

# Joining and Investigation of Similar Metals of Al(6061-T6) and Al(6082-T6) by using EN19 Taper Profile tool through Friction Stir Spot Welding

**B. Srinivasulu<sup>1</sup>,**

<sup>1</sup>Research Scholar<sup>1</sup> Department of Mechanical Engineering, Sri Satya Sai University of Technology & Medical Sciences Sehore, Bhopal, M.P, India

**Dr. G.R.Selokar<sup>2</sup>**

<sup>2</sup>Rector & Professor <sup>2</sup>Department of Mechanical Engineering, Sri Satya Sai University of Technology & Medical Sciences Sehore, Bhopal, M.P, India

**Dr. Namish Mehta<sup>3</sup>**

<sup>3</sup>Department of Mechanical Engineering ,Truba College of Science and Technology, Bhopal, , Madhya Pradesh. India

## ABSTRACT :

Friction Stir Spot welding derive from friction stir welding is a solid state welding method ,industrial as a novel method for joining of aluminium alloys. During this process frictional heat generated at the Tool and Work piece interface through rotating pin and material flow. Due to plasticized it effect in material of solid bond section. In the present work, Aluminium alloy plates Al6061-6061 and Al6082-6082 are joined by friction stir Spot welding (FSSW) using EN19 taper profile tool by welding parameters. It is evaluated that tensile strength is more for friction stir spot weldment joints of similar metal of Al6061 than A6082 metals used in the study.

**Keywords - Friction stir spot welding; tool design; 6061 and 6082 Al alloy; process parameter.**

## 1.INTRODUCTION

Reduction in weight without upsetting the protection show is a great dare in the automotive industry in tidy to improve fuel economy and diminish emissions. An automobile consists of external panels and a platform, which is typically made of steel and contains the drive system, engine system and exhaust system. For replace steel with aluminum in the structure of automobiles, it is needed to explore joining methods to know how to be use efficiently. However, these welding technique cannot be practical simply to aluminum alloy, because of its physical properties, particularly surface oxide film. This 2 novel joining mechanism is useful for producing aluminum joints without infectivity, blowholes, porosity and cracks

## 2.EXPERIMENTAL SETUP

In this process the aluminum plate of 4 mm thickness with grades T6061-T6 and T6082-T6 are selected. EN 19 Tool was selected with a Taper profile tool . The Chemical properties of the T6061 and T6082 are depict in the Table3 and Table 4. The experiment was conducted on a conventional Vertical Milling machine as shown in the fig.1

**Table 1: 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 2: Mechanical Properties of EN 19 Alloy Steel**

Tensile N/mm <sup>2</sup>	Yield N/mm <sup>2</sup>	Elongation %	IZOD KCV J	Hardness Brinell
850-1000	680	13	50	248-382

**Table3:Chemical composition of aluminium 6061**

component	Aluminium	Magnesium	Silicon	Iron	Copper	Zinc	Titanium	Manganesese	Chromium	Others
Amount(wt%)	Balance	0.8-1.2	0.4-0.8	Max.0.7	0.15-0.40	Max.0.25	Max.0.15	Max.0.15	0.04-0.35	0.05

**Table 4:Chemical composition of aluminium 6082**

component	Aluminium	Magnesium	Silicon	Iron	Copper	Zinc	Titanium	Manganesese	Chromium	Others
Amount(wt%)	95.2 to 98.3%	0.6 to 1.2%	0.7 to 1.3%	0.5% max	0.1% max	0.2% max	0.1% max	0.4% to1.0%	0.25% max	0.15% max

**Table 5: Process Variables**


Parameters	1
Tool Profile	Taper
Rotational Speed(RPM)	1120
Feed(mm/min)	25
Depth of cut(mm)	5.5
Inclination angle	0.5 deg
Tool	



