CHAPTER 1

INTRODUCTION

1.1 Background of Project

Fatigue tensile machine is subjected as testing specimen to determine range of alternating stress on fatigue limits. Fatigue tensile occurred on specimen where it were pulled repeatedly to form cyclic loading stress. The machine need to be operated as repeatedly process to gain a fatigue occurrence. The structural of specimen cracked or failed as a result when stress was applied repeatedly. The material failed if the force or loaded reach limit of fatigue cycle. Moreover, the cyclic loading stress was formed when the value of amplitude are constant alternating stress level.

Fatigue can be defined as tiredness or weakness material which load or stress is applied on material. It can be analyzed where structural damage occurs on material. Crack will be formed on surface when fatigue occurs on material. There are three stages on fatigue failure which are crack initiation, crack growth, and rapid fracture. Crack initiations occur at the early of fatigue which can form scratches on surface and crack growth will occur when crack start to grow on critical size. Based on rapid fracture, it occurs while crack is spread with rapidly critical. Tensile also will be defined as materials that were forced by pulling until it breaks at the point. At same time, force also can be measured until the materials break point. There are three typical of tensile strength which are yield strength, ultimate strength, and breaking strength. Yield strength is the point that material begin as the plastically deformation. When no stress applied on material, it will be elastically and

back to the original shape. Ultimate strength is the maximum stress of material that was pulled before it breaking. Breaking strength is the point of rupture and certain of the material can break or deform when applied load on it.

According to this project, these machines are designed to enable students learning about the process of fatigue tensile process. Thus, this machine is used for the convenience of students. The prices of the existing machines on the market now are too expensive and not all universitieshas the machine. The purpose of this project is to develop design with low cost and easy for student user for their project or learning.

The design need to be analyzed with fatigue tensile process to get the stress cyclic graph. There are three basics that necessary causes fatigue which are maximum tensile stress of sufficiently high value, large enough variation when applied stress and sufficiently large number of the applied stress. Moreover, there are many types alternative of stress which are fully reversed stress cycle, maximum and minimum stress are equal and it is commonly used in testing [1]. Fatigue testing also not only tests for specimen standard, it is also possible to produce such a small demonstration on the fatigue strength of the screw, wire, hangers, ping pong ball pen etc. When the design is being done, most universities would be affordable because of its low cost and easy to use.

Furthermore, these projects were designed first using UGNX 6.0 software according to the specification of design part. After that, these designs were analyzed or simulated using Finite Element analysis software. The analytical analysis method is about theoretical calculation based on the formula that relate to the experiment. The purpose of this project is to study reliability of the design. This is to ensure the design was able to analyze and sustain fatigue loading.

1.2 Problem Statement

There are few fatigue test machines in the market but the prices are relatively expensive. It is good to have basic fatigue test machine with low cost but able to produce reliable results. Usually only one fatigue machine available in the laboratory. Lab instructor normally demonstrates the experiment with minimum student involvement. To form a cyclic loading graph also hard if specimen is applied on the machine test. Thus, it is important to be able to predict the life of component subjected to variable amplitude loading using data generated in constant amplitude laboratory tests[1].

1.3 Objectives

1. To design a mini fatigue tensile test machine with suitable specifications using UGNX software.
2. To analyze part of mini fatigue tensile machine using Finite Element Analysis (FEA) software.
3. To simulate mini fatigue tensile machine using CATIA software.

1.4 Scope of Project

1. To design and simulate a mini fatigue tensile test machine that can be used for UniMAP students in lab session for subject solid mechanic.
2. Design the machine using CAD software (CATIA) or UGNX.
3. Analyze the part of design using Finite Element Analysis.
4. Evaluate the suitable material and component to use.
5. The design of the machine concentrated on gripper design, specimen geometry and type of motor.

1.5 Project Planning

Project planning can be defined as main part of project to manage the process of project proceeds. The process of project will be referring by schedules based on Gantt chart to plan the report progress.

1.6 Gantt Chart

Gantt chart showed the project progress by the schedules that were organized. By using this schedule all activities were monitored and easy to follow the progress project by week. It showed the progress project from the beginning until the end of the project.

1.7 Significance of Project

The project involved with the design of fatigue test machine. The design considers with low cost and it is easy for the students to use in producing basic fatigue data. This design helps user especiallystudents in the university because they are able to fabricate and use the machine for their project. This project also helps to analyze fatigue tensile test with the small material testing and therefore easy for the students to make an analysis.

1.8 Summary of Chapter

An overview of this chapter, it is more about the analysis of the fatigue tensile process. The cyclic was deformed when the value of amplitude are constant alternating stress level. Fatigue occurred when the machine was forcedly used with repeatedly on the

material testing to get a complete stress cycle. Design and specification of the project also need more prefer based on fatigue tensile process. The scope of project were identified to achieve the desired result. Besides that, the planning of these projects had been followed by the Gantt chart as usual. This chapter is about introduction and guideline of project based on design mini fatigue tensile machine.

Project title: Design of a Mini Fatigue Tensile Machine

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Table 1.1: Gantt Chart

No	Activities	2015																2016													
		September				October				November				December				February				March				April				May			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1	**Project background**																																
	Introduction																																
	Objective and scope																																
	Project Planning																																
2	**Literature Review**																																
	Design machine																																
	Sample of Equations																																
	Finding journals																																
3	**Methodology**																																
	Flow chart																																
	Design mini fatigue tensile machine																																
4	**Finite Element Analysis**																																
	Run a simulation																																
	Test a result																																
5	**Discussion**																																
6	**Full Report Writing**																																