FRICTION STIR WELDED 6061 ALUMINIUM ALLOY

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Abstract- Friction Stir welding (FSW) is a solid state attachment method used for welding of metals of same and different metals. This process of friction stir welding (FSW) is widely using for the reason it can produces sound welds and doesn't have common issues like solidification and liquefaction cracking connected to the fusion techniques. The Friction stir welding of Al 6061alloys had been commercialized and up to date interest is targeted on change of integrity with different metals. Thus on commercialize this method, analysis studies are required to characterize. particularly, FSW has impressed researchers to aim modification of integrity different metals like aluminum 6061 that differ in properties and sound welds with none or restricted inter metallic bonding of components has been done. In this paper we have to make a research on the current analysis state of FSW between aluminum 6061 with attention on the resulting welding and tensile strength, microstructure, elongation and the tools are used to produce the welds and also an insight into future analysis during this process of study the project of friction welding. By this process in our project we got an idea of going to maintain the rotational speed (rpm) 710 to 1400 and also by varying constant welding rpm (speed).

Keywords— friction stir welding tool, welding parameters, and Mechanical properties.

1 INTRODUCTION

Welding is the most economical and efficient way to join metals permanently. it is the only method of joining two or additional pieces of metal to make them act as one piece. Welding is significant to our economy. It is usually a fore said that fifty make the most the gross national product is related to welding in a way or the other. Welding ranks high among industrial {process} and involves additional sciences and variables than those involved in the other industrial process.

2 EXPERIMENTAL PROCEDURE

. The experimental study includes the butt joining of three of 3 pure aluminum plates. The welding method is carried out on a vertical shaping machine (Make HMT FM-2, 10hp, 3000rpm) as shown in Fig 2.1. Tool is hold in tool arbor as shown in Fig 2.2. Welding jigs and fixtures are designed to carry two plates of two hundred millimeter X mm millimeter X three millimeter thickness as shown in fig vi.5.1. Table 5.1 shows the combinations of the tool rotational speed (RPM), welding speed (mm/min) and tool geometry and diameter of the tool shoulder to the diameter of the tool pin (Ds/Dp). These combinations are chosen based on the literature survey and therefore the capability of the milling machine used for the experimental study. The schematic diagrams of tools utilized in this method.
In the present work, totally different FSW butt welds were obtained by variable varying the process parameters among the varying the R.P.M and therefore the best values are drawn supported the trend of the values. The weld joints are tested for enduringness and therefore the specimens are cross sectioned from the joints perpendicular to the fastening direction and are as per ASTM tips. The parameters tool movement speed, pin length and fastening speeds are varied by keeping the axial force constant

TABLE:1 CHEMICAL COMPOSITION OF H13 TOOL

ELEMENT	MIN % BY WEIGHT	MAX % BY WEIGHT
CARBON	0.37	0.42
PHOSPHORUS	0	0.025
SULPHUR	0	0.005
SILICON	0.80	1.20
CHROMIUM	5.00	5.50
VANADIUM	0.80	1.20
MOLYBDENUM	1.20	1.75

FIG : 2.1 SQUARE TOOL PROFILE

Fig: 2.2 welding plate on 710 rpm

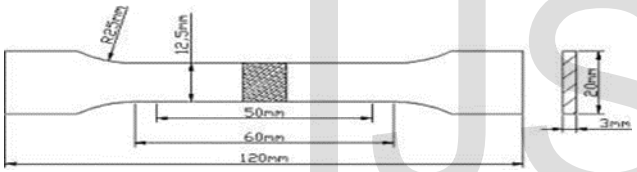

Fig 2.3 : schematic sketch of Tensile strength

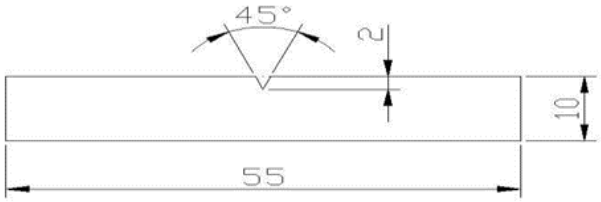

Fig:2.4 Fig 2.4: Schematic sketch of Impact Specimen

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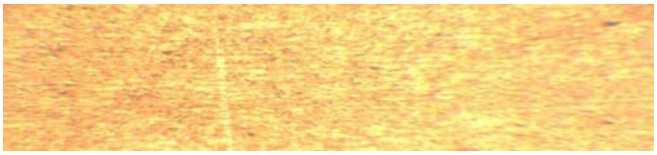
RESULTS AND DISCUSSION

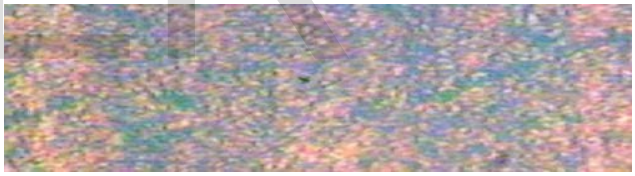
Micro structure study :

The figure below shows the optical photos of the stir zone of friction stir processed samples and additionally the bottom metal. it's discovered that the grain size has become finer inside the samples compared to the bottom metal in fig. friction stir welded samples showed recrystalized fine grains inside the stir zone and additionally the elongated grains in TMAZ.

Test Name: Microstructure
Type of Specimen: parent specimen
Metal for Testing: Aluminum



Test Name: Microstructure
Type of Specimen: Welded specimen
Metal for Testing: Aluminium



TABLE

ROTATIONAL SPEED/WELD SPEED	T.S(MPA)	Y.S(MPA)	EL%	IMPACT J	BRINELS HARDNESS
710/25	73.2	56.5	0.82	8	28
900/25	112.12	85.56	3.54	14	76.4
1400/25	120.12	94.85	3.08	9	72.4

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CONCLUSION

6. CONCLUSION

1. Aluminium is the best metal for friction stir welding method it offers higher results compared with completely different rpm and feed and as we tend to increase the rpm the welding output is getting better.

2. Tool profile used here is square of 5X5mm

3.Materials used for making tool is H13

4.At 1400 rpm tool rotates speed 25mm/min traverse speed with square profile resulted in good mechanical properties. Joint potency is good

.5.By observing all speeds we are able to say that aluminium is giving higher output

By conducting above experiment we are able to conclude that aluminium has the foremost effective properties for the method of friction stir welding. throughout this project we have a tendency to had undergone completely totally different rpm and feed for the aluminium and conducted several tests like micro structure test, tensile test, etc by observing all welding metals and process aluminium offers the higher output. aluminium during this method offers the higher output of withstanding fully totally different conditions. welding of aluminium in friction stir welding process successfully obtained for numerous welding speeds, rotation speeds

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