CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Bearing is a common component in machinery. The basic purpose of a machine bearing is to provide a near frictionless environment to support and guide a rotating shaft. There are many types of bearing available nowadays. General bearing styles are utilized at this time which is the rolling element bearing. For lower horsepower and lighter loaded machines, the rolling element bearing is a popular choice.

There are many types of rolling elements bearing, such as ball bearings, roller bearings, needle bearings, tapered roller bearing, spherical roller bearings and thrust bearings. In industrial application, rolling element bearings are considered as critical mechanical components and a defect in such a bearing may cause malfunction and may even lead to catastrophic failure of the machinery. Therefore, they have received great attention in the field of condition monitoring.

Different methods are used for detection and diagnosis such as vibration, acoustic and temperature measurements. Among these, vibration and acoustic measurements are the most widely used (Tandon and Choudry 1999). Several techniques have been applied to measure the vibration and acoustic responses from defective bearings, for example, vibration measurements in time and frequency domains, the shock pulse method, sound pressure and sound intensity techniques and the acoustic emission method. A lot of research have been done and published, on the detection and diagnosis of bearing defects by vibration and acoustic methods.

(Tandon and Choudry 1999) presented a detailed review of the different vibration and acoustic methods, such as vibration measurements in time and frequency domains, sound measurements, and the acoustic emission method. (White 1984) describes a method for simulating the machinery faults signals which are impulsive in nature and analyzed them. The basic understandings of the rolling element bearing's vibration monitoring fault detection are proposed by (Reimchi, Sudmersen et al. 2003). (McFadden and Smith 1984) describe the basic understandings of the rolling element bearing vibration for a defected case and a well-established model that considers the load distribution around the circumference of the rolling element bearing and the impulsive response of the bearing structure.

(Kiral and Karagulle 2002) provide a detailed review about simulation and analysis of vibration signals generated by rolling element bearing with defects. The vibration measurement methods can be classified as in time and in frequency domains. A brief review on the monitoring techniques in time and in frequency domain can be found in research by (Mathew and Alfredson 1984). Recently time-frequency domain analysis has become more popular. The Short Time Fourier Transform method is used by researchers(Yang, Mathew et al. 2002; Ihn and Chang 2004; Cristalli, Paone et al. 2006; Kim, Lee et al. 2007) in condition monitoring of rolling element bearings due to its superiority in time and frequency resolution while processing the vibration signals.

1.2 PROBLEM STATEMENT

Today's industry uses increasingly complex machines, some with extremely demanding performance criteria. Bearings are a one of the common component in machinery. In industrial applications, bearings are considered as critical mechanical components and a defect in such a bearing causes malfunction to machine. Failed machines can lead to economic loss and safety problems due to unexpected and sudden production stoppages. These machines need to be monitored during the production process. However, conditioning monitoring requires effective fault diagnosis. Before this, people detect the defective bearing using a conventional method such as, listening to the sound with their ears. They can detect failure when they hear an abnormal sound

from rotating machine. But this method is not practical, and after that, people used an off-line monitoring to detect the failure. Off-line monitoring is defined as monitoring when the machine is not producing or monitoring via a workpiece which is off the machine. The former is not an effective use of the machine and the research activity in this area at this time is the measurement of the workpiece. Thus, there is a time lag of one workpiece before faults are noted. This method can affect the productivity of the machine, and can decrease the total production. People nowadays start using an on-line monitoring to detect failure at the machine. On-line monitoring is a monitoring of parameters while the machine is producing. On-line monitoring has the advantage of more direct diagnosis of machine faults and a much quicker response to fault development, and especially the catastrophic failure. On-line monitoring lends itself to automation.

1.3 OBJECTIVE

The objectives of this study are:

i. To acquire vibration and acoustic signal release from rotating machine.
ii. To analyze data acquire from testing fault detection in order to differentiate between the defective bearings and good bearings using time frequency localization method.