

Friction stir Welding of Edge joint on Different Aluminum Alloys and Analysis on HYPERWORKS 9.0

Bhavikkumar B Darji, Dhananjaysinh D chuvhan and Saju Thomas

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

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

³ BE student (mechanical)GTU /Vadodara institute of engineering,
Vadodara , Gujarat, 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 aim behind . In analysis we use Al2011/3003material and Al6000/6011 material for flow stress, pressure and viscosity analysis with Hyper works 9.0

Introduction :

Friction stir welding (FSW) is a relatively new solid-state joining process. This joining technique is energy efficient, environment friendly, and versatile. In particular, it can be used to join high-strength aerospace aluminum alloys and other metallic alloys. FSW is considered to be the most significant development in metal joining in a decade. Recently, friction stir processing (FSP) was developed for microstructures modification of metallic materials.

Friction Stir Welding is a solid-state process, that the objects are joined below the melting point with the help of pressure. The heat generated in the joint area is typically about 80-90% of the melting temperature. In FSW, a

cylindrical shouldered tool with a profiled pin is rotated and plunged into the joint area between the two pieces of material to be joined

Keywords: *Friction Stir welding, Tool profile, properties ,investigation, hyper works..*

1.Introduct:

Normally metals and alloys are joined by fusion welding process All fusion welding processes (particularly for materials having low weld ability such as copper are characterized by welding defects. Some Al, Cu and Mg alloy series are not at all fusion wieldable Welding of different materials and much different in thickness are impossible/very difficult. The main defects noticed are; porosity, hot cracking, HIC, NIC, residual stresses, distortion, grain growth, composition changes at the weld nugget .Other problems, such as environmental pollution due to welding fumes and slag, very high energy consumption, pre and post weld treatments, high initial investment are not required in FSW.

2. Subheadings:

Review of Technical Research paper

Title: Friction stir welding and processing

Author: R.S. Mishra and Z.Y Ma

In this review article current developments in process modeling, microstructure and properties, material specific issues, applications of friction stir welding/processing have been addressed.

Tool geometry is very important factor for producing sound welds. However, at the present stage, tool designs are generally proprietary to individual researchers and only limited information is available in open literature.

From the open literature, it is known that a cylindrical threaded pin and concave shoulder are widely used welding tool features.

Title: Principles and practices of stud welding.

Author: Harry A. Chambers

This paper presents Principles & practices of stud welding method. Quality welds are critical to the performance of finished structural members attachments and connections. Whether the user employs the welding procedure in their in plant fabrication shop or purchases the finished weld plate from a sub contractor, the principles & practices discussed in the article should be followed for achieving consistent quality.

Title: friction stir welding process parameters for joining dissimilar aluminum alloys.

Author: D Muruganandam and Dr.Sushil lal Das

The percentage of elongation values are very less for the entire Tensile tested specimens, so the values in MPa are comparatively less for the tested range of rotational and welding speed parameters.

The percentage of elongation and the tensile strength values are very less for the entire Tensile tested specimen and they are cracked at the welded area (stirred zone) where least strength is identified comparing to two base metals for the tested range of rotational and welding speed parameters.

Title: Thermal analysis of FSW joint of age hardenable AA7075 using Altair's Hyperweld FSW.

Author: Sandeep patil, Sachin lomte & Dr. C. L Gogte.

FSW simulation performed on altair's hyper weld friction stir welding have opened new horizon of modeling and simulation of joining process. They have shown the different temperature distribution at different zone after FSW process for different parameters.

3. Work and processing

Work: In Hyper works bench we use model 1530-f From PTU international

Processing: Its take some few time for iterations.

As per the law of Newton for iterations.

In this analysis having 40 iterations so more iterations give more accurate result.

Also consider CFX raster scan.

