CHAPTER 1
INTRODUCTION

1.1. Background

In the modern era, development in the fields of engineering, especially engineering technology is progressing very rapidly. The development of science is a major factor in developing of technology in the field of engineering sciences. So, in the case the speed and accuracy are the challenges that faced today.

Machining plays important role in producing products. Milling is the most widespread metal removal process in metalworking industry. Manufactured products qualities are determined by their surface quality. The high friction between tool and work piece leads to high temperatures, tool wear, and poor surface quality [1].

Production and manufacturing process in many kind of fields required to solve the problem above without put aside the health and safety, it's mean a user or operator does not harm himself while interacting and work with the machine. According the safety operational standard of user in this day only operate the machine with computerized machine without directly touching and interacting with the machine. So that operator's safety is assured.

The end-milling process is one of the most widely used material removal processes in industry [2] Others, the operation of the machine with the type of automated or computerized also needed skill or knowledge in how to operate it. Beside that during the production some problem happened, like tool broken, the requirement of finishing product is not same with the expected result, the duration of production take long time and others some unexpected problems.

Some studies have observe the problem that face in the field of production. Current machining processed and cutting tool designs are slow

and too conservative, leading to high cost and significant waste [3]. Tool failure may result in losses in surface finish and the dimensional accuracy of a finishes part, or possible damage to the work piece and machine [4]. Because of that needs some optimization in every area.

Optimization in every area is one kind one rules that should be done before, during and after production. Increase material removal rate of existing CNC programs to lower cost, bid new jobs more aggressively, balance a cell or provide additional capacity without CAPX [5] is one kind of study about optimization process . In general type of end-mills are varied and have each purpose of every types to solve diverse problem in production.

Agnew,P.J. said in his paper "for example, when doing a slotting operation, unless doing a light cut of about 2D or less, it is best to use a two- or three-fluted end mill. The general rule is use less flutes for deeper cuts, with four or higher flutes for light cuts. The reason for this is the venerability of chip packing that can lead to destruction of the end mill [6]. Finally, all of that are basically interesting to make research in this field of finding optimization and simulation before machining processes.

1.2. Problem Statement

Surface roughness has a great influence on the functional properties of the product. And rouh-machining is a very important stage which determines the final outcome (surface roughness) of the product. Finding the rules that how influence of process factors and environment factors give affect the values of surface roughness will help to set the process parameters of the future and then improve production quality and efficiency [7]. Therefore to detecting tool wear during the surface-rough processing and avoid more damage problems, the author want to finding optimal feedrate and cutting depth of three type end-mill tools 2T, 3T and 4T by simulation on Third Wave System software.

1.3. Problem Limitations

To avoid problem expenditure is needed some of problem limitation so that can be more understandable by focusing on those problem. Those problem are:

1. Production process is only to surface-rough machining with materials Al-7075 T6.
2. The cutting tools that examined are carbide flat end mill type 2T, 3T and 4T.
3. The software that used to checking the total time and making program is “masterCAM V9” and Fanuc system 0i Machine to real machining experiment.

1.4. Objective of the Research

Based on the background and the problem statement in this report, the objective of this research are:

1. To detection of tool failure that occur in surface-rough processes by Three Wave System soft. Simulation before operation.
2. To determine the best feed rate and cutting depth for effective processing.
3. To find out the correlation of spindle speed, feedrate and cutting depth for consideration of next production.

1.5. Benefit

The benefit of research are expected after the research are:

1. The result of simulation can become reference to avoid failure of tools and workpiece’s damage during the operation as well as improved tool life,
2. The operation of surface roughness process more safety and effective by knowing optimal feedrate and cutting depth to increased material removal rates,
3. Reduced trial and error testing interactions, and
4. More understanding of using Three Wave software system especially in the milling process simulation.

1.6. Literature Review

There are some studies as the reference of this research. Those are researches about optimization carbide end mill with analyze and simulation. Design and developing of a multi-purpose carbide end mill (MP-CE) to suit all kinds of cutting proposes which will uncover the background information on different kinds of end mill structure, tool materials and various surface treatment on the cutter [8].

Generalized modeling of milling mechanics and Dynamics – Helical End Mill is study about predicted and measured cutting forces, surface roughness and stability lobes for ball, helical tapered ball, and bull nosed end mills are provided to illustrate the viability of the proposed generalized end mill analysis [9].

The research by Kuttolamadom,M[10] is about prediction of the wear and evolution of cutting tools in carbide/Ti-6Al-4V machining Tribosystem by volumetric tool wear characterization and modelling have proven that straight tungsten carbide wear when machining Ti-6Al-4V is mechanically-driven at slow surface speeds and thermally-driven at high surface speeds.

Optimal Selection of Tools for Rough Machining of Sculptured Surfaces is another research that focused on Evaluation of the effect of depth of cut and stepover, as major machining parameters and their influence on machining time and remaining volume and real time experiments showed that simulation results are really close to reality and thus CAM software is an adequate tool for optimization purposes [11].

And the research which using TWS AdvantEdge for finding optimization both in effective time reduce and also tool wear. Simulating steel machining AdvantEdge user defined and user defined yield custom material options [12] and the path for improvement in Third Wave Software [13].