

"Friction stir Welding of Edge joint on similar Aluminum Alloys 6082 and Analysis of Flow stress and Temperature"

Bhavikkumar B Darji, Magneshkumar M Tandel And Prof. Jaimin B Patel

BE student (mechanical)GTU /Vadodara institute of engineering,
Vadodara , Gujarat, India.

² BE student (mechanical)GTU /Vadodara institute of engineering,
Vadodara , Gujarat, India.

³ME Professor in Department of Mechanical Engineering, Vadodara Institute
of Engineering, Vadodara, India

ABSTRACT

Friction stir welding process is used for joining material such as Aluminum ,copper ,magnesium etc., which are otherwise difficult to weld by the conventional welding processes .The toll profile plays a critical role in determining the end properties of the welding joint apart from other parameter like rotation speed, welding speed, and axial load . The purpose of the investigations was to elaborate a set of FSW parameters for connecting 6082 aluminum alloy sheets allowing to produce welds of highest strength. The results of present experiments are adding new information on FSW of the aluminum alloys, especially 6082 type. The applied welding parameters provide good quality of welds. The aim behind . In analysis we use Al6082 similar material for flow stress ,temperature analysis with Hyper works 9.0

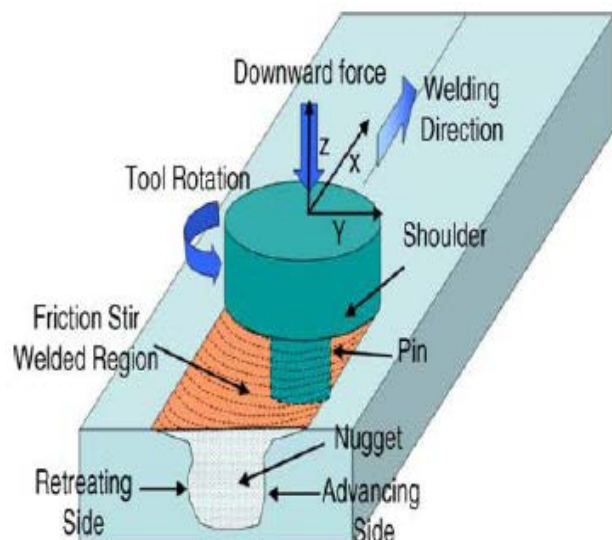
Keywords: Friction Stir welding, Flow stress ,Temperature, hyper works 9.0.

1.INTRODUCTION:-

Friction stir welding (FSW) technology help joining aluminum sheets, without material preheating. The welding process takes place by a rotating FSW tool. The tool works within welded materials moving along their edges.

The frictional heat generated due to rubbing of shoulder & work piece material results in plastic deformation and movement of material from advancing side to retreating side followed by formation of joint behind the tool shown in figure1.1.[1] The friction stir welding results in substantial change in typical mechanical properties such as strength, ductility, fatigue and fracture toughness of the joint formed [4]. Sato et al. [5] investigated the transverse tensile properties of the friction stir weld of 6063-T5

aluminum. Effect of FSW parameters on tensile properties of 2024Al-T4 has been studied and ductility found to increase with increasing tool rotation rate by Biallas et al. [6]. A. von Strombeck et al. [7] provided variation of tensile properties at different locations of FSW joints of 7075Al alloy & concluded that strength is almost constant in the nugget zone & the lowest strength is observed in HAZ. R.S. Mishra et al..



Aluminum alloy 6082 is a medium strength alloy with excellent corrosion resistance. It has the highest strength of 6000 series alloys. Alloy 6082 is known as a structural alloy. In plate form, 6082 is the alloy most commonly used for machining. As a relatively new alloy, the higher strength of 6082 has seen it replace 6061 in many applications. This material is used for milk churns, trusses,

cranes, ore skips, beer barrels, bridges, highly stressed applications and transport applications.

2. SIMULATION METHODOLOGY:-

Tools and methodology information:-

Tool	Dimension (mm)
Left plate width W1:	152.4
Right plate width W2:	203.2
Left plate height H1:	63.5
Right plate height H2:	12.7
Length of plates:	508.0

Tool information:

Work piece	Dimension
Shoulder Diameter DS:	20.32 mm
Shoulder Height HS:	76.2 mm
Pin Diameter DP:	7.62 mm
Pin Height HP:	11.43 mm
Pin Tilt Angle:	3 deg

Work piece information:

Si	Mg	Mn	Fe	Cr	Cu	Zn	Ti	other
1.05	0.8	0.68	0.26	0.01	0.04	0.02	0.01	0.05

- Chemical composition of AA6082-T6 (%)

Tensile strength, σ_{uts} (Mpa)	300
Yield strength, σ_{ys} (Mpa)	245
Elongation, ϵ_t (%)	9
Hardness, H_v , 02	110

- Mechanical properties of AA6082 aluminum alloy:-

We used high strength and high melting temperature tool for process with cylindrical profile.