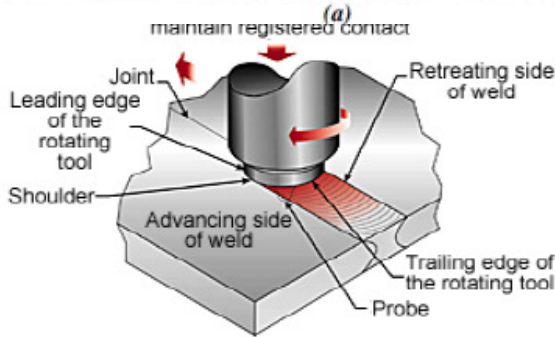
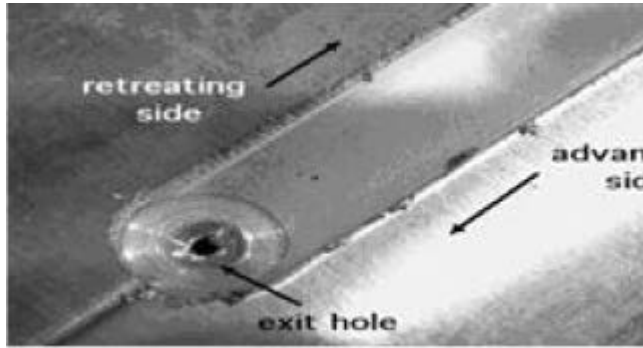
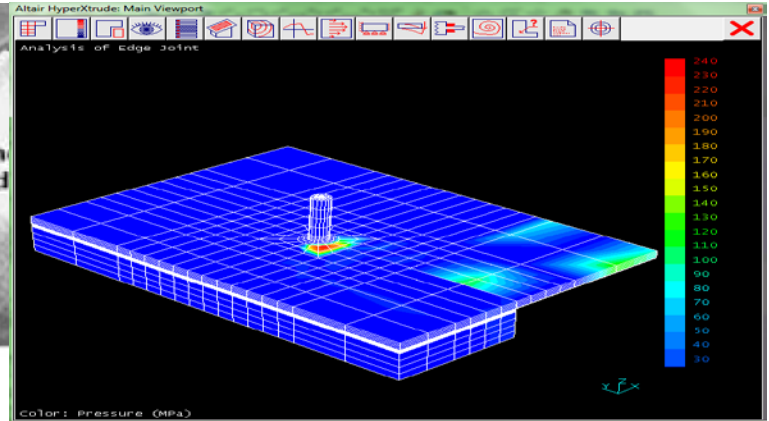


Fig. 1 Schematic drawing of friction stir welding

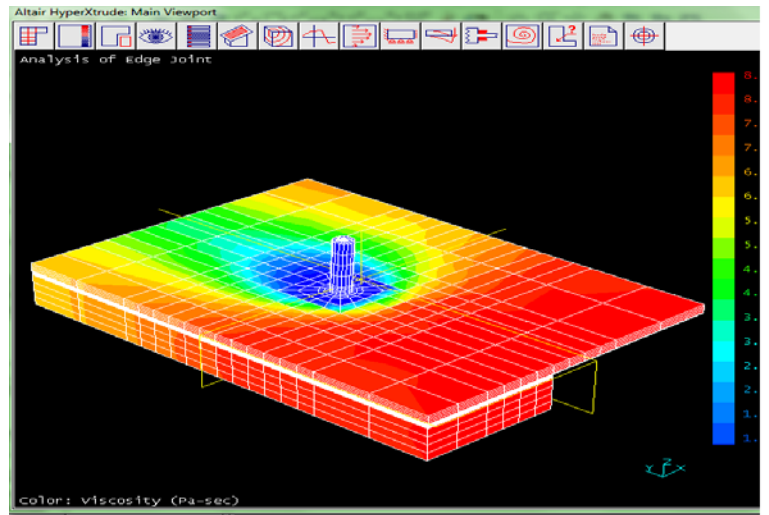
Analysis:-

Analysis is done of Al2011/3003 material and Al6000/6011 material for flow stress, pressure and viscosity analysis on Hyper works.

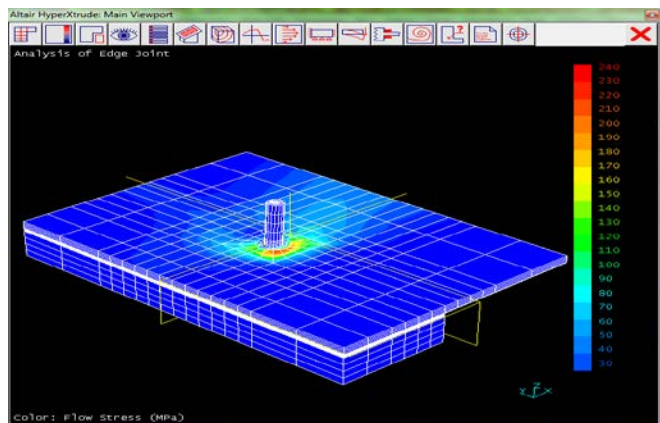
Analysis of Al2011/3003 material.



