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# A Review on A Comparative Study of Tensile strength and Microstructural Characteristics of Oxy-acetylene Welded Joints and Friction Welded Joints of Aluminium Alloy 6061

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***Abstract*-: Metal joined by welding techniques of high strength and low weight is a major challenge without any cracks or defects by oxyacetylene gas welding techniques for such materials like aluminium alloys. So that now a days Friction stir welding and Friction welding techniques getting much importance in joining of Aluminum alloys. But oxyacetelene techniques is mostly used in industries because of skillfull workers as well as it is less expensive than the other welding techniques like friction stir welding. Friction welding is a solid-state welding process it is done by generating the frictional heat by mechanically in between the workpiece and rotating tool. The thermal energy is generated by friction between the tool and the workpiece and plastic deformation of the workpiece. The workpiece is get plastically and fuse the materials with the addition of a lateral force called "upset. In this experiment study on tensile test and micro structural characteristics of welded joints welded by oxyacetelene welding techniques and friction stir welding(suitable for weld specimens with rectangular plate cross section) has been carried out and the same were compared. In friction stir welding the process parameters are upsetting pressure and 500 rpm axial pressure loading of 4Mpa with 6 MPa, feed rate of 0.2mm/s were used to obtain good welded joints and The process parameter of oxy acetylene Gas welding as the neural flame at 3000°C and 5mm electrode. In various welding region, the Microstructural evaluation of Friction welding and oxyacetelene welded joints shows clear distinct zones. And also in friction welded joint micro structural photographs showed comparable features both in parent metal and welded region. Thus microstructure evaluations and the tensile characteristic study proved that friction welded joints are good in both aspects compared to oxyacetelene welded joints.***

***Keywords*-: Welding parameter, friction welding, microstructure**

## I. INTRODUCTION

Welding may be defined as "the metallurgical joining of two metal pieces together to produce essentially a single piece of metal".

There are two groups of welding processes:

- Oxyacetylene gas welding
- Solid-state welding.

*1.1 Oxyacetylene gas welding:* Oxyacetylene is one of the oldest welding technique besides arc welding. In Oxyacetylene welding torch is used to weld metal results when two pieces of weld are heated to a temperature that produces a shared pool is generally supplied with additional metal called filler. Filler metal depends upon metal to be welded.

For melting the base metal required to producing an hot flame the joining processes use an oxyacetylene gas, such as a mixture of oxygen and acetylene and filler metal is used.

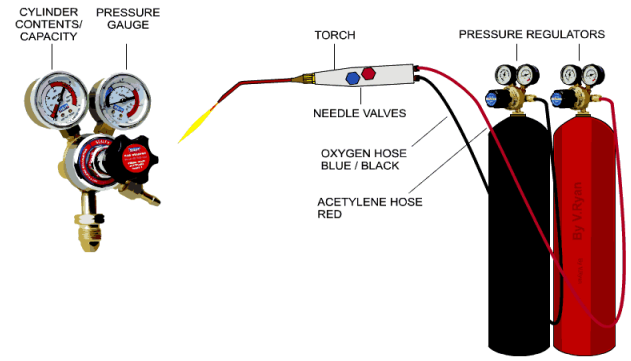


**Fig:1 Oxy-acetylene gas welding.**

*Advantages*

- Low capital cost
- No electrical requrements
- Consumable cost low
- Can be use manually or mechanised
- Transportable

*Disadvantages*

- Primerily limited to mild and low alloy steels
- Less suitable for stainless steel
- Quality influenced by parameters and torch nozzle and plate surface condition

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*1.2 Solid state welding:* Heat is used in solid state welding process to melt the base metal. This solid process makes this joint with greater strength and give bulk ness when molten filler metal is used. No filler metal is added in the friction stir welding is introducing as an self heat generating oppression process. The mostly used welding processes are the friction category, which can be organized into the following general groups.

In conventional welding processes oxyacetylene Gas welding is mostly used to join Aluminium alloys. While doing such joining process too much care should be taken in order to avoid weld Defects like cracks and diffusion. Recent studies proved that friction welding can form good welded joint with mechanical and metallurgical characteristics comparatively similar to that of base metal. Friction stir welding is type of solid state welding process that generating heat through mechanical coefficient of friction between a sliding work piece and a rotary tool, is again with additional lateral force is called "upset". this is plastically displace and fuse the material in friction welding process. Friction welded joints are used to fabricate suspension rods, steering linkage; the application of friction welding is gear box keys and drive input and output shafts and IC engine valves, Aircraft, shipbuilding and Automotive industries.