Fig 1. Experimental set up

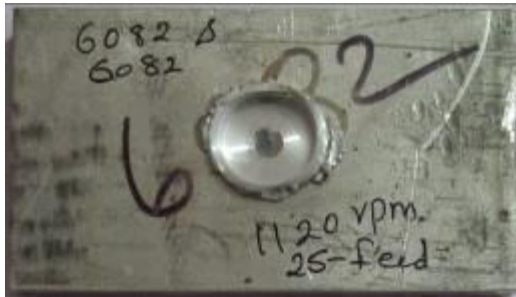


Fig 2: Welding Al-6082-6082



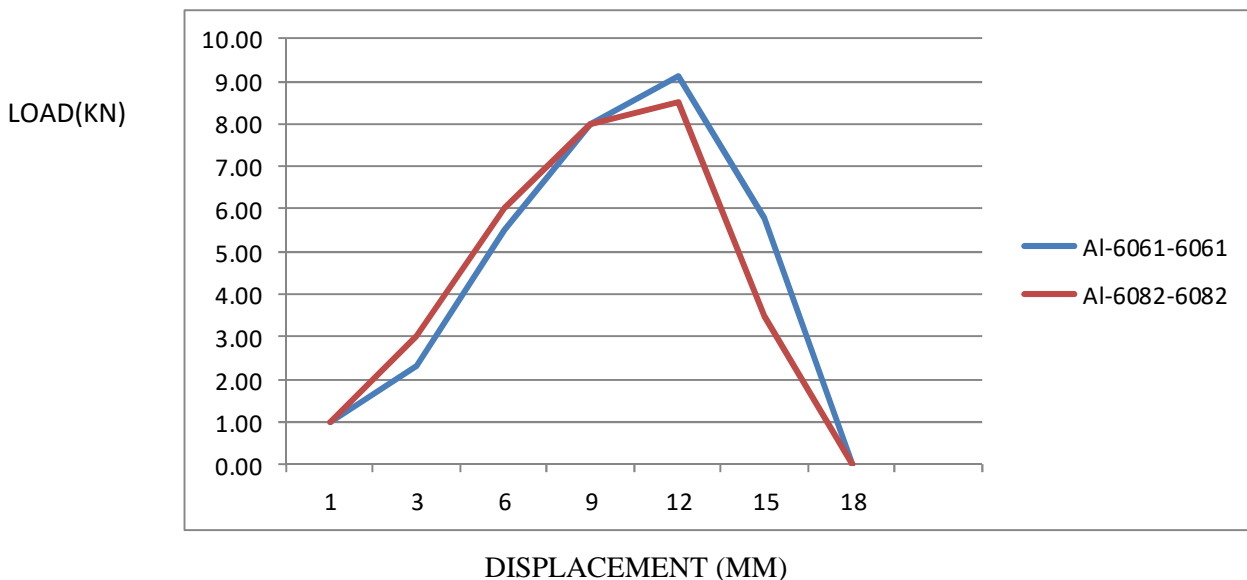
Fig 3: Welding Al-6061-6061

### 3. TEST RESULTS AND DISCUSSIONS:

After friction stir spot welding of the samples, by varying welding parameter such as rotational speed, Feed and inclinational angle of the tool. It is evaluate that tensile strength is more for friction stir spot weldment joints of similar metal of Al6082 than Al66061metals.



Fig:4 Test samples for Conducting Tensile Strength and Yield Strength



Graph :Compare of Al-6061-6061 and Al-6082-6082

### 4 CONCLUSIONS:

The experiments contain be conduct on a Vertical Milling machine by Taper Profile tool EN 19 Tool for Friction Stir Spot Welding on Al-6061-6061 and Al-6082-6082 .

➤ The samples are tested on a Universal Testing machine for Ultimate Tensile Strength, Yield Strength

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- Al6061-6061 with taper tool has got the values of Tensile strength 90.7 N/mm<sup>2</sup>, Yield strength 75.2 N/mm<sup>2</sup>.
  - Al6082-6082 with taper tool(EN19) has got the values of Tensile strength 80.4 N/mm<sup>2</sup>, Yield strength 67.8 N/mm<sup>2</sup>..
  - The biggest tensile strength and yield strength were obtained on Al6061-6061 with rotational speed (rpm) 1120, feed (mm/min) 25 and inclination angle 0.5 degree is taper tool with EN19.s

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