CHAPTER 1

INTRODUCTION

This chapter provides the general view on the subjects that are going to be studied. This chapter also contains problem statement, objective, and scope of study.

1.1 PROJECT BACKGROUND

Welding is a process of permanent joining between two or more pieces of metal materials. Nowadays, welding process has been widely used and plays an important process in many field of engineering's. According to Pradhan, 2012, the applications of process of welding technique have been used in manufacturing, automotive, shipping, and aerospace and etc. Welding process not only can joint similar materials, it also can joint dissimilar materials too. Some of the advantage of welding process are having the strong bond of joining, permanent joining method and provide the design flexibility (Raymonld et al, 2001)

Friction welding (FRW/FW) is a solid state (non-melting) joint process that produces coalescence of materials under compressive force contact of work pieces rotating or moving relative to one another to produce heat and plastically displacement material from the faying surfaces. FW process can combine between similar and dissimilar metal. It is recognized as the most successful among solid state welding methods, due to several advantages such as no filler metal requirement, not require flux or shielding gas, environmentally clean process, surfaces cleanliness is not as significant and very narrow heat-affected zones compared to other welding method (Kumar, 2010). Compared to the other welding, FW process has its own advantage

especially in welding the round bar type of work pieces. Nowadays, FW is widely used in the automotive, engine part and shipbuilding (Wiley, 2006).

1.2 PROBLEM STATEMENT

In FW process, the total surface area of the welding area part is welded compared the other welding process that only welds the side of the welded area. As we know, the conventional welding are widely used in Malaysia such as example the tungsten inert gas (TIG) welding or metal inert gas (MIG) welding. In the past experience in fabrication of chassis, groups of a university racing team in process of fabricate racing car chassis, encounter a major problem on the welding location of the solid round rod to the chassis with the engine mounting area occur failure or broke. After the inspection on the chassis, they notice the weld area between the rods bars and the chassis main body by using conventional welding process such as MIG only at the outer side surface only. However, FW is not widely used compared to other welding method in Malaysia. Moreover, the friction welding machine is too expensive, with the price in range of RM 15,000 – RM 25,000 per machine. So in this study, other alternative method is proposed using the concept friction welding machine applied to conventional machine in the lab such as milling machine. However, there still lack of information about the strength of the welded at the joint between two different diameters of work pieces for dissimilar welding by FW process. Therefore, this research will investigate the strength of joining between similar and dissimilar metal of FW with different speed rotational and will be analyzed it by using fatigue test.

1.3 OBJECTIVES

The objectives of this project include:

i) To fabricate the joining between similar and dissimilar metal by using friction welding.
ii) Investigate the strength of the joining on the work piece's metal under cyclic load.
iii) To find out the microstructural analysis at the interlayer surface of the welded area.

1.4 SCOPE OF WORK

The scope of work is about the limitation in this project, in other words this project only focuses on the specific materials and machine in order to achieve the objective for this project. These scopes of this project are:

i) Focusing on the friction welding as the joining between materials aluminium 1100 and mild steel by using milling machine.
ii) Fatigue test will be conducted to investigate the strength of the joining specimen welded with different rotational speed.
iii) Investigate the hardness, macrostructure and microstructure at the interlayer surface of the welded area by using Vickers Hardness machine, optical measurement machine and optical microstructure machine.