CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Acoustic Emission refers to the generation of transient elastic waves produced by a sudden redistribution of stress in a material. When a structure is subjected to an external stimulus, localized sources trigger the release of energy, in the form of stress waves, which propagate to the surface and are recorded by sensors. With the right equipment and setup, motions on the order of picometers (10 -12 m) can be identified. Sources of acoustic emission vary from natural events like earthquakes and rock bursts to the initiation and growth of cracks, slip and dislocation movements, melting, twinning, and phase transformations in metals. In composites, matrix cracking and fiber breakage and debonding contribute to acoustic emissions. Acoustic emission have also been measured and recorded in polymers, wood, and concrete, among other materials (Reddy, 2007).

Detection and analysis of acoustic emission signals can supply valuable information regarding the origin and importance of a discontinuity in a material. Because of the versatility of Acoustic Emission Testing (AET), it has many industrial applications and is used extensively as a research tool. Acoustic emission is unlike most other Non-Destructive Testing (NDT) techniques in two regards. The first difference pertains to the origin of the signal. Instead of supplying energy to the object under examination, acoustic emission testing simply listens for the energy released by the object. Acoustic emission tests are often performed on structures while in operation, as this provides adequate loading for propagating defects and triggering acoustic emissions. The second difference is that acoustic emission testing

deals with dynamic processes, or changes, in a material. This is particularly meaningful because only active features are highlighted. The ability to discern between developing and stagnant defects is significant. However, it is possible for flaws to go undetected altogether if the loading is not high enough to cause an acoustic event. Furthermore, acoustic emission testing usually provides an immediate indication relating to the strength or risk of failure of a component (Reddy, 2007).

For the material, mild steel was chosen because mild steel is the most common form of steel as its price is relatively low while it provides material properties that are acceptable for many applications. Mild steel has low carbon content (up to 0.3%) and is therefore neither extremely brittle nor ductile. It becomes malleable when heated, and so can be forged. It is also often used where large amounts of steel need to be formed, for example as structural steel. Therefore, this work was carried out in order to study the welding fault detection on the welding joint of mild steel. It is to detect any welding fault during the welding process from the characteristic of the acoustic emission signal acquired

1.2 OBJECTIVE OF THE PROJECT

The objectives of this project are:

i. To study welding fault detection on welding joints using the acoustic emission technique.
ii. To classify and analyse the acoustic emission signal between joint with defect and no defect using the Acoustic emission Technique.

1.3 SCOPE OF PROJECT

This focus is based on the following aspect:

i. Welding of Mild Steel using the MIG Welding.
ii. Acquire Acoustic emission signal near the welding joint using the Acoustic emission acquisition system.
iii. Analyse the signal acquire using the Acoustic emission data acquisition system and Matlab.

1.4 PROBLEM STATEMENT

There are several types of non-destructive testing. However, no single NDT method will work for all flaw detection or measurement applications. Each of the methods has advantages and disadvantages when compared to other methods. For example there are Penetrant Testing and Eddy Current Testing. For Penetrant Testing, it is only detect surface breaking defect and requires a relatively smooth and nonporous surface. For Eddy Current Testing, only conductive materials can be inspected and the depth of penetration is inspection is limited.

Some of mild steel based item that needed to be created using welding technique may have several defect caused by the welding process when combining two joint of the item. This defect may decrease the efficiency of the item or may have the possibility of breaking down a machine if the item is use in the machine. Hence, this project is focus on finding the welding fault on the welding joint of mild steel. The equipment that is used to catch the signal is Acoustic emission devices. The signal that has been interpreted will be analyse using Matlab software.