CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

This chapter gives a short description of the project background including several approaches. It then introduces objectives, scopes, problem statement of this project on effect of coolant on lathe cutting tool life.

1.2 PROJECT BACKGROUND

High carbon steel have played an important role in, production of cutting tool, automotive industries, bolts and nuts , chain , knives, pipes, magnets and many other applications. These materials are used extensively because they possess several excellent properties including extreme hardness and ductile, can be forged when heated, and the price are very low relative to other common material. However, tool wear imposes a major problem in machining high carbon steel, because of their high thermal conductivity, high chemical reactivity and high modulus of elasticity. (Kalpakjian and Schrnid, 2000).

Tool wear and breakage of cutting tools has been a common problem in the production line now days. Tool wear weakens the cutting tool, increases the forces used in cutting and causes a lack of consistency in material removal. It wills causes companies spend money to grind and time is wasted to replace cutting tools due to tool wear. There are many factors that contribute to the wear of cutting tools: the work pieces properties, cutting tool properties, cutting surface speed, cutting feed rate, depth of cut and machine rigidity.

Coolant or cutting fluids have been seen as a solution rather than a problem in metal cutting, which it improving the surface finish of work piece and promoting chip removal process.

The use of cutting fluids in metal cutting was first reported in 1894 by F. Taylor who noticed that cutting speed could be increased up to 33% without reducing tool life by applying large amounts of water in the cutting zone (R. F. Avila and A. M. Abrao, 2001. Cutting fluids increase the tool life and improve the efficiency of the production systems providing both cooling and lubricating the work surface. Higher surface finish quality and better dimensional accuracy are also obtained from cutting fluids (M. Sokovic, K. Mijanovic 2001). Many types of cutting fluids namely, straight oils, soluble oils, synthetic and semi synthetic are widely used in metal cutting processes.

For this purpose, we compare the three type of coolants which is pure water, water emulsifiable oils, and straight cutting oil coolant to determine which one would be the most effective coolant for heat removal from the cutting tool, improve tool life and decreasing the surface roughness on parallel turning of carbon steel bar.

The high carbon steel that been used in this experiment will be undergoing heat treatment process which is hardening process in order make the work piece even harder and easily make the tool wear. The process of hardening consist of heating the metal to a temperature of 30^0c -50^0c above the upper critical point for hypo-eutectoid steels and by the same temperature above the lower critical temperature for hyper-eutectoid steels. It is held at this temperature for some time and then quenched. Hardening is accomplished when the high-carbon surface layer is quenched to form martensite so that a high-carbon martensitic case with good wear and fatigue resistance is superimposed on a tough, high-carbon steel core.

The Quadra-Chek 300 Series optical measurement machine is use to see the internal structure that changes have any wear occurs in reducing the tool life. Surface roughness analysis is done by using Perthometer to measure the work pieces after machining process

in order to see which coolant is the best in tool wear reducing beside give a better surface finish to the work pieces.

1.3 PROBLEM STATEMENT

Types and amount of coolant are some of the parameters need to be considered to increase the tool life and produce a better surface finish. Too much coolant will not only waste money but also it is health hazard. To overcome wastage, the optimum flow rate for different types of coolant has to be investigated. The cutting tool is the single inserted type use on conventional Lathe machine. The result of the investigation will not only save cost but also save production time. Each work piece will be tested for its hardness before turning process. The result of the cutting will be tested for its surface texture using Petrometer and the tool wear using SCM machine

1.4 PROJECT OBJECTIVE

The objectives of this project are to investigate:

- The effect of tool wear on types of coolant
- The amount and type of coolant on tool wear and surface roughness on parallel turning of carbon steel.

1.5 SCOPE OF PROJECT

In this project, high carbon steel is used as specimen. High carbon steel that been hardened at the right hardness using the oven will be used and the turning operation is performed by using conventional lathe machine. Machining variables considered are cutting length, cutting speed, feed rate and depth of cut . Only easily available and common coolant will be used as a cutting fluid in the machining process and the flow rate will be adjusted using the flow rate regulator. STATISTICA software is used to create the design