# 1. PRELIMINARY

1.1. Background`

Engineering structures designed by obeying some of the limitations to avoid the problem. To obtain this limitation, engineers usually analyze the result of the simulation or experiment. Including the analyze of fatigue of the structure caused by continue loading. Then, the data of maximum loading and the cycle of operation can be obtained. With this result the value of the structure's lifetime while the continued loading been given can be known. The engineer also put the safety factor of the calculation. But, the fatigue force can initiate the initial crack on the structure [1]. This initial crack may lead the structure to fail.

Crack can appears in many positions of the structure. For example on the edge of the hole of a thin plate. Holes are the most common stress concentration failure in metallic structure [2], where the stress may extremely increase when receiving load, often to appear the initial crack on micro-scale. Generally, the failure occurs when the crack is unable to withstand the stress during its operation.
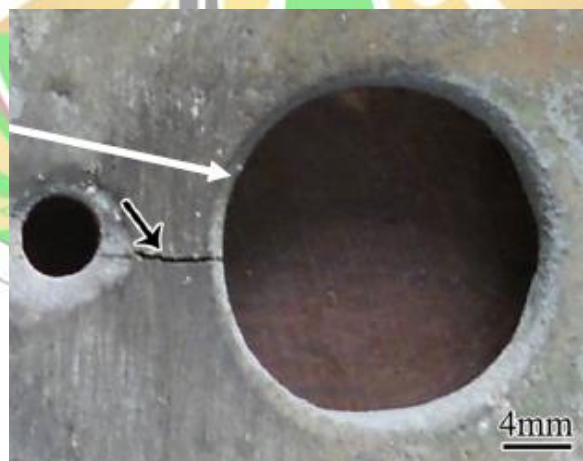
Figure 1.1 Hole edge cracks [3]

Some of the common methods have been done by some of the researchers to reduce crack propagation, Macabe and colleagues used stop holes and insert a pin to them [4]. Peng simulated the effect of stiffener on plate with crack [5]. While Dahlan and colleagues have done the experiment of stiffener on reducing crack propagation[6].

In this research, the stiffener is used to reduce the crack propagation at the edge of the hole on a thin plate. The stiffener is hopefully can increase the stiffness of the structure of the plate near the initial crack. This research is done to analyze the effect of the stiffener installation to the propagation of the crack on the edge of the plate's hole who received uniaxial loading, by considering the stress, before and after the stiffeners have been installed.

1.2. Problem Formulation

Hole in a thin plate, often to appear the initial crack on micro-scale, then become bigger or extend, by receiving continues loading. Because of that, this research is conducted to find out the decreasing crack stresses on the edge of the plate's hole by using stiffeners method.

1.3. Objectives

By the above background, this research is held to:

1. Discovered the effect of the stiffener method on reducing stresses at the crack tip.
2. Obtained the optimum position of stiffener on reducing stresses at the crack tip.
3. Discovered the most effective type of contact of stiffeners on reducing stresses at the crack tip

1.4. Outcome

Results of this research can find the most effective type of contact of stiffeners on reducing stresses at the crack tip.

1.5. Problem Scopes

The problem limitations in this research are:

1. The material of the model is an aluminum alloy with its properties such as ductile, isotropic, and homogeneous.
2. The given load is only a mechanical load.
3. The crack behavior only analyze on linear elastic fracture mechanic region which plastic deformation assumted small.

1.6. Report Outlines

This research consists of five chapters, the first chapter contains the introduction that describes the background, problem formulation, objectives, outcomes, problem scopes, and report outlines of this research. Then in the second chapter explains the literature review, which contains basic theory used in this research. The third chapter describes the research methodology, the summary of research stages in the form of flow charts, and simulation design. Furthermore, in the fourth chapter will be explained about the result of this research. In the fifth chapter of this research the conclusion is served.