THE CORRELATION BETWEEN MACHINIBILITY AND SURFACE FINISH IN CNC LATHE MACHINING

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I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in terms of scope and quality for the award of the Bachelor degree of Mechanical Engineering (Thermal-Fluids)

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This report is submitted to Faculty of Mechanical Engineering in partial fulfillment of the requirement for the award of the degree of Bachelor of Mechanical Engineering (Thermal-Fluids)

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" I hereby the author, declare that the work in this report entitled "The correlation between machinibility surface finish in CNC lathe machining " is my own except for quotations and summaries which have been duly acknowledged"

Signature : .....

Author : MUK HAZREE.....

Date : 13/12/05.....

DEDICATION

To my lovely family, Mr. Surian bin Abd Jalal, my brother Saiful Nizam, my sisters Azly Azlinda and Nur Hazliza, Muhammad Adib Irfan and Nur Alya Afikah. To my entire friend in 4 BMCT thank you for being my sweet friend. To my supervisor Mr. Mohd Ahadlin, thank you for knowledge and support. Special thank you to Fazrie bin Zamri because always with me to give support and attention.

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ABSTRACT

This project is carried out with the purpose to find or get the relationship between machining process and the result of surface finish. The scope of this study chose a Computer Numerical Control (CNC) Lathe Machine operation for machining process and machinability such as spindle speed and feed rate for cutting parameters. The material will be used are copper, aluminum and mild steel. The cutting tool using for this study is a Tungsten Carbide. After machining process, find the surface roughness depends on characteristic of surface finish. The surface roughness will be measure and the result obtained will be analysis on it. The analysis of the surface roughness showed the relationship between machinability like spindle speed affected the quality of roughness surface from Ra and Rmax versus spindle speed graph plotted. The result of the experiment showed that at a particular spindle speed produced the different surface finish.

ABSTRAK

Projek ini dijalankan bertujuan untuk mencari atau mendapatkan hubungan antara proses pemesinan dan keputusan permukaan akhir. Skop kajian ini memilih Mesin larik kawalan berangka berkomputer untuk proses pemesinan dan sifat kebolehmesinan seperti kelajuan pengumpar dan kadar suapan sebagai parameter pemotongan bagi operasi larik ini. Bahan yang digunakan dalam kajian ini ialah tembaga, aluminium dan keluli. Manakala mata alat yang digunakan ialah Tungsten Karbida. Selepas proses pemesinan, dapatkan kekasaran permukaan bergantung kepada ciri-ciri yang terdapat pada kekemasan permukaan yang dihasilkan. Kekasaran permukaan akan diukur dan keputusan yang diperolehi akan dianalisis. Analisis pada kekasaran permukaan menunjukkan hubungan antara ciri-ciri kebolehmesinan seperti kelajuan pengumpar memberikan kesan kualiti pada kekasaran permukaan melalui graf Ra dan Rmax melawan kelajuan pengumpar yang telah diplotkan. Keputusan daripada ujikaji menunjukkan bahawa kelajuan pengumpar menghasilkan kekemasan permukaan yang berlainan.

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S	Spindle speed	34
F	Feed rate	34
D	Depth of cut	34
V_c	Rotation per minutes (rpm)	34
Ra	Arithmetic mean value	45
Rmax	Height differential between maximum peak to every sample length.	45
μ	1×10^{-6}	45

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CHAPTER 1

INTRODUCTION

Machining is one of manufacturing process. Machining can be defined as the process of removing material from a work piece in the form of chips. Machining is mainly made up to three categories such as drilling, turning and milling.

Computer numerical control (CNC) is one of machining process. Computer Numerical Control machining is a form of machining in which a computer processor is linked to a machine tool.

1.1 General

Machining is the most important of the manufacturing processes. Machining can be defined as the process of removing material from a work piece in the form of chips. The term metal cutting is used when the material is metallic. Most machining has very low set-up cost compared to forming, molding, and casting processes. However, machining is much more expensive for high volumes. Machining is necessary where tight tolerances on dimensions and finishes are required. Machining is mainly made up to three categories such as drilling, turning and milling.

Most machining operations can be divided into those that remove metal from an item, and those that form metal in an item. Often an unfinished work piece will need to have some parts removed or scrapped away in order to create a finished product. For example, a lathe is a machine tool that generates circular sections by

rotating a metal work piece, so that a cutting tool can peel metal off, creating a smooth, round surface. A drill or punch press can be used to remove metal in the shape of a hole. Other tools that may be used for various types of metal removal are milling machines, saws, and grinding tools. Many of these same techniques are used in woodworking.

Metal can be formed into a desired shape much more easily than materials such as wood or stone, especially when the metal is heated. A machinist may use a forging machine to hammer or mold a hot metal work piece into a desired shape. The dies or molds may be used if the metal is soft enough, or under high pressures. A press is used to flatten a piece of metal into a desired shape. Advanced machining operations might use electrical discharge, electro-chemical erosion, or laser cutting to shape metal work pieces.

