CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

This project is to investigate the Lathe Machine optimum cutting speed for the three chosen materials. Previous research done on the impact of cutting parameters that affect surface roughness suggest us that among cutting parameters(cutting speed, feed rate, and depth of cut), cutting speed has the biggest impact on the surface roughness [3].Cutting speed is defined as the speed at which the work progress with respect to the tool . Feed rate is defined as the distance the tool travels during one revolution of the part. Besides surface finish, Cutting speed and feed also determine the power requirements and material removal rate. The primary factor in choosing feed and speed is the material to be cut. However, one should also consider material of the tool, rigidity of the work piece, size and condition of the lathe, and depth of cut.[4] In high-volume production, machining parameters have amplified impacts on the machine performance in terms of productivity (cycle time), reliability (tool life), and product quality (surface finish). In addition, production parameters become critical in high-volume production since they directly impact the overall order fulfillment (production makes pan and delivery reliability)[1].The three material with different hardness are chosen in this project , they are Aluminum, Mild steel and Brass. [4]

1.1.1 Background:

Metal cutting is one of the important and widely used manufacturing processes in engineering industries. The study of metal cutting focuses, among others, on the features of tools, input work materials, and machine parameter settings influencing process efficiency and output quality characteristics (or responses). A significant improvement in process efficiency may be obtained by process parameter optimization that identifies and determines the regions of critical process control factors leading to desired outputs or responses with acceptable variations ensuring a lower cost of manufacturing [1]. Cutting conditions include cutting speed, feed, depth of cut and cutting fluids. For a machining process such as turning, the cutting conditions play an important role in the efficient use of a machine tool. There is an economic need to operate these machines as efficiently as possible in order to obtain the required payback. Since the cost of turning on these machines is sensitive to the cutting conditions, optimum values have to be determined before a part is put into production. This need is even greater in the case of rough machining since a greater amount of material is removed thus increasing possible savings. The optimum cutting conditions in this context are those which do not violate any of the constraints that may apply on the process and satisfy the economic criterion.[5]

In order to determine the optimum cutting conditions, one has to estimate the tool life and cutting forces with a reasonable degree of accuracy since many of the constraints that may apply on the process are influenced by these parameters. For a practical machining situation, since no adequate machining theory is available to predict the tool life and cutting forces, one is compelled to rely on empirical equations to predict these parameters. However, these empirical equations involve a number of constants which are not readily available. Furthermore these constants depend on many factors thus requiring a huge amount of data for a general workshop situation. To obtain and manage such a huge amount of data is an extremely difficult task. Therefore an alternative to this empirical approach that can be used to predict cutting forces, tool life, etc. will be of great value. [5]

1.2 PROBLEM STATEMENT

Select the wrong cutting speed for each material may lead to the following:

a) High maintenance cost of the Lathe machine.
b) Poor surface finish of the work pieces.
c) Short tool life.
d) Low production rate.
e) Material waste.
f) Increase production cost.

1.3 SCOPE OF STUDY

In order to achieve the objectives of this project, the scopes are as below:

a) Literature review, all information about the Lathe Machine, Tool bits, the three chosen materials, turning process, surface roughness are gathered from the Internet.
b) Usage of Lathe machine.
c) Calculation to find out the cutting speed and RPM.
d) Usage of Perthometer.
e) Calculation for surface roughness.

1.4 OBJECTIVE

To determine the Lathe Machine optimum cutting speed for the three chosen materials (Aluminum, Mild steel and Brass).

The effects are to:

a) reduce the maintenance cost of the Lathe Machine.
b) speed up the work processes
c) reduce down time.
d) increase tool life.