UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF NEW MAGNETIC CLAMPING FOR LATHE MACHINE (MODEL GH-1440-3)

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

by

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DECLARATION

I hereby, declared this report entitled “Development of New Magnetic Clamping for Lathe Machine (Model GH-1440W-3)” is the results of my own research except as cited in references.

Signature **:…….**

Name **: AFFERRY BIN MOHD SALEH**

Date **: ……**

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) (Hons.). The member of the supervisory is as follow:

…….

(Dr. Norfariza Binti Ab Wahab)

ABSTRACT

Chuck is a device that used to clamped any material that will be machine with the turning machine and it is connected to the headstock spindle of the lathe. These devices have its own limitation where the thickness must not less the area of clamping on the chuck. This project is to development a new magnetic clamping for attach and detach the workpiece on the chuck and it able to clamp small and thin workpiece. The chuck will be made by using mild steel and will have a few intercepts with brass. Magnetic mechanism will be placed in the chuck. A few cutting processes will be done between the conventional chuck and the magnetic clamping on a different thickness of workpiece. Next all the workpiece will be tested on few parameters on specimen and preform surface roughness testing to compare and to finalize where the effectiveness of the magnetic clamping. From the result obtain, with the magnetic clamping have much better result of surface roughness on thin workpiece. Thus, using magnetic clamping as the clamping method for thin workpiece is much effective in turning machine.

ABSTRAK

Chuck merupakan satu alat yang digunakan untuk mengikat apa-apa bahan yang hendak dilarik menggunakan mesin larik yang dimana ia diikat pada headstock spindle pada mesin. Alat-alat ine mempunyai had tersendiri dimana ketebalan bahan yang hendak dilarik mesti tidak kurang daripada keluasan kawasan pengikat pada chuck. Projek ini adalh untuk membina satu Magnetic clamping yang dimana ia mudah untuk mengikat dan tanggalkan bahan kerja pada chuck tersebut. Ia juga mampu mengapit bahan-bahan kerja yang kecil and nipis. Chuck ini akan diperbuat daripada mild stell dan mempunyai lintasan beberapa dengan tembaga. Mekanisme magnet akan dipasangkan pada chuck tersebut.Beberapa ujian akan dilakukan antara magnetic clamping dan conventional chuck dengan beberapa ketebalan bahan kerja yang berbeza. Seterusnya semua bahan kerja akan diuji dengan beberpa parameter dan ujian surface roughnes akan dijalankan untuk membandingnkan dan membuat kesimpulan muktamad bagi kebersanan magnetic clamping ini. Daripada keputusan yang diperolehi, magnetic clamping mempunyai hasil yang lebih baik daripada kekasaran permukaan pada bahan kerja nipis. Oleh itu, menggunakan magnetic clamping sebagai kaedah mengikat untuk bahan kerja nipis adalah lebih berkesan untuk mesin larik.

DEDICATIONS

I dedicate my dissertation work to my family and all my friends, A special feeling of gratitude to my loving parents, Norlida Binti Ghazali and Mohd Saleh Bin Lajis whose word of encouragement and always give positive vibes whenever me in depress. My sister Haryani Binti Mohd Saleh that always support and give encouragement to proceed with thesis. I also dedicate my dissertation to all my friends that support and contributed some of the ideas for this research. Thank you for everything.

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LIST OF ABBREVIATIONS, SYMBOLS, AND NOMENCLATURES

mm	-	millimeter
CNC	-	Computer Numerical Control
FEMM	-	Finite Element Method Magnetics
FTK	-	Fakulti Teknologi Kejuruteraan

CHAPTER 1

INTRODUCTION

This chapter will explain the overview of the study and the purpose of this study. The chapter includes the background of the study, problem statement, objectives that is expected to be achieved and the scope of the study that is going to be conducted.

1.1 Background of the study

Chuck is a model of clamping gadgets that used to support an item, usually with radial balance, especially round part. It usually used to support a spinning device or spinning workpiece. Some chucks can also keep irregularly form things. Magnetic clamping usually used for fixturing of ferromagnetic material in perfection of switching functions. This magnetic clamping typically uses an electromagnet or permanent magnet to hold the material or workpiece during machining. (Felix and Melkote, 1999)

The main advantage for this magnetic clamping is to make it easy to attach and detach the workpiece and it able to clamp small and thin workpiece. Magnetic clamping also offer several advantages over conventional clamping methods such as three-jaw chucks. Compared with the three-jaw place, magnetic clamping produce very little flexible deformation of the workpiece and thus enable limited perspective and form specifications to take place.

