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Effect Of Welding Parameters And Tool Shape On Properties Of Friction Stir Welding Ofaluminum Alloy Aa- 6061

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ABSTRACT: - FSW is simply the process of connecting solid state used in various ways to soft materials such as aluminum alloys as it avoids the many common problems of fusion welding. On the other hand, friction welding has many advantages when applying this function to aluminum alloy welding. FSW plays an important and vital role in welding quality such as welding speed, spin speed and performance engineering. The aim of this research is to study the quality of the aluminum alloy welding AA6061 and the effect of different welding speed with the speed of rotation and the profile of the needle on the alloy. The welding tool consists of a pin and a shoulder rotating by heating the piece to be soldered and moving the wet alloy around it, all of this with a frictional motion. In this study or study, the effect of the welding parameters and the shape of the tool (speed of welding and rotation speed) on the mechanical properties of the aluminum plates are examined experimentally. On the other hand, in the welding process, the heat has played a major mechanical role and the appearance of the joints that are connected to the welding coefficients.
Key-Words: - Friction stir welding; Tool shapes; Aluminium.

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I. INTRODUCTION

The definition of welder is called "FSW" because the solid state is joined by a new joining process. This welding was used because welding of aluminum alloy is difficult and high strength as well as alloy metal [1].In 1991, especially in the UK, FSW was invented for solid-state adhesion, and this invention was initially applied to aluminum alloys [2]. The friction between the surface of the panels to be soldered and the surface of the contact for a special tool resulting from this process heat is followed by adherent material and one of the components of this process shoulder and pin. The function of the shoulder in this process is to generate heat and contain the plastic material in the welding area, and on the other hand are mixing the components to be soldered pin and this leads to a link. This allows for the production of welds characterized by excellent mechanical properties and free of defects (3). These three distinct areas of the friction welding process (SZ) are an extrusion zone, a heat-affected zone (HAZ) and finally a mechanically induced heat zone(TMAZ) (4). The dimensions of the FSW, FSW, and FSW process parameters influence material flow behavior.

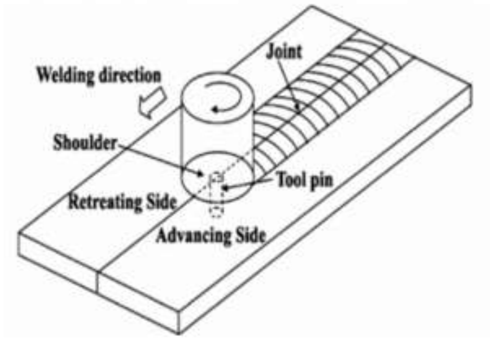

Fig. 1 Schematic of the friction stir welding process

Experimental work

Table 1 shows the chemical composition of aluminum alloysAA 6061.

Table1: Percentage of chemical composition AA 6061 alloy

Mg	Si	Fe	Cu	Zn	Ti	Mn	Cr	others	Al
0.8-1.2	0.4-0.8	0.7	0.15-0.4	0.25	0.15	0.15	0.04-0.35	0.05	98.7

The aluminum sheets to be welded were cut into rectangular pieces from 250 to 150 mm and then soldered by friction welding. A traditional vertical milling machine was used with a design stabilizer and was installed on a grinding machine table to prevent vibration. To fix the two cards. Four high carbon steel forms of probes are used as welding tool: circular, triangle, square, and hexagonal shape. Modern Heat Modern Developments in Industry and Industrial Manufacturing ISBN: 978 - The process of processing of tools is done before welding.

