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Failure of En19 Taper Thread Tool On Welding Ms Plate

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Abstract: FSSW is used a lot of vicinity which are from marine to aerospace industry. FSSW is effected with tool rotational speed, tool transverse speed, dwell time and tool plunge depth. One of them is weight. With the reference to the research work In this paper two flat plates of similar metals of MS of 1.2 mm thickness & 30.25mm specimen width are subjected to a solid state welding at 900rpm using the EN19 taper thread tool. The tensile-shear test results showed that the FSSW specimens are better than the specimens welded by the conventional FSSW process at 900-1300 tool rotational speeds with using taper thread tool pin profiles. By doing tensile test following ASTM B 557:2006 procedure the ultimate shear load obtained from the conventional friction stir spot welds is 1.960KN.

Keywords : Solid state welding, MS Plate, taper thread profile, failure

I. INTRODUCTION

Friction stir spots welding (FSSW) produces weld for adjacent function from a rotating, non-consumable welding device, enabling the device to 'stir' the joint surfaces between friction and heat generated from plastic work. The

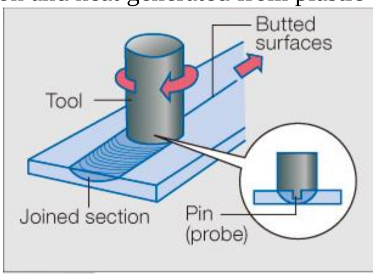

Figure 1: FSSW Metal Joining

Depression on friction and plastic work for summer causes the block to necessarily melting in the work piece, stay away from some problems emerging from a different situation in the state. In the device, two-speed rate is to be considered while friction welding; How the pin swings and how quickly it navigates on the welded interface can be seen in Fig 1. [Bahemmat P et al. (2012)].

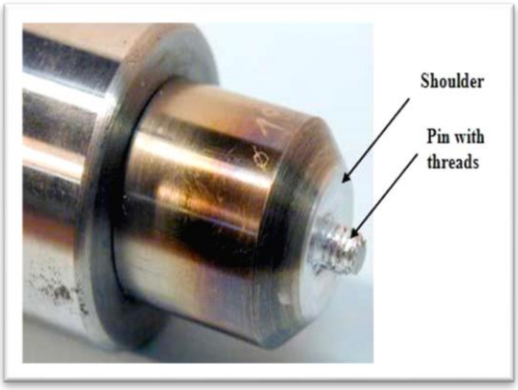

Figure 2: FSSW Tool

Heat Input during FSSW:

The tool base metal, stirring, gets deformed, and mixes it. Due to the effect of the equipment on the original material, metal content of metal and temperature increases. This diversity in temperature is an indefinite signal of the era of heat brought by the frictional contact between the welding process. In FSSW welding, the heat is determined by including the input curve, and then using the position.

$$U = \frac{2\pi}{60}\,\omega \int_{t_0}^{t_1} T\,dt \quad \text{...1}$$

where,
ω: Tool rotation speed
T: Torque
And t_0 and t_1 are the tool contact and withdrawal times
U: Heat input

However, this is only a gauge of heat input. Yang et al. Used similar situation to assess weld input, thinking about the contribution of heat by commitment to the device, estimates the abundance of heat contributions, as was illustrated in equations 2 and 3 . Condition 4 displays absolute heat input. The equation 1 was used for all heat input estimates in the current research work.

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$$Q_\Omega = \int_0^t M_z \left(\frac{2\pi\Omega}{60}\right) dt \quad ......2$$

$$Q_f = \int_0^t F_z v_z \, dt \quad ......3$$

$$Q = Q_\Omega + Q_f = \int_0^t M_z \left(\frac{2\pi\Omega}{60}\right) dt + \int_0^t F_z v_z \, dt \quad ......4$$

Where, $Q =$ Total heat input

$Q_\Omega =$ heat input due to the contribution of the rotational speed

$Q_f =$ heat input due to the contribution of the tool plunge

$\Omega =$ Rotational speed

$M =$ Torque

$F =$ Axial force $t =$ Time

Tool traverse speed or Welding speed (mm/min)

Looking at the need for high down power, the welding machine can be captured so that the importance of the plunge decreased (shock) came out of the clear setting so that the fault in the weld may be realized. On the other hand, this tool can cause a stir on the surface of the plate or a basic underwear match of the weld thickness is seen separately in relation to the base material and leads poor joint.

The welding process affects these combined properties through the age of aging and scattering, so it should be considered with the effect of the welding process factors on the age of heat and related results. The process variables of the FSSW can be seen in Table I.

Table I: Process Variables

Tool design Variables	Machine Variables	Other Variables
Shoulder and pin materials	Welding speed	Anvil material
Shoulder diameter	Spindle speed	Anvil size
Pin diameter	Plunge force or depth	Work-piece size
Thread pitch		
Feature geometry		

Steel has been widely applied in the automotive industry because its wide range includes desirable properties, ease of processing, availability and recycling. The frictional spatula is the tool design in the qualities of spot welds, exceptionally dependency on the welding process parameters, and the material should be welded. They make it difficult to meet the orderly qualities for any particular material. Equipment design plays an essential role in meeting the high power spot weld.

II. LITERATURE REVIEW

M. Come in Khan (2007) - To reduce the weight of the vehicle and improve crash performance, Endeavor explained the increasing use of state-of-the-art high power steels (AHSS) and the spotlight on the weldability of these alloys. Resistance Spot Welding (RSW) is the required sheet metal welding process in the production of motor vehicle festivals. Friction stir spots welding (FSSW) was developed as a novel strategy to spot welding sheet metal and spot welding has become a potential contender for AHSS.

