CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Incremental Sheet Forming (ISF) was first explored at the Institute for Manufacturing in 1990 by Colin Andrew, and then taken up in Japan during the 1990s (Allwood et al., 2005). Allwood also said that, many researcher or studies in ISF to date have been with one indenter only, and based around modified Computer Numerical Control (CNC) milling machines. A new incremental forming machine was commissioned in October 2004 at the Department’s Institute for Manufacturing, which is the first dedicated rig to be built outside Japan (Allwood et al., 2005).

Nowadays, have a many new incremental forming machine were develop by the company, university and other institution. Researchers of Faculty of Mechanical Engineering (FKM) from Universiti Malaysia Pahang (UMP) also develop new incremental forming machine controlled by personal computer – numerical control (PC-NC) in March 2008. The incremental forming process which runs without mould can be used to replace stamping applications which is very costly due to the mould application. The application of the machine is for low batch sheet metal manufacturing product. This research will produce a new concept of forming process which is cheaper, efficient and suitable for SMI/SME industry, which will benefit the manufacturing industry in our country.

As a part of graduation requirements, the final year degree students of Faculty of Mechanical Engineering from Universiti Malaysia Pahang (UMP) will have to submit the thesis as a final year project for duration of two semesters. These projects propose to
analysis and optimization machining parameter based on different type of material in incremental forming machine using ALGOR software (simulation).

1.2 OBJECTIVE OF THE STUDY

The objective that must be carried out by this study in order to get the analysis and optimization machining parameter of Incremental Forming (IF):

1.2.1 To study and understanding the concept and principle of Incremental Forming (IF).
1.2.2 To investigate the deformation mechanics under an optimization with different type of material.(stepdown)
1.2.3 To investigate the effect different type of material on Springback in ALGOR Simulation.

1.3 SCOPE

1.3.1 Predictable model will be developed using ALGOR software
1.3.2 This project need to operate the ALGOR software with five of material and different Nodal Prescribed Displacement $Z (\text{-ve}) = 0.5 \text{ mm}, 1.0 \text{ mm and 1.5 mm.}$ [Aluminum Alloy 5052-O, Titanium Ti-6Al-4V, Steel (ASTM - A572), Zinc and Stainless Steel (AISI 309)]
1.3.3 This project needs use same thickness of material is 0.5 mm.
1.3.4 During the analysis, data must be recorded and the analysis needs to be done on it.
1.3.5 By analyze and comparison of data, suitable parameter can be selected.
1.4 PROBLEM STATEMENT

1.4.1 Springback is a very important factor to influence the quality of sheet metal forming. Springback are main goal that need to be archive in order to get high accuracy, high productivity and cost-effective product in incremental sheet forming (ISF) process. However, as what world cannot deny that, practical is not as perfect as theory which due to large number of variable and the uncertain nature of the process, even highly skilled operator is difficult in archive optimal performance of machining. Springback of the workpiece is one of the main problems to achieve since this characteristic is close relation with accuracy.

1.4.2 ISF not have guideline to form sheet metal especially setting stepdown parameter for different type of material.