudi. Reka bentuk yang ringkas dan selamat dicadangkan untuk mengoptimumkan dan menganalisis projek ini yang diharapkan berfungsi dengan cekap. Kesimpulannya, jadual kedudukan linear ini dapat memudahkan kerja pengendali yang hanya perlu dikendalikan pengendali sekali untuk keseluruhan proses penggerudian.

ABSTRACT

Drilling is a continuous machining process. Drilling is a cutting process that uses a drill bit to cut a hole of circular cross-section in solid materials. This forces the cutting edge against the work piece, cutting off chips (swarf) from the hole as it is drilled. Various cutting tools are available for drilling, but the most common is the twist drill. Wide varieties of drill processes are available to serve different purposes such as drilling, reaming, boring, counter boring, counter sinking, spot facing, trepanning and under cutting. The objective of this project is to optimize and analyze the linear positioning table for drilling machine to make it more effective and perfect to function. Furthermore, the methods that can be used are by installing the screw on the based part of the linear positioning table for drilling machine. For this linear positioning table easy to use, the scale reading will be design on it so that operator will easily mark the desired measurement to be drill. A simple and safe design is proposed to optimize and analyze this project which is expected to function efficiently. In conclusion, this linear positioning table will be able to ease the operator work which the operator only needs to clamp once for the entire drilling process.

DEDICATION

I dedicate this thesis to my great family especially my father, Mohd Azmi Bin Ismail, my mother, Hasiah Binti Jaafar and my siblings, Siti Hajar, Mohamad Zahid, Ahmad Taufiq Al Haq and Siti Fatimah Atihkah who never stop giving off themselves in countless ways. For their endless love, support and encouragement to keep me move forward.

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LIST OF SYMBOLS AND ABBREVIATIONS

- CNC - Computer Numerical Control
Mm - Milimeter
% - Percentage
Ø - Diameter

CHAPTER 1

INTRODUCTION

1.1 Overview

This chapter is discussed about the background of the study about the drilling process and a few clamping method. Other than that, the characteristic of drilling machine is also being explained and the type of drilling machine that selected is press drill machine. Besides, there are also a list of types of drilling machine and the problems that can be identified in this project. After the problem is come up, the objectives for this study can also be recognized to find the solution. The last part in this chapter is talked about the project scope that will be cover on this project.

1.2 Background of the Study

Drilling is a process of producing round holes in a solid material or enlarging existing holes with the use of cutting tools called drills or drill bits. The drill bit is usually a rotary cutting tool, often multi-point cutting tool. The bit is pressed against the work piece and rotated at rates from hundreds to thousands of revolutions per minute. Drilling is a continuous machining process. Numerous cutting tools are existed for drilling, but the most mutual is the twist drill. Wide changes of drill processes are accessible to assist different resolves such as drilling, reaming, boring, counter boring, counter sinking and tapping as shown in the Figure 1.1.

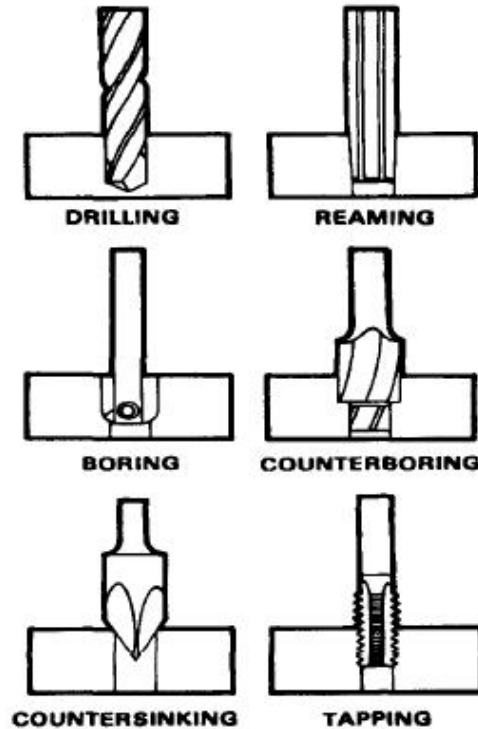


Figure 1.1: Drilling Processes

[https://smithy.com/sites/default/files/media/jpg/machining%20handbook/Chapter_6/6-2.jpg]

1.2.1 Clamping Method

A clamp or can be known as fastening device is used to grip an objects securely and tightly to limits the movement through the application of inward pressure. This clamping is very essential during the high speed of the cutting process. The workpiece that are going to be machined must be clamp tightly to get the high precision and accurate results. Generally, clamping provide two main purposes which are hold the workpiece against its locator or prevent movement of the workpiece. However, the main purpose of clamping is to hold the position of the object against the locators firmly throughout the machining cycle. The method can be described as follows:

- i. The clamp should allow rapid loading and unloading of parts and be fast-acting.
- ii. The clamp should not deform the part of damage it.
- iii. The clamp must have enough strength to restrict its movement and hold the parts.

1.2.2 Characteristics of Drilling Machine

All drilling machines have the following construction characteristics: a spindle, sleeve or quill, column, head, worktable, and base.

