A Review: Experimental Study on Formability of Tailor Welded Blanks Produced by Fsw

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***Abstract*- The main objective of this research work is to investigate the formability of Friction Stir Welding (FSW) of AA5083 and AA6061 dissimilar aluminum alloys, with thickness of 3&4 mm and to investigate the formability and structural properties of the weld. Friction stirs welding emerging solid state joining process. FSW process is used to weld both of these dissimilar alloys. Defect-free, tailor weld blanks were produced on the plates of AA5083and AA 6061 having thickness of 3 and 4 mm. Welding parameter such as tool rotational speed, welding speed and tool geometry plays major role in deciding the quality of weld, formability of TWB. Formability of TWB will be tested by Limiting dome height. The effects of tool rotational speed and the welding speed on the joint performance were discussed.**

***Index Terms*—friction stirs welding, limiting dome height.**

I. INTRODUCTION

A constantly rotated non consumable cylindrical shouldered tool with a profiled probe is transversely fed at a constant rate into a butt joint between two clamped pieces of butted material. The probe is slightly shorter than the weld depth required, with the tool shoulder riding atop the work surface. Frictional heat is generated between the wear resistant welding components and the work pieces. This heat, along with that generated by the mechanical mixing process and the adiabatic heat within the material, cause the stirred materials to soften without melting. As the pin is moved forward, a special profile on its leading face forces plasticized material to the rear where clamping force assists in a forged consolidation of the weld. This process of the tool traversing along the weld line in a plasticized tubular shaft of metal results in severe solid state deformation involving dynamic recrystallization of the base material.

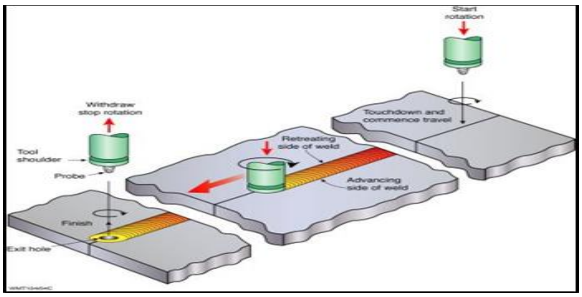

Fig.1 Fsw process

II.LITERATURE SURVEY

R. K. Kesharwani et al [1], in this paper author consider tool rotational speed, worktable translational speed, tool shoulder diameter, tool pin geometry as parameter and consider two dissimilar sheets of AA5052-H32 and AA5754-H22.as a result FSW using 1800 rpm of tool rotational speed, 50 mm/min of worktable translational speed, 20 mm of tool shoulder diameter and square tool pin geometry gives maximum weld strength (UTS = 175 MPa, approx) and maximum % elongation (13.854, approx).

Daeyong Kim et al[2], in this research paper Formability of automotive friction stir welded TWB (tailor-welded blank) sheets was experimentally and numerically investigated in this work for four automotive sheets, aluminum alloy 6111-T4, 5083-H18,5083-O and DP590 steel sheets. Experiment results were distinctively different depending on materials investigated, since the difference of the measured properties of the weld from those of the base was so various: as for weld zone properties compared to base properties, 6111-T4 had lower flow stress with reduced ductility, while 5083-H18 weld zone improved ductility with significantly lower flow stress.

K.Satheesh kumar et al [3], in this paper rotational speed, transverse feed, axial force parameter is used. Two dissimilar aluminium AA6061 and AA7075 6mm thickness plate were welded by friction stir butt

joint. Parameter effect on weld is the higher rotational speed and medium transverse feed produced excellent mixing of friction stir welding and ultimate tensile strength reached up to the maximum level in this higher rotational speed. The welding zone area zinc particle will be evenly distributed in this zinc particle produce substantially increase strength. The lower rotational speed produce insufficient heat input and also affects the tensile properties.

C. Leitão et al [4], on this paper tool geometry, tool rotational speed, welding speed are considering as parameter. Two dissimilar 1 mm thick plates of AA 5182-H111 and AA6016-T4 aluminum alloys are used for FSW process. As a result presence of small defects at the weld root of the dissimilar welds induced rupture of some of the blanks during the formability tests, namely, the blanks with 200 mm diameter and the blanks with 180 mm in diameter tested with 8 kN blank-holder force. However, it is was possible to drawn without rupture 180 mm diameter blanks under higher blank-holder forces (16, 20 and 32 kN) which proves that the rupture resulted exclusively from the presence of the defects and the dissimilar TWBs have good formability behavior.

E.E. Feistauer et al[5], in this paper tool rotational speed, axial force, welding speed, tilt angle and tool geometry are consider as a working parameter. Two dissimilar aluminum alloys AA5083 and AA5059 selected for experimental work. It concludes that Changes in mechanical properties on the local scale were successfully assessed by DIC, and stress–strain curves were calculated for different weld regions. The results suggested that due to the mismatch of mechanical properties and geometric characteristics in the TWB joints, local constraints can impose premature strain in the HAZ zone of the 6 mm thickness sheet.

YURI HOVANSKI et al [6], in this paper tool geometry, tool rotational velocity, tool tilt angle and welding speed are considering as a parameter. Two different thickness of AA5182-O material are used for experiments. After performing experiment formability differences associated with the geometric discontinuity created by a dissimilar Thickness joint. For thickness ratios ranging from1.5 to 3.3, the simulation provided a conservative estimate of the changes in dome height during LDH testing of the dissimilar thickness blanks.

Avinash P et al [7], in this paper tool rotational speed, traverse speed and tool geometry is considered as parameters and two different material AA2024 T3 and AA7075 T6 are used. The effects of tool rotational speed and the welding speed on the joint performance Tailor welded blank of AA2024 and AA7075, having a thickness ratio of 1.3 have been successfully butt welded using FS welding technique. Further sound weld has been produced at medium rotational speed (1000 rpm) and lower travel speed (80 mm/min).

III.OBJECTIVES

i. To determine the effect of tool pin profile on tensile strength of the FSW joints.
ii. To determine the effect of tool rpm on tensile strength of the FSW joints.
iii. To determine the effect of tool transverse feed on tensile strength of the FSW joints.
iv. To determine the best combine of welding parameters for defects free welds.
v. To evaluate formability by stamping, HDST or LDH.

IV.EXPERIMENTAL WORK

There are three levels and three factors selected for the study of different conventional tool with different shoulder diameter. The various possibilities of welding according to design of experiment having three levels and three factors .Total 27 number of combination is found for checking these selected parameters. The parameters and coding list is as describe below.

PARAMETERS	LEVELS		
	LOW	MEDIUM	HIGH
Tool Rotational Speed(RPM)	1750(A)	2000(B)	2250(C)
Traverse speed (mm/min)	5(α)	10(β)	15(γ)
Tapered tool(shoulder dia)(mm)	22(1)	24(2)	27(3)

Table 1– experimental parameter

V.CONCLUSION

1. In the present work experiment are carried out for tensile test and limiting dome height test.
2. Hardness in advancing side is more than the retreating side in HAZ and TMAZ because the grain refinement is more in advancing side than retreating side.

3. Formability strongly depends on mechanical properties of the welded blank, further tests (tensile tests and LDH tests) have to be carried out to draw the conclusion.
4. In LDH test the failure occurred in weld region and in HAZ/TMAZ region.

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