CHAPTER 1

INTRODUCTION

1.1 PROJECT BACKGROUND

Thermal fatigue is caused by repeated process heating and cooling material can give a cyclic stress because of the differential thermal expansion (Srivastava et al., 2004). This happens when the small damage with continued cycling is possible until it develops into a big damage such as cracks that may lead to failure. This crack will affect the surface of die due to the heat check on it. This also will affect the tool life because of corrosion and erosion on the die. This think is not good for material because it will cause the material easier to damage. Based on my investigation, to know the characteristic of thermal fatigue, thermal fatigue machine testing is required to measure the thermal fatigue properties of it. There are so many models of the machine can use to test it and need to choose a machine with suitable automation system because of different mechanism they use. Usually, for the simpler and lighter machine like the pneumatic system, it is suitable to use in operating machine for thermal fatigue test.

The pneumatic system is usually applied to an actuator or motor through a valve (Goshorn, 13 Nov. 1984.). This actuator only will move when to have some pressure is applied to it and will move with high speed. Pneumatic system also suitable to use for this machine regarding simpler and low in cost compare to the hydraulic system but are usually not considered suitable for use in machine control due to the compressibility and cushioning effect of air as a driving medium. However, to control all operating of this machine in it
cycle, it must be equipped with logic process controllers for the program all controlling the operating sequence of the machine for more efficiently in operates (Goshorn, 13 Nov. 1984.).

Programmable Logic Controller has been used in many industries today such as for industrial process in manufacturing to run the machine because it is used automation system. This is because it has a single controller which can easily run many machines at one time. Programmable controller will control all operating the machine using the sequential design

1.2 PROBLEM STATEMENT

Automation system was used widely in manufacturing operation especially for control a machine. Mostly it used application area of programmable logic controllers (PLC) are to control circuit for hydraulic or pneumatic system. PLC is a device provide with special input output units suitable to direct usage in industrial automation systems. It is designed for use in an industrial environment, which uses a programmable memory for the integral storage of user-oriented instructions for implementing specific functions such as logic, sequencing, timing, counting, and arithmetic to control through digital or analog inputs and outputs, various types of machines or processes (Bolton, Newnes, 2015.). In order to control this system, it is necessary to develop a controllable motion for pneumatic and furnace to control the process.

In thermal fatigue testing machine, the time required to perform one complete testing is depend on the performance of the machine and pneumatic control. By using a better controller in a system, it will increase the overall performance of the machine. Pneumatic and thermal control system will be evaluated for best response of the process
1.3 OBJECTIVE

i. To design thermal controller and pneumatic system for thermal fatigue machine

ii. To fabricate and evaluate the performance of the thermal controller and pneumatic

1.4 PROJECT SCOPE

i. Identify the process flow and mechanism of thermal fatigue machine

ii. Design pneumatic system and develop the Programmable Logic Controller (PLC) program to control the machine process flow

iii. Select suitable hardware and electric part to be installed at controller

iv. Program the PLC controller according to the system requirement

v. Design electrical circuit for temperature controller and PLC

vi. Fabricate the new controller for machine