CHAPTER 1

INTRODUCTION

1.1 PROJECT BACKGROUND

Resistance spot welding is an important process in industry. In electric resistance spot welding, the overlapping work is positioned between the water-cooled electrodes, and then the heat is obtained by passing a large electrical current for a short period of time. Resistance spot welding is a widely used joining process for fabricating sheet metal assemblies such as automobiles, truck cabins, rail vehicles and home applications due to its advantages in welding efficiency and suitability for automation. For example, a modern auto-body assembly needs 7000 to 12,000 spots of welding according to the size of a car, so the spot welding is an important process in auto-body assembly. Each spot welding is not performed on the same condition because of the alignment of sheets and electrodes as well as the surface condition. Spot welders can also be completely automated, many of the industrial robot found on assembly lines are spot welders. A further place where spot welding is used is in the orthodontist's clinic, where small scale spot welding equipment is used when resizing metal "molar bands" used in orthodontics.

The weld is made by a combination of heat, pressure and time. As the name resistance welding implies it is the resistance of the material to be welded to current flow that causes a localized heating in the part. The pressure exerted by the tongs and electrode tips, through which the current flows, holds the parts to be welded in intimate contact before, during and after the welding current time cycle. Spot welding can used to weld various sheet metals. Range of the sheets are in the (0.5 – 3.0) mm. It process are uses two shaped copper alloy electrodes to concentrate
welding current and force between the materials to be welded. Then it is quickly heated to the melting point, and after the current is removed a nugget of welded metal is produced. The result is a small spot. The amount of heat released in the spot is determined by the amplitude and duration of the current. The current and duration are chosen to match the material, the sheet thickness and type of electrodes. Applying the current for too long can burn a hole right through the materials being welded. The behavior of resistance spot welding process is extremely important to the quality of the entire welding structure. The displacement of the electrodes is also considered as an important feature during the resistance spot welding process due to its performance in the control of the quality of welding. The resistance spot weld is unique because the actual weld nugget is formed internally with relation to the surface of the base metal. The gas tungsten-arc spot is made from one side only. The resistance spot weld is normally made with electrodes on each side of the workpiece. Resistance spot welds may be made with the workpiece in any position. Spot welding can be easily identified on many sheet metal goods, such as metal buckets. Aluminum alloys also can be spot welded. However, their much higher thermal conductivity and electrical conductivity mean that up to three times higher welding currents are needed. This requires larger, more powerful, and more expensive welding transformers. The strength of the spot welds in the vehicle structure determines the integrity of structural performance during vehicle operations. Most spot welds generally carry only shear forces, but the spot welds can experience a significant amount of the peel force, or force normal to the spot weld in certain loading conditions. The combination of stress states and geometric shapes of the spot welds lead to stress concentration that can result in fatigue crack initiation around the spot weld. The cracks degrade structural performance and increase noise and vibration of the vehicle structure. Therefore, understandings of the strength for the spot welds are very important in vehicle structure design. Some researchers had studied on the effects of geometric factors, such as nugget diameter, sheet thickness, specimen width, and base metal properties, on the fatigue behavior of the spot welds. Those studies showed that generally strength of spot welds depends on the loading conditions and geometric factors.
The determination of appropriate welding parameters for spot welding is a very complex issue. A small change of one parameter will affect all the other parameters. For that reason, a spot welding process needs the optimum process condition that can afford allowance in parametric values for good quality of welding. The strength of spot welded depends on these parameters. Small change of parameters will effect on strength.

1.2 PROBLEM STATEMENT

i. The increasing strength of spot welded depends on material used and spot welding parameters such as weld time and weld current.

ii. The heat generate must be suitable to the thickness of the specimen to prevent burn a hole right through the materials being welded.

1.3 OBJECTIVE

To investigate the strength of spot welding using variable thickness of sheet metal, weld time and weld current.

1.4 PROJECT SCOPE

This research is focus on strength of spot welding which is to investigate the best method to join the plate. This focus area is done based on the following aspect:

i. The material used in the project is mild steel with variable in thickness (1.2mm and 1.5mm) to produce spot welding with different strength.

ii. The equipment used in this project is spot welding machine with variable in current supply and time of welding.

iii. Tensile test machine used to determine the strength of the joining.

iv. Analyze the data