This magnetic clamping is in round shape with the flat working area on the top and an on and off change or key place on the side. Inside the chuck is a sequence of places that are organized to increase the flux along the outer lining area of the system. Flux is optimized and makes it possible to secure any ferrous materials placed on top of the system by organizing the place in a similar design.

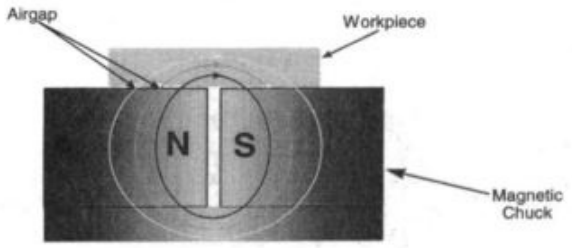


Figure 1.1: Working principal of magnetic chuck

This project is mainly focus on developing a new magnetic chuck for the lathe machine by using the entire conventional machine that available. The design of magnetic chuck is based on the lock system on the lathe machine available at JTKP Machining Technology Laboratory since the surface of magnetic chuck is flat. Furthermore, the magnet that will be use on this magnetic chuck is permanent magnet which it's don't involve any electrical system. Then, for effectiveness a few analyses on the cutting parameter will take place.

1.2 Problem Statement

This project is focusing more to produce a new magnetic clamping for the usage our laboratory, which involve in conventional machining to produce it. From the survey that has be done, most of the project or research that involve in thin and small material unable to proceed due to the limitation of clamping at the JTKP Machining Technology Laboratory. All the lathe machines that be used at FTK is 3-jaws chucks and 4-jaws chucks where the students only be expose and use on these type chucks. Since there are no magnetic clamping that be developed or purchased in JTKP Machining Technology Laboratory, therefore a new magnetic clamping will be produced.

1.3 Objectives

The main objective of this project is to develop a new magnetic clamping for lathe machine (Model GH-1440W-3). The specific purposes for this project are summarized as follows:

i. To design a new magnetic clamping for lathe machine.

ii. To choose suitable material for developing magnetic clamping.

iii. To develop a new magnetic clamping for lathe machine.

1.4 Scope

Scopes for this project is based on objectives that have stated and there are the several scopes that will be carrying out:

i. Design of the magnetic clamping is based on Lathe Machine.
ii. Materials that will be used for develop magnetic clamping are aluminium, mild steel, and brass.
iii. Development of the magnetic clamping is using all the conventional machine that available at the laboratory.

CHAPTER 2

LITERATURE REVIEW

This chapter explains about all findings obtained from many literature reviews, which may come from the internet, journals, article, and books about the topic related to this study. This section includes findings about the overview of manufacturing process, turning machine, magnetic clamping, magnetic clamping method, and effect of cutting machining parameters.

2.1 Manufacturing Process

Manufacturing is the backbone of industrial community. A person that involved in the industry must know the variety production procedures, material being prepared, tools and accessories for production products with proper precautionary features to avoid injuries. A few consideration of workshops practices relating the basic working knowledge such as different technological innovation materials, resources, accessories, production procedures, uses of various testing instruments and inspecting products manufactured in the industry.(Singh, 2006)

Selecting the suitable manufacturing process is not simple and straightforward. Different manufacturing technologies such as generating processes, rapid prototype, joining technologies, assembly, and surface engineering processes require that selection based on a few factors that applicable to the process. Other than that, in manufacturing process design also is considered such as the shape to be

manufactured, parameters demand by the process, accuracy that can be produced, the assumption of the process for the surface condition, cost of the process and tools that required. (K. G. Swift, 1996)

