CHAPTER 1

INTRODUCTION

1.1 Introduction

Crack initiation and propagation behavior has been evaluated to prevent an early failure of machine equipment. Delaying the crack initiation and propagation is important for the maintenance of machine elements as well as for the detection of crack initiation. Various methods for delaying crack initiation and propagation have been investigated. The stop-drilling technique is one of the methods for arresting further crack growth from cracks. The stop drilling technique involves drilling small circular hole near the crack tip. The main idea of the method is to reduce stress concentration at the edges of stop-drilled holes. In this study, the effects of drilling holes in the vicinity of crack tips on crack growth are to be determined.

1.2 Problem Statement

Many failures in engineering applications or machine components have been caused by a crack initiated from points at which stress was concentrated. As the stress concentration level is higher than a critical value, continuous crack-growth results in failure in the machine components

1.3 Objective

Primary objective of this project is to investigate the delay of crack by using stop drilled hole on the mild steel plate. In order to support the main objective, the other objectives are identified as follows:

I. To investigate the effectiveness of stop drill holes in order to delay the crack initiation.

II. To simulate the testing by using Finite Element Analysis (FEA).

1.4 Project Scope

The project has two level of study about the delay of crack by using stop drilled hole technique. The first level of study will be the determination of maximum applied load and the time taken for the plate to fracture using a common tensile test.

The second level will be modeling and analysis of the test by using Finite Element Method (FEM). The model is validated by comparing the results from FEM with the results obtained from the tensile test.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

As a part of the project, the analysis of literature was done as it uses to have a further understanding the project. The materials that used for the literature review were from journals, books, and from the internet web pages. The review was to find out the relevance of the project and it must have a significant relation to the project.

2.2 Crack

The definition of crack initiation depends on the length scale being considered. Basically, crack initiation can be defined as the local overcoming of interatomic cohesive forces in combination with the formation of new surfaces (Ulrich Krupp, 2007). Once a crack is present in a material, it will tend to grow under the influence of cyclic loading. The crack may be initiated by pre-existing from manufacture, or may be caused by an impact, or similar event. The crack will grow to a critical length then fracture of the component will occur. The crack repair lies in retarding or arresting the crack propagation, which can be achieved by reducing crack-tip stress intensity, introducing residual compressive stresses, and reducing crack-tip stress concentrations.