1.2 Computer Numerical Control (CNC) Lathe machine

CNC stands for computer numerical control. It is a versatile system that allows controlling the motion of tools and parts through computer programs that use numeric data. CNC can be used with nearly any traditional machine. The most common CNC machines found in the machine shop include machining centers (mills) and turning centers (lathes).

CNC has been around since the early 1970's. Prior to this, it was called NC, for Numerical Control. In the early 1970's computers were introduced to these controls, hence the name changes.

Computer Numerical Control machining is a form of machining in which a computer processor is linked to a machine tool. It is a system in which programmed numerical values are directly inserted and stored on some form of input medium, and automatically read and decoded to cause a corresponding movement in the machine which it is controlling.

Since its inception in 1953 CNC has continued to play an increasingly important role in product manufacturing. With the tools and machines that are available, manufacturing facilities now have the capability of reproducing parts at an exceptional rate with repeatable accuracy. Technology in manufacturing method use changing rapidly. Today 90% of all machine tools manufacturing in the world are computerized to enhance capability. Students must have the basics of CNC to have a chance to compete in the skilled trade's workforce of today. It becomes even more important for tomorrow's workforce. At below is the most common CNC machining process found in the machine shop:

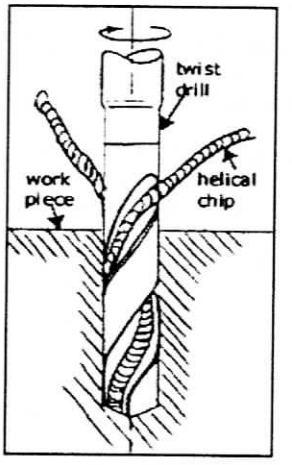

Figure 1.1: Drilling

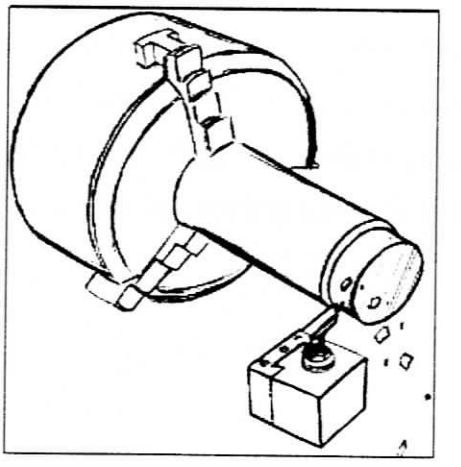

Figure 1.2: Turning

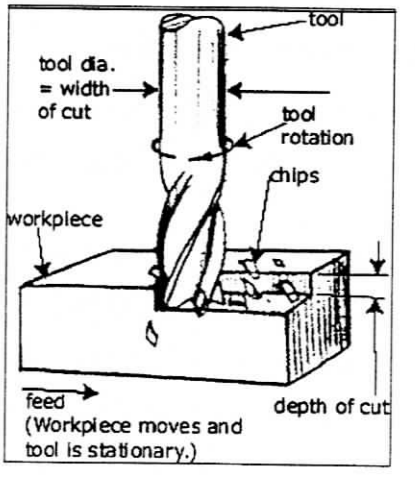

Figure 1.3: Milling

1.3 Objective

The objective of this project is to find or get a relationship between machining process and the result of surface finish using Control Numerical Computer (CNC) Lathe machine.

1.4 Scope

The scopes of this project are students must have skill to use CNC Lathe machine like know to set programming and the function of every part in CNC lathe machine. The different material such as copper, mild steel and aluminum are use in this project. While the cutting tool use is Tungsten Carbide and find surface roughness after machining process with refer the surface finish on the material after machining process.

1.5 Problem statement

In machining process, it is very important to get a good surface finish. But the problem occur when the surface finishes and surface roughness not in specification. This is because the factor likes machinability, spindle speed, feed rate, cutting tool and material not suitable for the machining process.

Each material has not same composition and characteristic. This different can be effect to the surface finish. Different spindle speeds setting, feed rate and cutting tool also give effect to surface finish. For example, as faster the spindle speeds, as not good surface finish will produced. But, all the conclusion is depends to the related between machinability and surface finish on the material, spindle speeds setting, feed rate and cutting tool such as Copper, the machinability can be difficult to machine because of built up edge formation, Mild Steel the machinability it is

easily to machine, formed and welded, and Aluminum the machinability is generally easy to machine

1.6 Problem analysis

From the problem statement, the important thing to do analyze is the machinability factor like spindle speed and feed rate. Set the spindle speed to do machining process start from 800 to 2000 rpm. Take three reading to get an average. For the feed rate, set to 0.15, 0.20 and 0.25 inc/min. Use a same feed rate for every spindle speeds.

A suitable cutting tool and material also will use to get a good surface finish after machining process. We use a different material like copper, aluminum and mild steel. Before that, analyze all the material characteristic and composition. While, the cutting tool use in this project is Tungsten Carbide.

From this factor, we will get a surface finish and measure the surface roughness and analyze the correlation between machinability and surface finish related to suitable spindle speed, feed rate, cutting tool and different material.