CHAPTER 1

INTRODUCTION

1.1 PROJECT BACKGROUND

Acoustic emission (AE) has been described as a transient elastic wave generated by the rapid release of energy from a localized source or source within a material. (ASTM E1316 2009). The transient elastic waves will take a form of displacement vibration in the material which can be detected by displacement gauges or accelerator gauges. These gauges are called AE transducers. AE is related to the internal changes of material structure which are caused by external physical one action, such as load and temperature.

Since the acoustic emission (AE) technique detects stress waves generated during the transient release of stored strain energy in materials subjected to external mechanical loads, material state and fracture mechanisms may be evaluated in a non-destructive manner by analyzing AE data. Thus, the AE measurement method has been applied to tasks in many engineering fields, such as the real-time evaluation of safety and reliability of civil engineering and architectural structures (Yuyama et. al 1994), mechanical and aerospace structures (Cherfaouie et. al 1998) manufacturing processes (Choi et al. 1992) as well as advanced materials (Hoshino, 1992)

For mechanical testing, the applied load may be controlled by the examiner or may already exist as part of the process. In either case the applied load is measured along with the AE activity. Consequently the emission activity must be evaluated in relation to the applied load. AE reveals the internal fracturing and deforming processes within. AE will start when the load on specimens exceeds some level, and the intensity

of AE will increase with increasing loads. For this study, the Kaiser Effect within specimens subjected to a tensile and torsion load have been evaluated by the AE features during the whole loading period.

The Kaizer effect is an AE phenomenon briefly defined as the absence of detectable acoustic emissions until the previously applied stress level is exceeded. This effect is based on the experimental discovery by Kaizer in Germany during 1945-1950, that metal materials had the capability to remember the previous maximum stress level.

1.2 PROBLEM STATEMENT

Kaizer first noted high frequency bursts of energy or acoustic emission, during tensile tests in metals (Kaiser, 1950). By uniaxially loading a rock sample until acoustic emission is detected, it can determine the maximum stress. However, the Kaizer Effect is easy to demonstrate and in this study we have attempted to provide corroborative evidence that the stresses we have measured are indeed the principal stresses in the reservoir.

In the previous demonstration and in the remainder of this work we have utilized acoustic emission onset directly as the indicator of maximum stress. Some researchers apply Kaizer Effect in acoustic emission. From their research, some method of acoustic emission test is done from several mechanical testing such as fatigue and tensile testing.

In this thesis, new types of mechanical testing have been chosen. Torsion test have been chosen to apply Kaizer Effect in acoustic emission using aluminum and mild steel material. The tensile test also done for this experiment and the analysis of the result will do with this two mechanical testing.

1.3 OBJECTIVES

The main objectives for this research are:

i. To study about acoustic emission (AE) event and analyze the signal parameter during load-unload method to the specimen from mechanical testing under Kaizer Effect.

ii. To compare the specimen result using acoustic emission testing with different types of mechanical testing.

1.4 HYPOTHESES

In this research, some of hypotheses have done such as:

i. The applying load for Kaizer Effect in acoustics emission test is same value, so the prediction of the result for each experiment of torsion test will be same with the tensile test.

ii. From Kaizer Effect in acoustics emission, the curve for each experiment of loading versus time shows the different value. The curve depends to the properties of material and will be show that the maximum load for mild steel is greater than the maximum load for aluminum.

iii. From the Kaizer result, more acoustic event is observed when the repeat increasing load or stress is applied in the experiment. However, there has no acoustic emission when the load for cycle two is not exceeding than the peak of cycle one.