CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Machining is very important in manufacturing process. Manufacturing companies were often facing problem in settling the machining tools. It took times when changing a tool that have lost its effectiveness to replace it with a new tool. If the company changing their tool frequently it will cost the company a lost in production time when the machine has to stop running. Companies also have to spend money for the machining tools. If the changing of the machining tools can be reduced, it can help in saving the machining tools cost and the time lost when changing the new tools. Tool life affects production costs and therefore competitiveness of the process and may as well have a considerable impact on tool supply, stability of production and last but not least delivery performance. Since tool failure is unavoidable, tool life must be properly taken into account for the calculation of tooling cost and planning of tool supply for production. In daily practice this or a similar situation would call for immediate short term actions of tool life improvement in order to stabilize production or for long term activities of tool life optimization and cost reduction. [1]. This project is going to find a solution to optimize the tool life by investigating the relationship between selected cutting parameters and develop the first and second order tool life model when machining modified AISI P20 tool steel thus helping to solve the cutting tools cost and production time problem.
1.2 PROBLEM STATEMENT

The main problem to define the major reason for tool failure is the large number of process parameters and their possible interactions affecting tool life [1]. The life of cutting tool depends upon many factors, such as the microstructure of the material being cut, metal removal rate, the rigidity of the setup and effects of cutting fluid [2].

During machining process, the cutting tool ability will degrades with time; in other word it became dull. Until a certain time, the tool can no longer cut through the material. If the condition is not suitable with the tool, it will shorten the tool life faster. Low tool life may endanger tool supply and therefore production output and tooling cost may even exceed the calculated manufacturing costs of the entire product [1].

To overcome this problem, cutting tools users need to have a prediction model to help them predict the tool life by calculation. Therefore the cutting tool users can mix and match the suitable parameters for the cutting process. In this way, the cutting tools can be prevented from being damage for a short period of time.

1.3 OBJECTIVE

1. The objective of this study is to predict tool life in end-milling operation of modified AISI P20 tool steel by developing the first and second order mathematical model for tool life.
2. To investigate the relationship between cutting parameters; cutting speed, feedrate, axial depth, radial depth with tool life.

1.4 SCOPE / LIMITATION

In this project, the developed tool life models were limited to the certain range of parameters. There are four selected cutting parameters, cutting speed, feedrate, axial depth, and radial depth. The range of cutting speed is from 100 to 180 m/min, the feedrate is from 0.1 to 0.2 mm/rev, the axial depth is from 1 to 2mm, and the radial depth is from 2 to 5mm.
1.5 Thesis Outline

This thesis consists of five chapters. Chapter 1 gives the introduction of this project. In the introduction, there will be brief explanations about the background of this study, the problem statement, the objective of this study, and the scope/limitation in this project.

Chapter 2 shows the literature review of this study. The literature review will discuss on the selected points such as, the machining process, CNC milling process, cutting tools, modified AISI P20 tool steel, and response surface methodology. In the cutting tool part, there will be a more deep discussion about the tool life.

Chapter 3 presents the methodology of this project. It gives information about the equipment used, the preparation of the work piece, experiment process, and response surface methodology.

Chapter 4 discus’s about the analysis of the experiments in this project. From this analysis, the mathematical models for the tool life, the first and second order will be developed. The accuracy of both mathematical models will be analyzed. Thus this chapter will achieve the objective of this project.

Chapter 5 provides the conclusion and recommendation to this project. The conclusion was made after all the experiment in this project performed and the result has been analyzed. Recommendation for further experiment was made based on the experience during running the experiment.