"Parametric Optimization of Friction Stir Welding Process parameter on Aluminium alloy 6061 Material using different tool profile"

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***Abstract*—This Article Considers Investigation Procedures for Friction Stir Welding in Aluminum Alloy, Via Control of hardware Profiles. Friction stir welding (FSW) is an imaginative strong state joining process concocted during the 1990s by The Welding Institute in UK. Considered as one of the main welding processes. FSW process empowers the upsides of strong state joining for creation of ceaseless straight welds, the most widely recognized type of weld joint setups. The critical part of the cycle is the uncommonly planned pivoting instrument which has two fundamental parts. The initial segment is the profiled pin (or test) stretching out along the pivot of the turning part. The second piece of the apparatus is the Shoulder. The shoulder is the functioning surface of the device, typical to the pivot of turn. The undertaking point is to weld two plates of Aluminum Alloy utilizing different apparatus profiles and different welding boundary like Rotation speed, Traverse speed, Axial burden and to improve the strength of joint.**

I. INTRODUCTION

Friction stir welding (FSW) is a moderately new joining process that has been utilized for high creation starting around 1996. Since dissolving doesn't happen and joining happens underneath the liquefying temperature of the material, an excellent weld is made. This trademark enormously decreases the evil impacts of high intensity input, including twisting, and disposes of hardening deserts. Friction stir welding additionally is profoundly proficient, creates no vapor, and uses no Tool profile, which makes this interaction harmless to the ecosystem. Friction stir welding (FSW) is a protected joining process, which was imagined at TWI in 1991. Friction stir welding (FSW) was created and licensed [in 1991 at TWI in Cambridge (UK) and has been created to a phase where it is applied in series creation. Presently 51 associations hold non-select licenses to utilize the cycle. A large portion of them are modern organizations, and several of them exploit the process in commercial production, e.g., in Scandinavia, USA, Japan and Australia. They have filed more than 285 patent applications related to FSW.

II. PROCEDURE FOR PAPER SUBMISSION

A. Review Stage

The apparatus calculation is the most compelling piece of FSW improvement. In research paper to A6061 amalgams sounds promising, having magnificent servitude. Chamber strung pin has delivered great subjugation between both compounds. By utilizing strung apparatus pin worm opening imperfection can be eliminated. We realize that FSW interaction, one of the most amazing welding processes for aluminum and aluminum composite material. At some point isn't possible welding process by combination welding around then we can utilize FSW. FSW generally utilized for slender plate material. Tool math is the most persuasive piece of FSW improvement. We realize that FSW cycle, one of the most amazing welding processes for aluminum and aluminum amalgam material. At some point isn't possible welding process by combination welding around then we can utilize FSW. FSW broadly use for slight plate material. Different high-level apparatus like laser welding, blast welding, and so forth are utilized yet not affordable. Accordingly, the best methods to be accommodated joining these two metals which likewise ought to be protected and affordable. With the progression of Industrialization and Globalization, the interest for the quality, zero deformity and time indicated welding is expanded. There are not very many explores directed on impact of the properties of on the welded joints different device profile. Different high-level hardware like Laser Welding, Explosion welding, and so forth are utilized yet not practical. Subsequently, the best procedures to be

accommodated joining these two metals which additionally ought to be protected and affordable.

B. Experimental Stage

A number of experimental were carried out to obtain the optimum mechanical properties by adjusting the rotational speed 400,600, and 800rpm and different tool profile and constant welding speed. Our welding speed is 25mm/min. Were also considering different shape of tool, and compare result of the process. We make three different tools with good mechanical properties and done the process with this tool. Our main goal to make best tool for FSW process and also use for any size of material. We check welding strength and porosity. After completed making of tool we started welding process with different condition, we are also use different shape of tool like circular, square, hexagonal as shown in fig 1.1.

Fig. 1.1 Tool profile

We also did welding process on different number of aluminium plates. During first condition welding process started, we are use circular tool and the rotational speed is 400 r.p.m and transfer speed is25mm/min. During second condition, square profile pin and rotational speed is 600 r.p.m and transfer speed is constant. During the both condition we can check welding property, mechanical property and other property. During third condition rotational speed is 800 r.p.m. and checkall property. Also, change transfer speed at same rotational speed and check all property. Welding process done with use different tool and 6061 Aluminium alloy material. Our researches are based on changing of tool, rotational speed, transfer speed and check its porosity, mechanical property And also check variation of total Result. We check defects.

III. RESULT AND ANALYSIS

In FSW Process The tool was damaged because of heat this problem can be eliminated by using oil

Number of experiment has been carried out with the help of Takuchi Method. In the Process of FSW, rotating and transfer speed of tool are 400rpm and 25mm/min respectively. During the process, rotating and transfer speed will remain constant, only tool will be changed. There are three tools (hexagonal, Square, Circular) used in this process.

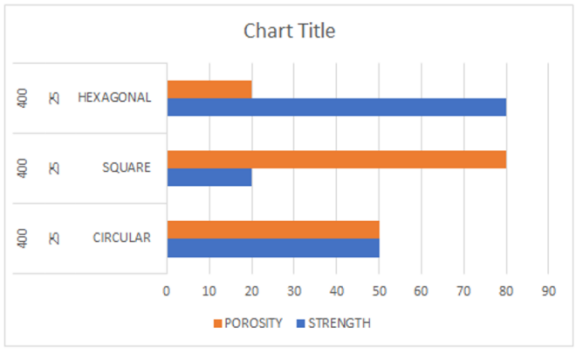

Fig. 1.2 Tools Vs Porosity & Strength Chart (Rotating speed: 400rpm)

After completion of process, following results are taken as shown in above fig.1.2. It is clearly shown from the fig.1.2, If tool shape is hexagonal, porosity is less and strength is high.so as, If tool shape is Square, porosity is high and strength is less.