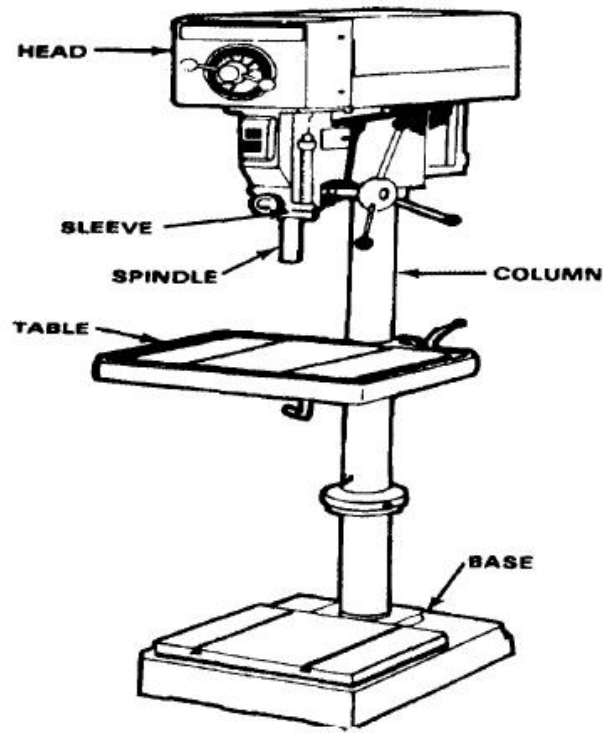


Figure 1.2: Construction Characteristics of Drilling Machine

[<https://smithy.com/machining-handbook/chapter-6/page/1>]

1.2.2.1 Spindle

The spindle holds the drill or cutting tools and revolves in a fixed position in a sleeve. In most drilling machines, the spindle is vertical and the work is supported on a horizontal table.

1.2.2.2 Sleeve

The sleeve or quill assembly does not revolve but may slide in its bearing in a direction parallel to its axis. When the sleeve carrying the spindle with a cutting tool is lowered, the cutting tool is fed into the work: and when it is moved upward, the cutting tool is withdrawn from the work. Feed pressure applied to the sleeve by hand or power causes the revolving drill to cut its way into the work a few thousandths of an inch per revolution.

1.2.2.3 Column

The column of most drill presses is circular and built rugged and solid. The column supports the head and the sleeve or quill assembly.

1.2.2.4 Head

The head of the drill press is composed of the sleeve, spindle, electric motor, and feed mechanisms. The head is bolted to the column.

1.2.2.5 Work Table

The worktable is supported on an arm mounted to the column. The worktable can be adjusted vertically to accommodate different heights of work or it may be swung completely out of the way. It may be tilted up to 90° in either direction, to allow for long pieces to be end or angled drilled.

1.2.2.6 Base

The base of the drilling machine supports the entire machine and when bolted to the floor, provides for vibration-free operation and best machining accuracy. The top of the base is similar to a worktable and maybe equipped with T-slots for mounting work too large for the table.

1.2.3 Types of Drilling Machine

Drilling machine has variety of types. Some of them are as follows:

1. Portable drilling machine
2. Bench type drilling machine
3. Sensitive drilling machine
 - Bench mounting
 - Floor mounting
4. Upright drilling machine
 - Round column section
 - Box column

5. Radial drilling machine or Radial arm press
 - Plain
 - Semi-universal
 - Universal
6. Gang drilling machine
7. Multiple spindle drilling machine
8. Automatic drilling machine
9. Deep hole drilling machine
 - Vertical
 - Horizontal

1.3 Problem Statement

1. The linear positioning table for the drilling machine is manually moves for x-axis.
2. The scale reading does not require on the linear positioning table for drilling machine.
3. Less safety measure for that linear positioning table for drilling machine.

1.4 Objectives

The objective of this project is to optimize and analyze the linear positioning table for drilling machine. The specific research tasks to fulfill the objectives of this thesis are summarized as follows:

1. To modify the linear positioning table for drilling machine.
2. To optimize the design and experiment result of linear positioning table for drilling machine.
3. To analyze the experiment result of linear positioning table for drilling machine.

1.5 Project Scopes

This project will only cover on:

1. Design of the locking function at the linear positioning table for drilling machine.
2. Design of the scale reading of linear positioning table for drilling machine.
3. Analyze the result in term of surface roughness and cutting force only.

CHAPTER 2

LITERATURE REVIEW

2.1 Overview

In chapter two, literature review contains the current knowledge included essential findings as well as the theoretical contribution to a specific subject or topic. There will be a introduction of machining process, machining operation, about the drill press and the effect of clamping.

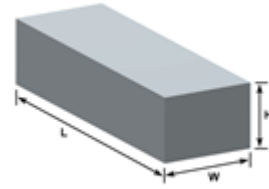
2.2 Introduction of Machining Process

Machining is manufacturing process that describes a variety of material removal processes in which a cutting tools getting rid the unwanted materials from a raw workpiece and converting that workpiece into the desired shape and size. The workpiece is typically cut from a larger piece of stock. The large stock might be in any shape such as solid bar, flat sheet, shaped beam or even hollow tubes.



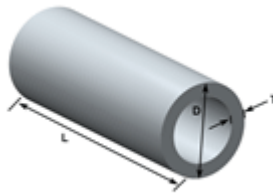
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Flat sheet



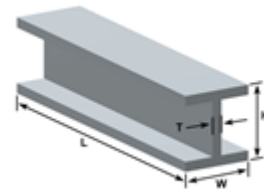
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Rectangular bar



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Round tube



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I-beam

Figure 2.1: Variety Type of Stock Shape

[<http://www.custompartnet.com/wu/machining>]

Machining process can also be performed on some existing parts such as a forging or casting. Machining is a part of the manufacture of many metal products, but it can also be used on materials such as wood, plastic, ceramic, and composites. For these reasons, machining is often considered the most common and versatile of all manufacturing processes. A machinist is a person who specializes in machining while a room, company or building where a machining is done is called a machine shop. Much of modern-day machining is carried out by computer numerical control (CNC), in which computers are used to control the movement and operation of the mills, lathes, and other cutting machines.