Fig. 2 conventional vertical milling machine

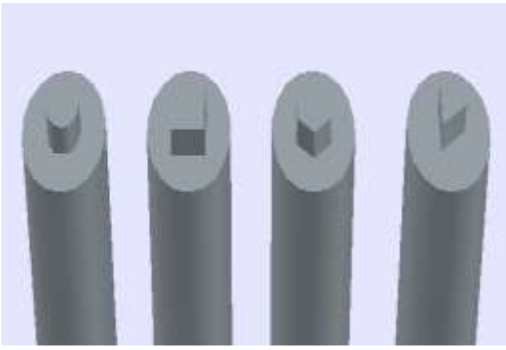

Fig. 3 Shapes of the probes

Five different speeds were used to rotate the welding process, which was 600, 800, 1000, 1200, 1800 rpm and five-speed welding, which were 0.5, 1, 1.5, 2 and 2.5 mm / s using only one pass through Welding process. The rest of the welds remained constant. A 0.5 kgf load with microhardnessvicerers was measured. A preset time period has been reserved for this force (standby time) to allow its resiliency flexibly for ten years. Each hardness value was made in several measurements. On the other hand, UTM was used for tensile testing for tensile strength and strength of welded plates. Tensile samples were extracted along the cross-section according to ASTM E8M-04 as shown in Figure 4.

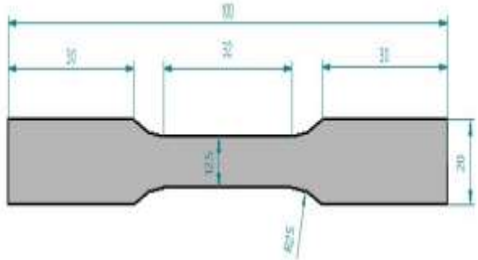

Fig. 4 Tensile test specimen as per ASTM Standards

II. RESULTS AND DISCUSSION

Graphs are plotted as expected results and are displayed in Figures 5-8. Figure (5) shows the appearance of the top surface of the welded friction plates at different speeds. Welding speed of 1 mm / s was kept at the same speed. On other side, the welding defect has a rotational speed of 1000 and 1200 / min form 5 (A and B). Figure 5 (C) shows the upper surface appearance of a spin speed of 1800 rpm. A large long-term disadvantage is the formation of cracks in the direction of transit near center of the SZ. When moving the tool forward cracks appear, and the layers are placed more than the grounding of the smelting exposed to the air on the advanced side.

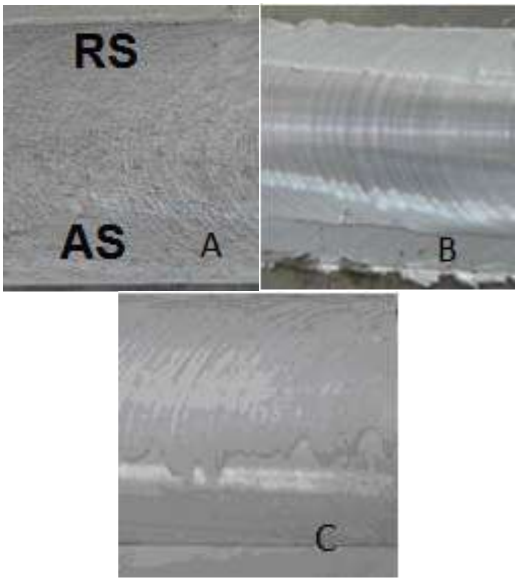

Fig.5 Appearance of top surface welded at (A) 1000 rpm, (B) 1200 rpm and (C) 1800 rpm

The rotation rate remained constant at 1000 rpm at the top surface of the weld friction at a speed 0.5, 1, and 1.5 mm / s Fig 5. High temperature and thermal input cause melting of liquid from aluminum alloys. The surface under the shoulder is unevenly covered by this fluid, and only stiffness occurs when exposed to air during the frontal movement of the shoulder, Figure 6 (a) and (b). The surface becomes smooth at a welding speed of 1.5 mm / s, Figure 6 (C).

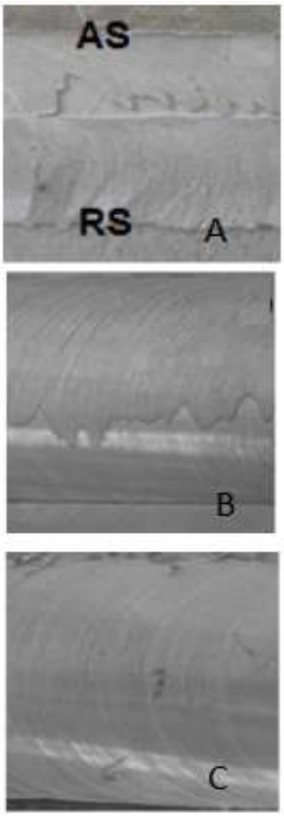

Fig.6 The shape of the upper surface at (A) 0.5 mm / s, (b) 1 mm / s and (c) 1.5 mm / s

The shape of the tool and the speed of rotation on the rigidity are affected in the area of formation. Figure 7. The stirring area has a marked decrease with increasing speed of rotation at constant welding speed. For the impact of the pin profile, it is possible to observe that the maximum hardness value achieved by a triangle pin profile.