A.B. Varma et al (2014) - ASS 304 and ASS 316 are used in paper and its tensile strength and rigidity were considered using the taguchi approach and ANOVA, while the microstructure was thought by a scafifferent framework. Tensile shear equivalent sheets (AISI304 to AISI304 and AISI316 to AISI316) were seen more frequently for different evaluations of Austenitic stainless steel (AISI316 to AISI316). Tensile welded specimen of weld current resistance is the major overcasing factor affecting shear strength. These results are in increased values of tensile shearing power.

Scotty Martin et al. (2016) - Worked on the quality evaluation of versatile net-based AISI 304 stainless steel resistance spacing welding joints. At work, the quality of Resistance Spot Welding (RSW) Joints of 304 Austenitic Stainless Steel (SS) was surveyed with its Tensile Shear Weight Limit (TSLBC). The results showed that the fault of the presenter and characterization of the versatile pure model

M. Purnanwari et al. (2017) - Assessed the fracture strength of Martensitic stainless steel resistance spacing welds. Paper is focused on the strength and fracture of AISI420, stainless steel resistance spots welds under tensile shear load.

III. EXPERIMENTAL SETUP

The toolsets and the modules help to design any model of the requirements with user friendly platform. So in this project the EN19 tool with taper thread profile is designed for the tool fabrication. The design is illustrated in the Fig 3. The Table I & II give the information about the tool composition and its properties.

Table I: Chemical composition of EN 19 Alloy Steel

C	Mn	Cr	Mo	Si	S	P
0.35-0.45	0.5-0.8	0.9-1.5	0.2-0.4	0.1-0.35	0.05	0.035

Table II: Mechanical Properties of EN 19 Alloy Steel

Tensile N/mm2	Yield N/mm2	Elongation %	IZOD KCV J	Hardness Brinell
850-1000	680	13	50	248-382

Tool Design using AutoCAD

AutoCAD is the software which helps the engineer to design 2D and 3D models with solid, surfaces and mesh objects.

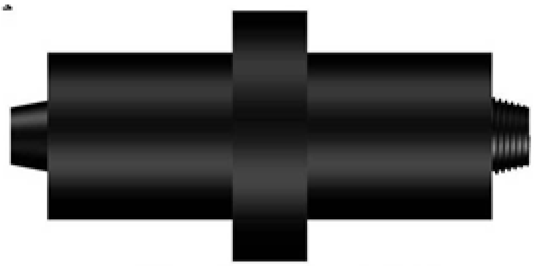

Figure 3: Design of Taper Thread Profile

Fabrication of Tool

Fabricated of tools are done by using the Tool sharpening machine which is shown in the fig 4

Figure 4: Sharpening Machine for Tool Fabrication

The EN19 tool with Taper square profile is fabricated with the help of tool sharpening machine and the fabricated tools are shown in Fig 6

Figure 5: Taper Thread Tool

Process Parameters of Vertical Milling Machine

Table III: .Specifications of Vertical Milling Machine

Type of Machine	FN2V
Overall Dimensions (L x W)	1520 x 310 mm
Clamping area (L x W)	1350 x 310 mm
Power operated table traverses	800 mm
Longitudinal	265mm 400 mm
No of Speeds	18
Main Motor	5.5 kW/1500 rpm

Measuring Cap. (kN)	400
Measuring range	0-400
Least count (kN)	0.04
Load range in Kn with Accuracy of measurement ± 1%	8 to 400
Resolution of Piston movement (mm)	0.1
Max. tensile clearance at fully decended piston position	50 to 700
Maximum clearance for Compression test (mm)	0-700
Distance between columns (mm)	500
Piston Stroke (mm)	200
Maximum straining speed at no load (mm/min)	150

The experiments are carried out with the EN19 tools by affixing to the collect of the vertical milling machine.

Table IV: Specifications of Tensile Testing Machine (UTM)

IV. RESULTS

The 1.2 mm thickness MS plates are welded using FSSW at 900rpm with EN19 taper thread profile tool.

The joint was obtained as desired which can be seen in Fig 6.

Figure 6: Al6082-Al6082 Welded Specimen

The welded joints are subjected for tensile test. The tensile test was carried on an UTM at the Hyderabad Engineering Labs. The result obtained is the maximum tensile load obtained for the joint is 1.960KN. The graph is shown in Fig 7.

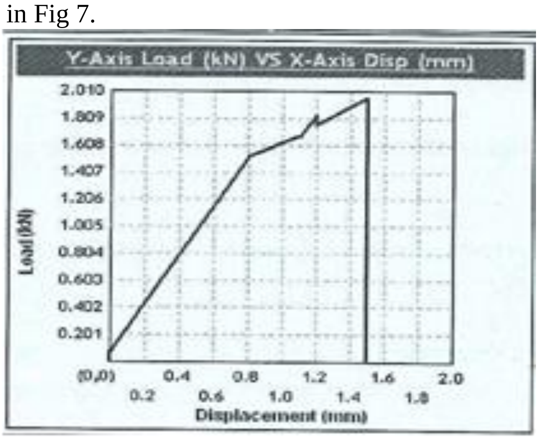

Figure 7: Load Vs Displacement

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V. CONCLUSION

In the process of welding the two mild steel pieces of thickness 1.2mm with E19 taper thread profile tool at rotational speed of 900RPM, the tool got blunt and the welding process failed. The failure work pieces and the blunt tool are shown in the fig 8

Figure 8: EN19 Tool Blunt while doing on MS Plates

In light of the experience raised in this research, proposals proposed for future work are recommended. Although different weld efforts have been tried in different parameter combinations, especially for encouraging improvement in amphibious heat treatment

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