1. EFFECT OF FRICTION STIR WELDINGON THE TENSILE STRENGTH, HARDNESS AND MICROSTRUCTURE OF 5052-O AL-MG ALLOY

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ABSTRACT

In this research, the effect of different rotational speed, traverse speed and rotational direction of friction stir welding tool on the properties of 5052 Al-Mg alloy have been studied. Moreover, heat that generated during the friction stir welding process was measured as a temperature in degree centigrade. Milling machine with taper cylinder pin tool were used as a friction stir welding machine to weld Al-Mg alloy plates type AA5052-O with thickness of 14mm. Rotational tool speed of 400, 600, 700, 900, 1020, 1120, 1400, and 1500 rpm with constant welding speed of 10 mm/min were used, while welding speed of 10,14, 21, 45 and 66 mm/min with constant rotational speed of 1120 rpm were used too.

The welded samples were evaluated to determine their surface quality, hardness, tensile strength, bending strength and their microstructure. The defect of welded plates was investigated by using visual inspection, ultrasonic device, scanning electron microscope and optical microscope. The results showed that there is no significant effect on the microstructure of plates after welded because heat generated was less than the melting point of aluminum alloys and closed to recrystallization temperature of Al-alloy.

The majority of samples exhibited smooth surfaces with thinning flash surface formation when they welded at rotational speed more than 900 rpm and rough surface when they welded with rotational speed lower than 900 rpm. In addition, welded zone has slightly high hardness compare with base metal and closed to heat affected zone. However, some specimens have low hardness in welded zone because they have tunnel hole or cavities as a defect at the center of welded zone. On the other hand, hardness increased with increasing rotational speed up to 1120 rpm then decreased. However, it is decreased with increasing welding speed. Tensile test showed that the ultimate tensile strength was increased with increasing the rotational speed up to 1120 rpm, then decreased at rotational speed more than 1120 rpm. The highest tensile strength was obtained at 1120 rpm and 10 mm/min which equal to 110% of base metal. It has good bending resistance when it bended with angle of 180°.