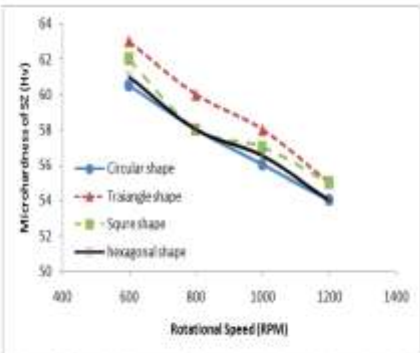

Fig. 7 Variation of surface microhardness of Friction Stir Weld plates with rotation speed for different toolshapes

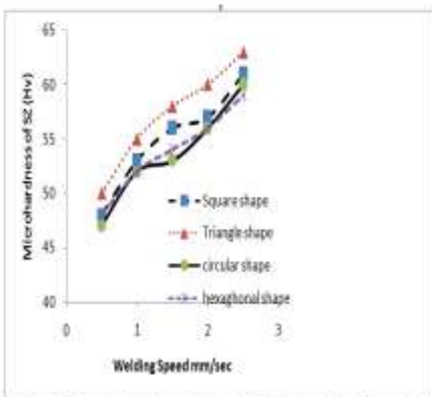

Fig. 8 Variation of surface microhardness of Friction Stir Weld plates with welding speed for different toolshapes

The shape of the tool and the speed of the weld are affected by partial hardness in the area of the formation. 8. Increasing welding speed affects the microhardness of the SZ.

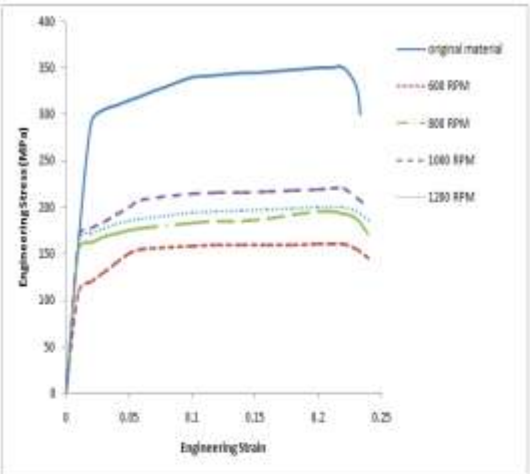

Fig. 9 Effect of rotational speed on Stress Strain Diagram

The speed of rotation of an FSW is affected by a gene. The properties of the basic materials were found to be more than the strength characteristics of all welded joints. The final strength of welded joints increased due to increased spin speed. The use of higher rotation speed leads to lower insertion of the material leading to deformation of the material especially in the SZ and TMAZ areas. This results in an insignificant decrease in the large tensile strength at an increase of welding speed of 1000 rpm.

III. CONCLUSION

In this study FSW was made of aluminum alloy AA6061. The effect of weld parameters and tool shape on the mechanical properties of welded aluminum plates was studied.

1. Effect of weld surface topology During the FSW process, suitable materials of welding

parameters, welding speed and rotational speed should be selected to achieve a free defect link.

2. The shape of the tool is greatly affected by a low rotational speed (600 rpm) on the mechanical properties of the joints.
3. The flow of metal welded under face of the palm is insufficient at a low rotational speed of 600 rpm with a welding speed higher than the speed of rotation. The weld speed is 2.5 mm / s, which leads to the drilling of the welding surface.
4. The phenomenon of increasing the tensile strength in the last process to the upper value then starts to fall occurs in the FSW.

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