

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Arc welding have been used since 1940s, and it is the most common welding method that been used in industry. The way the arc welding function is by creating an electric arc between an electrode and the base material using a welding power supply. Arc welding capable of using either AC (alternative current) or DC (direct current) current supply depend on types of material to weld. The preferred welding processes for aluminum alloys are frequently gas metal arc welding (GMAW) and gas tungsten arc welding (GTAW) due to their comparatively easier applicability and better economy (Malarvizhi, 2010). Another important component in arc welding is its filler material which is electrode. Welding electrode can be divided into two kinds of electrode that is non-consumable and consumable electrode. Electrodes also produces vapors that serve as a shielding gas which highly effect the material in term of weld properties such as strength, toughness, and corrosion resistance. In this thesis, effect of different filler material (electrode) on the corrosion behavior of aluminum alloys welded joint was investigated. The author used TIG (Tungsten Inert Gas) welding as the procedure in welding process. TIG welding is a subtype of GTAW method. In the TIG welding process, the metal transfer from the electrode tip to the weld pool across the arc is either globular, spray type or short-circuiting type depending upon many factors, such as the magnitude of welding current, shielding gas, current density, electrode extension and electrode chemistry (Kumar, et al., 2010).

One of the most important components in any welding type is filler material. Filler material or electrodes are materials which is compulsory in welding process.

Generally, filler material that needed to use are depend on the base metal where welding will be performed. The electrode rods have to be compatible with the metal that intended to be weld. It is functioned to bond two surface of metal.

The problem for welded joint for most type of material is corrosion behavior that formed which affected the quality of the weldment. That is why corrosion is the main element in this study. This process happened when the material disintegrate into constituent atom due to chemical reaction with surrounding mostly oxidation of metal to oxygen. Corrosion rate for material depend on the chemical properties of its own. In this case intermetallics particles in the aluminum alloys played a major role in passivity breakdown and pit morphology, and the intensity of corrosion attack are influenced by chemical composition of the exposed alloys and much more factors (Hosni, et al., 2007).

Aluminum is a common material used in industry due to its properties such as low density which allowed the alloy to be reshaped easily. Aluminum also has higher corrosion resistance compared to most material. This makes aluminum have a huge possible application such as appliances, packaging, medicinal industry, or even construction of homes and furniture (Perryman, 2007). Due to the high in strength to weight ratio, aluminum are widely used in transportation such as cars and even airplane. Without aluminum which is light but strong, there are possibly no commercial air travel can be made at all. Good electrical conductivity properties also become a main reason why it is used in electrical field for example as power line.

1.2 PROBLEM STATEMENT

In this modernize era, every industry prioritize more on safety of workers and quality of products, which is why choosing the right material and method can give big effect on performance of product. Aluminum is one type of material that preferable by many due to the material properties. However, even how good aluminum is, one common problem is still become a threat and the problem is corrosion, and welded joint is much vulnerable to corrosion attack. In marine field, the exposure of any structure to sea water will increase the corrosion rate and automatically reduce the structure

performance. The failure of building structure and piping system in marine field will not only detrimental but also threaten the safety of workers. To overcome this problem, an approach should be taken so that the rate of corrosion can be reduced. Therefore investigation of filler material to the corrosion behavior of aluminum alloys weldment is significance as a way to reduce the corrosion rate.

1.3 OBJECTIVE

The objectives of this paper are as follows:

- i. To study the effect of filler material on corrosion behavior of AA6061 aluminum alloy welded joint.
- ii. To study the effect of current on corrosion behavior of AA6061 aluminum alloy welded joint.

1.4 SCOPE OF STUDY

Some of the main scopes of this study are:

- i. AA6061 aluminum alloys were used as study material.
- ii. Welding process of AA6061 aluminum alloys were done using TIG welding.
- iii. Different filler materials for welding specimen were used which is filler material type ER4043 and filler material type ER4047.
- iv. Specimens were welded using three different currents, 30 A, 35 A and 40 A.
- v. Optical Microscope and Scanning Electron Microscope (SEM) were used for microstructure analysis.
- vi. Potentiostat were used for electrochemical test.
- vii. 3.5% NaCl was used as the medium for corrosion test.