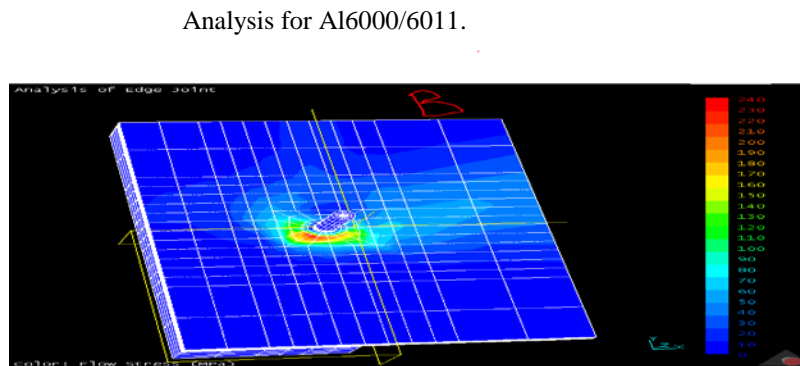
Pressure analysis for Al2011/3003 material



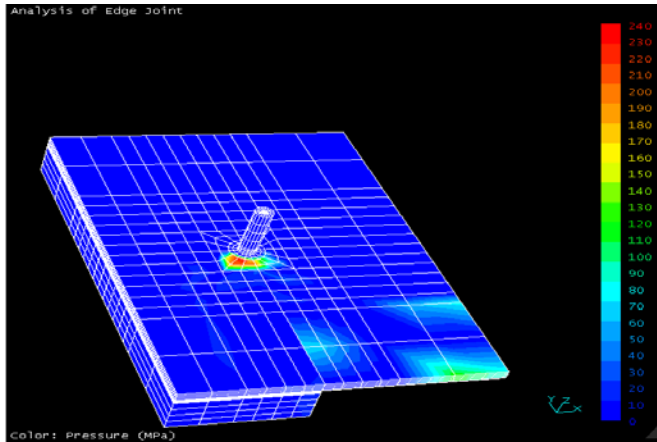
Viscosity analysis for Al2011/3003 material



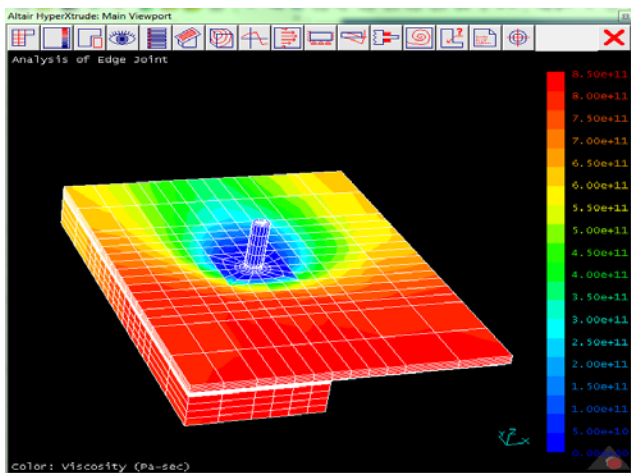
Flow stress analysis for Al2011/3003 material



Flow stress analysis for Al6000/6011 material



Pressure analysis for Al6000/6011 material



analysis for Al6000/6011 material Viscosity

material	Flow stress		viscosity		pressure		Temp.	
	Max	Min	Max	Min	Max	Min	Max	min
Al2011/3003	84.167	0.7746	7.634 E+011	1.9452 E+001	32.72	0	274.73	23.54
Al6000/6011	237.22	0	8.1456 E+011	0	232.6657	0	718.73	20

[Result Table]

4. Conclusions

From this we conclude that as there is change in material there is increase & decrease in the pressure and rotation of tool which is applied on the material.

5.Future scope

To increase the weld quality by changing the tool geometry we can also increase the strength of the weld and decrease the stress which take place in material.

References

- 1) C.G. Andersson, R.E. Andrews, B.G.I. Dance, M.J. Russell, E.J. Olden, R.M. Sanderson, in: Proceedings of the Second Symposium on Friction Stir Welding, Gothenburg, Sweden, June 2000.
- 2) R.S. Mishra and Z.Y. Ma “Friction stir welding and processing.”
- 3) Harry A. Chambers “Principles and practices of stud welding.”
- 4) D Muruganandam and Dr.Sushil lal Das” friction stir welding process parameters for joining dissimilar aluminum alloys”