CHAPTER 1

INTRODUCTION

1.1 PROJECT BACKGROUND

Recent demand for the automotive industry has influenced the improvement in manufacturing of automotive parts. It has become the pushing factor to produce an automotive parts which meets the criteria such as high strength, low cost, light weight and others. Hot press forming die is an advance forming process that was developed to increase the material strength and good formability which makes it possible to produce complex shapes with tensile strength up to around 1,500 Mpa in manufacturing of automotive parts (Karbasian et al, 2010).

Since hot press process using cooling channel, the material strength can be increased by allowing the material undergoes fast cooling after heating the material at desired temperature range. The heated material is in austenitic phase and the phase will transform into harder phase after quenching process, for example martensite.

Nowadays, a new technique based on considerably long twist drills, called Deep Twist Drilling (DTD) is presented. The hole of the cooling channel in hot press forming die is made by using a deep twist drilling process. DTD is a process of drilling hole ten times of the diameter of the hole. The previous method of producing cooling channel is by using Gun Drilling and Boring Trepanning Association (BTA) Drilling. It is estimated approximately 250 million twist drills are used annually, from the surveyed
that has been carried out in the United States. (Pletting, 1999). It is proved that twist drills are most preferable tool operations used.

Nevertheless, the drilling machine itself can’t detect the complications occur during the drilling process where the drill bits will become wears and break as the drilling depth increased. Therefore, tool condition monitoring (TCM) was designed and introduced to overcome this complication. TCM is used to monitor whether by online or offline from the beginning of the drilling process until the tool bits has reached the maximum limits before its wears and break by using the accelerometer sensor that was attached at the spindle of drilling machine and send the result to the software. As the result was obtained, the classifier such as an Artificial Neural Network (ANN) and Support Vector Machine (SVM) need to be decided to analyse the result.

1.2 PROBLEM STATEMENT

Deep twist drill is one of the machining processes which widely used in manufacturing industry especially in hot stamping process. However, the major issue is tool wear and breakage. Therefore, by monitoring the tool condition through classify it via several classifier such as SVM and ANN, it can detect the status of the tool, and through that, it is available to reduce the changes of tool to failures.

1.3 PROJECT OBJECTIVE

The main objectives for this study are:

I. To analyse deep drilling classifier on data collection.

II. To classify the tool drill failure mechanism of deep twist drilling based on several classifiers such as SVM and ANN based on actual deep drilling experiments data.
III. To classify the data obtained by using SVM and ANN via Weka and MATLAB software.

1.4 PROJECT SCOPE

This project is focusing on condition monitoring of deep drilling process which conducted based on this scope:

i. The parameter involved; feed rate, depth of cut and and cutting speed.

ii. The diameter and length of tool drills; 8mm and 210mm.

iii. Raw material used is SKD 61 and tool drills material is High Speed Steel (HSS).

iv. The accelerometer sensor is used to measure vibration during the drilling process is conducted.