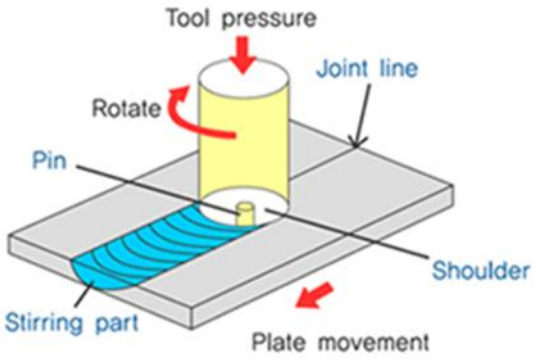


**Fig:2 Solid state welding**

*Advantages*

- The two dissimilar metals can be easily joint
- The both metals can made full surface of the cross-section.
- Friction welds are higher strength
- Friction weld often costless
- Friction welding minimizes the need to clean furnace residues
- Low environmental impact

*Disadvantages*

- Exit hole left when tool is with drawn
- Large down forces required with heavy duty clamping necessary
- Less flexible than manual and arc process
- Slower transvers rate than some fusion welding techniques

## II. Weld Defects In Oxyacetylene Welding Processes

Some discontinuities develop during the welding process due to heat is generate in welding process. And this discontinuity change the metallurgical microstructure. Some major discontinuities are described below.

*2.1 Porosity*

In oxyacetylene welding process porosity is occurred due to Trapped gases released during melting of weld area. And also Trapped gases are released during chemical reaction during welding, solidification of melt metal. Generally porosity is occurred in spherical in shape or elongated pockets. Most welded joints contain some porosity.

*2.2 Slag Inclusion*

Slag is normally seen as lines are elongated. This lines are continuous or discontinuous along the surface of the welding. This is readily identified in radiograph. When shielding gases are ineffective during welding. the environment impurity may also contribute in to the such inclusions. To prevent the slag inclusion the slag should be cleaned from weld bed between the passes via grinding , wire brushing ,or chipping .

*2.3 Lack of Fusion and Penetration*

Due to the Lack of fusion the poor adhesive property of the weld surface can obtain with the base metal, The incomplete penetration of tool is affected on the groove of weld surface with base plate. Incomplete penetration form crevices and channels causes the serious problem of corrosion and adhesion in pipes. This substances can settle in these areas.Incomplete fusion produces poor weld beads.

*2.4 Distortion*

In this Welding methods involves the make metal at its molten state where we are joining the base metals, It prone to shrinkage as the heated metal cools. Shrinkages are produces the residual stresses and distortion. Distortion can produce major problem. Hence the final product is not the desired shape .

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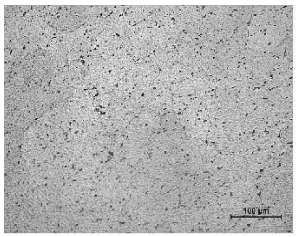
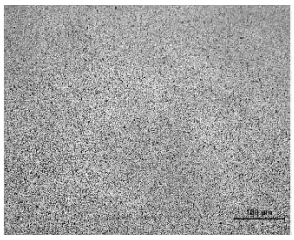
## III. Result From Microstructure Studies

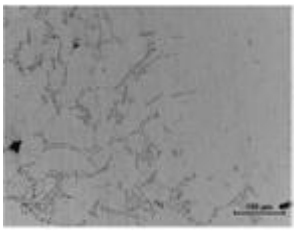
The various photographs of the microstructure showing below: parent metal that joined by oxy-acetylene gas welding and friction stir welding joints at various zones etc from the micro structural studies has been presented in Figure.



**(A) BASE METAL**



**(B) WELD ZONE-FW**



**(C) WELD ZONE- GW**

**Fig:3 Different Zones Of Welded Joints**

## IV. Conclusion

Different type of welding defects in oxy acetylene welded joints are discussed in this paper. The most problem identified in oxy acetylene welding are associated with solidification process and structure, including blow hole crack formation in the weld joint.

These problem can be reduced by adopting advanced welding technique , friction stir welding (FSW) which is alternative welding process. Friction stir welding which offers solid-state bonding with high joint efficiency, which solve all these problems of solidification associated with the oxy acetylene welding.

Micro structural photographs of conventionally welded joints exhibited clear distinct zones of various weld regions. Thus all these studies reveals the suitability of friction stir welding techniques for the effective joining of Aluminium Alloys.

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