2.1.1 Conventional Machining

Conventional machining also known as some call the traditional machining. This processes are involving with a sharp cutting tool to remove material to obtain the desired part. By using this method, machining a hard metal it will demand of time, energy, and costs. Some cases, contact-machining may not conduct due to its limitations. This type machining costs in phrase of device use and in loss of quality in the product to caused recurring pressures during produce. Get in touch with machining also can be described as a process using technical energy. The contact machining techniques most often used are advantage cutting, countersinking, turning, and grinding. (Sheikh-Ahmad, 2009)

a) Milling Process

A milling device is a product device that eliminates steel as the task is fed against a spinning multipoint cutter machine. The milling cutter machine moves at high-speed and it eliminates steel at a very fast amount with the help of several reducing sides. Milling device finds extensive application in production perform and used for machining flat areas, curved areas, areas of trend, internal and external discussions, and helical areas of various cross-sections. The varieties of milling resources available cover a variety of functions and shapes.

In milling device, the steel is cut by means of a spinning cutter machine having several reducing sides. The try to be produced is held in a turning desk, a three-jaw place, an index head, between centers, in a special fixture or attached to

device desk. The turning amount of the reducing device and the feed amount of the workpiece depend upon the type of material being produced. (Singh, 2006)

For the milling resources, they are usually classified according to their outside size, hole size and width, but may have a mixture of reducing information.(Beddoes and Bibby, 1999) Figure 2.1 shows the milling machine and the common tools that be used in the milling machine:

(a)

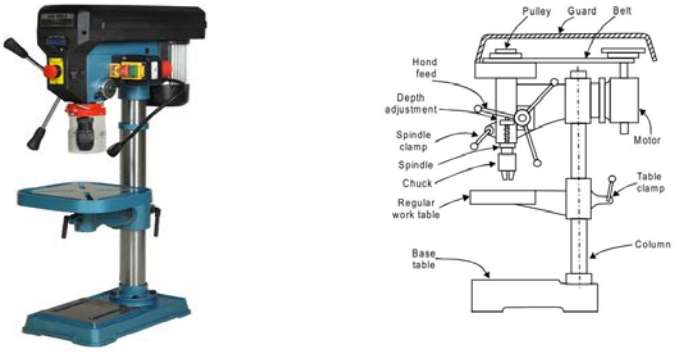
(b)

Figure 2.1: Milling machine (a) and the common tools used in milling (b)

(http://www.baileigh.com/metalworking/drills-mills-lathes/vertical-mills)

b) Drilling Machine

Drilling is a process of manufacturing circular gaps in a strong material or increasing the size of current gaps with the use of multi-tooth cutting tools. (Marinov, 2014) Drilling is the most typical content elimination function in materials and compounds machining. Exploration can be done on traditional straight drilling devices, milling devices etc. In drilling on a straight routine media, the spindle provides the main spinning movement to the routine bit and the nourish into the workpiece is offered through the spindle axis. (Sheikh-Ahmad, 2009)



(a) (b)

Figure 2.2: Drilling Machine (a) and the construction of drilling machine (b) (http://www.a-onetools.in/pillar-drill-machine.htm)

c) Grinding Machine

Grinding is a term used in modern production practice to describe machining with high-speed difficult wheels, protects and ties. Grinding wheels come in a great number of forms, sizes, and types of rough. Grinding is an abrasive machining which enfold polishing, lapping, honing and related super finishing processes.(Rowe, 2014)

During grinding functions, the main reducing movement may be used on either the workpiece or device, based upon on the geometry. The grinding method comprises of difficult contaminants, usually rubber carbide or alumina, which provide the reducing activity and are a part of a matrix, established into a useful form. As the difficult contaminants variety in size and are usually arbitrarily focused within the matrix, it is often difficult to determine an undeform processor width for each reducing edge. (Beddoes and Bibby, 1999)

Figure 2.3: Example of surface grinding machine
(http://www.ustudy.in/node/4523)

2.1.2 Advance Machining

Advance machining techniques are also known as non-conventional metal machining or advances machining processes. Development of new machine is required in the industry due to the uses of hard, high durability and warm proof in the technological innovation. Some of the machine have been found use in the industry of production of complex. New components such as hastalloy, nitralloy, waspalloy, nimonics, carbides etc., are hard to device and which have remarkable programs in airplanes, atomic reactors, generators, unique reducing resources etc. (Singh, 2006) Non-contact machining give much easier to clamp fragile material, it much flexible and complex shape can be machine.