Tensile strength. (Mpa)	324
Shear Stress(Mpa)	500
Modulus of elasticity(Gpa)	330
Poisson ratio	0.38
Hardness(load/10mm)	225
Thermal conductivity(W/m.k)	138
Melting point(C^0)	2625

- Tool properties:- (Molybdenum material) :-

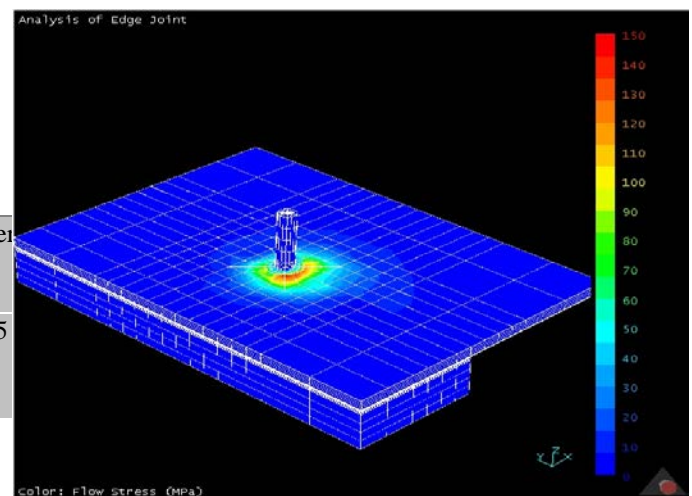
3. RESULT OF SIMULATION:-

Analysis:-

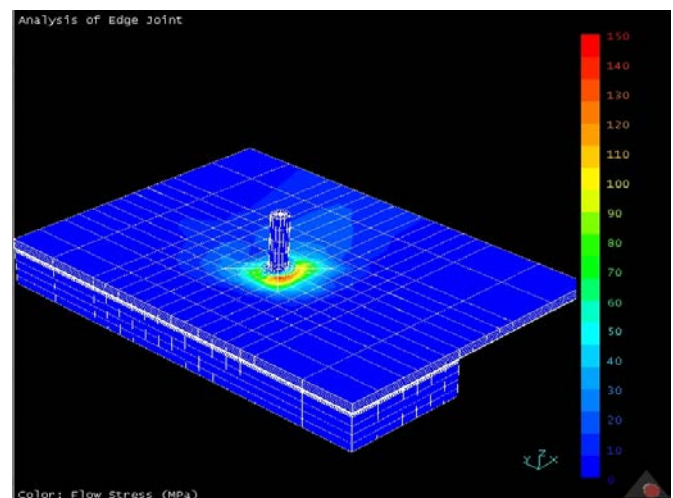
Analysis is done of Al6082 similar material for flow stress, pressure and viscosity analysis on Hyper works.

- Analysis of FSW for AL6082 at constant traverse speed 4.23mm/sec.:-

Flow stress:-



Flow stress at 700rpm .



Flow stress at 800rpm .

Temperature:-

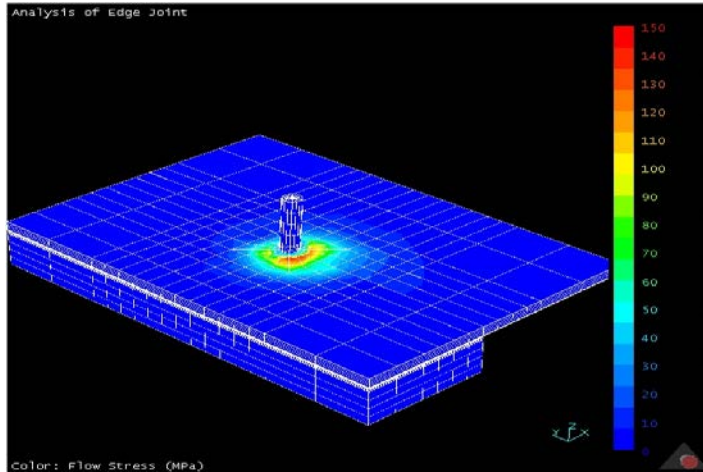
4. CONCLUSIONS:-

- 1]. For simulation AL6082 , If we are increasing the speed of tool than Flow stress will constant. and Temperature will increase .
- 2]. We are increasing tool speed with constant traverse speed than Flow stress will be constant and Temperature will be increase.

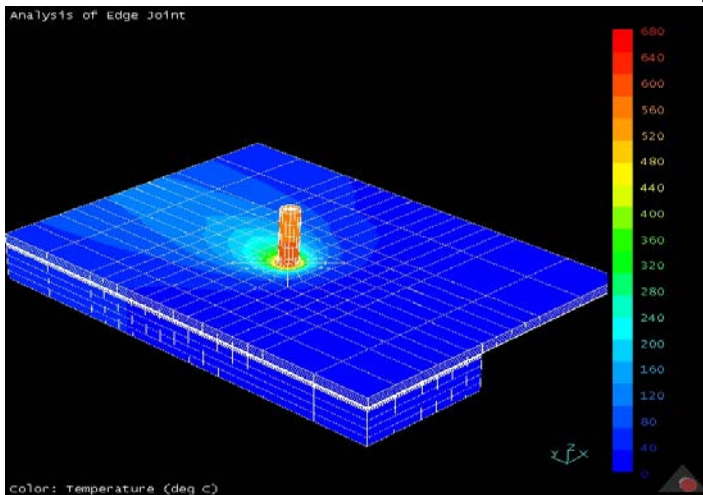
FUTURE SCOPE:-

By Changing the traverse speed and use different tool profile we can increase weld quality.

REFERENCES:-



Temperature at 700rpm .



Temperature at 800rpm .

4. RESULT TABLE:-

Tool speed (rpm)	Traverse speed (mm/sec)	Flow stress (Mpa)	Temperature (c ⁰)
700	4.23	150	600
800	4.23	150	680

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