If tool shape is circular, both porosity and strength are average.

Now, the porosity and strength are taken for rotating speed of 600 rpm.

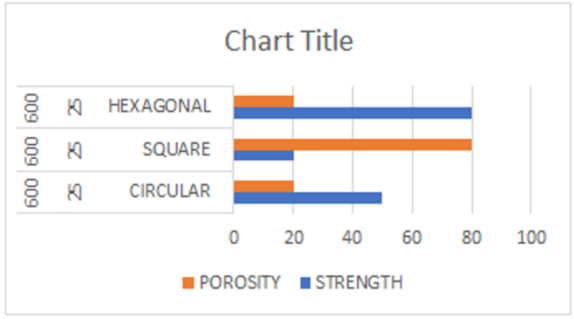

Fig. 1.3 Tools Vs Porosity & Strength Chart (Rotating speed: 600 rpm)

After completion of process, following results are taken as shown in above fig.1.3. It is clearly shown from the fig.1.3, If tool shape is hexagonal, porosity is less and strength is high.so as, If tool shape is Square, porosity is high and strength is less.

If tool shape is circular, both porosity is less and strength are average.

Now, the porosity and strength are taken for rotating speed of 800 rpm.

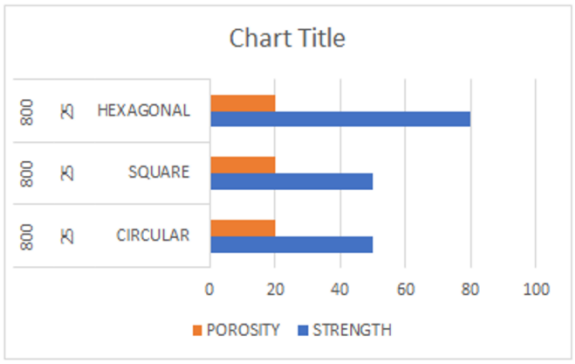

Fig. 1.4 Tools Vs Porosity & Strength Chart (Rotating speed: 800 rpm)

After completion of process, following results are taken as shown in above fig.1.4. It is clearly shown from the fig.1.4, If tool shape is hexagonal, porosity is less and strength is high. so as, If tool shape is Square, porosity is less and strength is average.
If tool shape is circular, both porosity is less and strength are average.

The following chart is between tool and tensile strength, hardness.

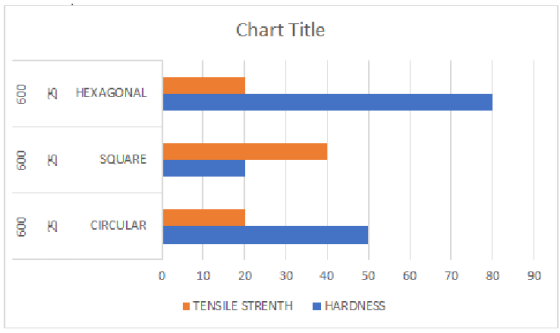

Fig. 1.5 Tools VsTensile strength, Hardness. Chart (Rotating speed: 600 rpm)

It is shown from above figure 1.5,if the tool and rotational speed are hexagonal and 600 rpm respectively then hardness of welding is high

The following chart is between tool and tensile strength, hardness.

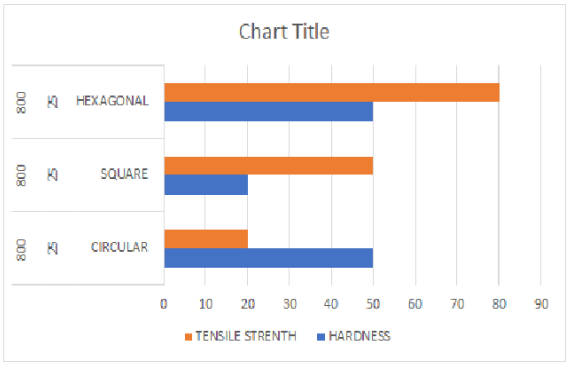

Fig. 1.6 Tools Vs Tensile strength, Hardness. Chart (Rotating speed: 800 rpm)

It is shown from above figure 1.6, if the tool and rotational speed are hexagonal and 800 rpm respectively then tensile strength of welding is high

IV. CONCLUSION

During the process of FSW, if rotational speed of tool is 400 r.p.m then porosity will get maximum for square tool and strength is maximum for hexagonal tool. so as, for rotational speed of 600 r.p.m, the porosity and strength are maximum for square and hexagonal tool respectively. In the same manner, if rotational speed of tool taken as an 800 r.p.m then porosity will remain same for all tool(hexagonal, square, circular) but strength is maximum in case of hexagonal tool. if rotational speed of tool taken as 800 r.p.m and hexagonal tool is used, it will get higher tensile strength. For the same tool as mention above but if the rotational speed of tool is changed to 600 r.p.m then welding hardness will get maximum.

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