CHAPTER 1

INTRODUCTION

1.1 PROJECT BACKGROUND

Laser micromachining of silicon material for Micro Electro Mechanical System (MEMS) component was analyzed to decrease the defection of material. Laser machining also have problems in thermally induced cracks and laser debris, for sure need specific research and development. It has been an emerging technology in processing of silicon material for MEMS. The processing options of silicon material for development of MEMS are still relatively limited. In other side, MEMS fabrication has increasing demands for new requirement in production technology. In terms of high reproducibility and positioning with low production cost, the packaging and assembly were required high accuracy. In parts of forming metal sheets have been used long pulse and continuous lasers for macroscopic mechanical applications. Even thought, for MEMS manufacturing, the applicability of various laser types is limited by long relaxation time of the thermal fields responsible for forming phenomenon. For example, laser thermal forming, as usual is laser forming that is a flexible rapid prototyping and low volume manufacturing process. It has many advantages in technological compared to the conventional forming technologies such as forming of thick plates, design flexibility, possibility of rapid prototyping and production of complex shapes, in directly this laser thermal can applied in thermal response of silicon after it were analyze in FEM.
Process application of laser machining in real world is very difficult to control and waste a large amount of heat. Important of virtual work is easily conducted without produce amount of waste and save an energy and money. From this project, virtual work can find out an errors occur when implement laser cutting process. In simulation, prospective to define and to visualize the machining zone is being able and easily to control a process by considering parameters involve. Simulation works also give exposure to user to find an accuracy data and most important is it save money, time and energy. Parameter to be control easily detected from simulation work.

In terms of thermal, it will consider about heat propagation and effect on material selected that is silicon. Response of heat affect will show the temperature distribute when laser micromachining has been perform. Investigation of material response to thermal applied goes through with ALGOR software. Thermal transient for heat transfer can analyze to simulate the virtual laser micromachining with different geometry.

1.2 PROBLEM STATEMENT

Laser micromachining has been proposed for silicon processing particularly in micro electro mechanical system, electronic and optical industries. However, there are a lot of uncertainties in laser machining of silicon due to being unable to visualize the machining zone and difficult to control the real process, which frequently leads to producing large amount of waste.

1.3 PROJECT OBJECTIVES

i. To develop a predictable model for virtual laser machining of silicon

ii. To simulate laser machining of silicon varying machining parameters

iii. To obtain a relationship between temperature distribution in silicon and process parameters
1.4 PROJECT SCOPES

i. The predictable model will be developed using ALGOR

ii. Machining parameters considered are pulse duration and laser power

iii. The model geometry will focus on 2D linear and circular geometries

iv. Material model will be isotropic phase change model

v. Simulation will be carried out in ALGOR package to obtain temperature distribution and machining parameters will be established in EXCEL

1.5 ORGANIZATION OF THESIS

This thesis consists of five chapters.

Chapter 1: Introduction of project

Chapter 2: Literature review

Chapter 3: Methodology

Chapter 4: Result and discussion

Chapter 5: Conclusion and recommendation