CHAPTER I

INTRODUCTION

1.1 Background

Nowadays, almost all machines are made to work automatically. In general, these machines work on high rotation, where the rotation causes vibration with a frequency high enough so that it can no longer perceived by the human senses. Conventional methods can not be used efficiently because it requires a long time and high cost. Therefore we need an efficient method of monitoring and can detect damage with a high degree of accuracy that with predictive maintenance methods.

Predictive maintenance is regular monitoring of the condition actual mechanics, by detecting recent problems to prevent further damage. Predictive maintenance can be used includes thermography, Tribology, and methods of using vibration signal. Tribology is the monitoring method using the analysis of lubricant properties, while the thermography method based on heat detected from engine components. Method of vibration analysis is a method of monitoring based on the vibration of mechanical components that move back and forth, linear and rotating (Mobley, 2002).

Predictive maintenance based on vibration signal analysis applied to various engine components one of them is a gearbox. The prfoblem of monitoring the condition of the gearbox has got increased interest in the last

two decades with the aim to improve safety and reduce the cost of operation of the machine (Shao et al, 2009).

Various methods used in vibration signal monitoring of gearbox. Statistical Method of is one method that can be used for monitoring the gearbox. The statistical method commonly used is the method of the RMS (Root Mean Square). RMS is value of the normalized signal to the second statistical moment. Under this method, the damage can be seen with a large RMS value. When the RMS value is greater so the defective condition of the gear is greater too (Metwaley et al, 2011).

Based on this background, it is necessary to research in improving predictive maintenance techniques on gear damage detection using vibration signal.

1.2 Problem Formulation

From the description above explanation, it can be the formulation of the problem, which is how to detect the presence of gears damage based on the characteristics of the vibration signal.

1.3 Problem Limitations

To determine the direction of the research, it is given limitations as follows:

a. It is assumed the damage occurs only in the gear, the other component is considered in good condition.

b. The gears which damaged are the gear drive and there are only 4 kind of damage.

c. This test use electrical motor as the engine to rotate the shaft in 3 kind of rotational speed (300 RPM, 750 RPM, and 2250 RPM).

d. The data displayed in the graphs of time domain and frequency domain.

1.4 The Purpose of the Research

The purposes of the research:

a. Detect the damage that occurs in gear as the engine components.

b. Find out the characteristics of the vibration signal in the form of time domain and frequency domain, which is generated by the gear with different damage types.

c. Find out the type of gear damage that occurs.

1.5 Benefit of the Research

The benefit of this research is in order predictive maintenance for monitoring the condition of the gearbox, so the condition can be monitored

without having to do the demolition, and if there is damage then it can be known directly and also to prevent further damage on engine components.

1.6 Writing Systematics

Systematics of writing consists of:

a. **Chapter I Introduction** contains research background, objectives and benefits of the research, the formulation of the problem, problem limitation, and writing systematic.

b. **Chapter II Basic Theory**contains a literature review related to gear, the type of gear damage, sense of vibration signals, Fourier approach, concerning a periodic wave, frequency domain and frequency domain analysis and explanation of the accelerometer signal.

c. **Chapter III Research Method**, containing workpiece under study, machines, and the measuring instrument used in the research, place of the research and implementation of the research consists of the preparation work from the simulation of transmission gear, variation gear damage, and the processing of vibration signals.

d. **Chapter IV Data and Analysis**, contains data of vibration signals obtained from the Vibrationmeter, this data is then processed

using PC in order to get a graphic display on the frequency domain. Damage analysis is based on the graphic display.

e. **Chapter V Conclusion and Suggestion**. Contains the research conclusions and suggestions related to this research and to the next research.