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FABRICATION AND TENSILE TESTING OF LAPPED WELDED AL PLATE

Mr. Niteen Shivaji Mali
TPO/Lecturer in Department of Mechanical Engineering
Dr. D.Y.Patil Polytechnic, KasabaBawda , Kolhapur.
niteensmali@gmail.com

Mr. Dhairyashil Ashok Naik
Lecturer in Department of Mechanical Engineering
Dr. D.Y. Patil Polytechnic, KasabaBawda , Kolhapur.
dhairynaik@gmail.com

Abstract

This study was aimed at establishment of a model that can predict tensile strength of gas welded lap joints. In present study six samples of the aluminum are produced by varying their overlap length. These three plates are fabricated by gas welding technique. To know the tensile strength of the lapped joints, these plates are tested on universal testing machine. It is found that more the overlap length more the strength of the weld.Finally, estimation of the tensile strength and the fracture portion of the joints were achieved. This estimation made good accordance with the experimental results.

KeyWords: -Welded joint, Tensile strength, Al Laminate, Overlap length, Yield stress.

Introduction:

Welding is the process of joining the metals with help of heat, with or without application of pressure. Welding is a fabrication or sculptural process that joins material, usually material or thermoplastics, by causing fusion, which is distinct from lower temperature metal joining techniques such as brazing &soldering. In construction of lightweight structural systems such as satellites, aircraft, high-speed trains and fast ferries, structural strength to weight ratio is one of the major considerations. To achieve this objective the structure are fabricated by welding process,Friction Stir Welding (FSW), Gas Tungsten Arc Welding (GTAW) and Gas Metal Arc Weldi ng(GMAW). It is necessary to test the Mechanical properties of weld joint of fabricated structure like Tensile strength, Impact Strength. The research found that mechanical properties were increased to certain extend and then fall down because of metal fibre laminate. The bonding between the fabricated structure need to be strong otherwise it will leads towards delamination of structure. The tensile strength of the welded joint depends upon following factors.

Fig.No.1 Cause and effect diagram of Welded Joint

2.0 Problem definition

Welding has got very good strength because of which it finds its application in manufacturing of various structures like automobile, bridges and air crafts. The welded joint usefully above application are under tensile and fatigue resistance the biggest challenge is to find out the tensile strength under various environmental and working condition the welding geometry , welding defects , environmental condition process parameter , and type of loading are the major key factors for determination of tensile strength. A very less research has been carried out on lapped joint of aluminum 6061 for its weld tensile strength our research is focusing on finding tensile strength of weld joint.

3.0 Material Selection

The specimen of Al selected,as Aluminum has unbeatable strength to weight ratio. Its lighter weight means that less force is required to move the vehicle, leading to greater fuel efficiency. Its corrosion resistance is an added bonus, eliminating the need for heavy and expensive anti-corrosion coatings. Aluminum is also known as the 'winged metal' because it is ideal for aircraft; again, due to being light, strong and flexible. In fact, aluminum was used in the frames of Zeppelin airships before airplanes had even been invented. Today, modern aircraft use aluminum alloys throughout, from the fuselage to the cockpit instruments. Even spacecraft, such as space shuttles, contain 50% to 90% of aluminum alloys in their parts.

4.0 Fabrication and Development of Lapped weld Joint

We have decided to work on Al plate thickness of 1mm and 1.2 mm. The overlap length is decided as shown below as used by many researchers.

Table 4.1 Selection of overlap length

Sr.No	Al Plate thickness in mm	Overlap length in mm		
		1	2	3
1	1	15	30	40
2	1.2	15	30	40

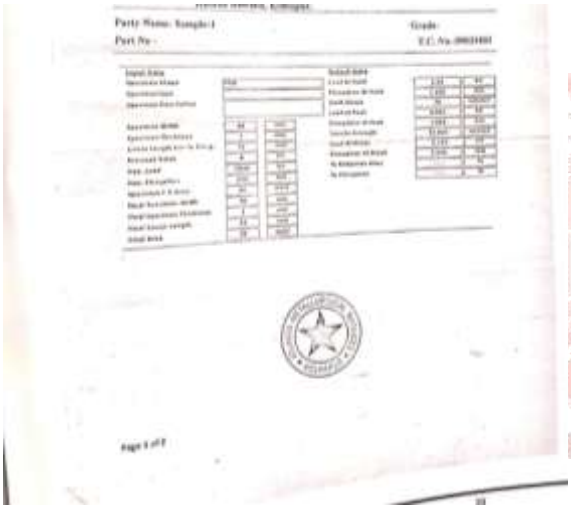
4.1 Procedure followed

- Al 6061 plate of 1*4 feet are taken.
- The marking of 30*90 mm size is made on to the aluminum plate.
- Then the plates are cut as per the size by using shear cut machine.
- The overlap length is marked as per the table no.4.1 on to the plates as decided.
- Plates are then welded by gas welding process.
- Tensile test is carried out on Universal testing Machine.

Fig.No. 4.1 Fabricated Al Plates

5.0 Testing and Results

5.1 The tensile testing is carried out on universal testing machine.All the 3 samples for 1mm and 1.2mm each are tested. Result of 1 sample is given below in fig 5.1 and 5.2.



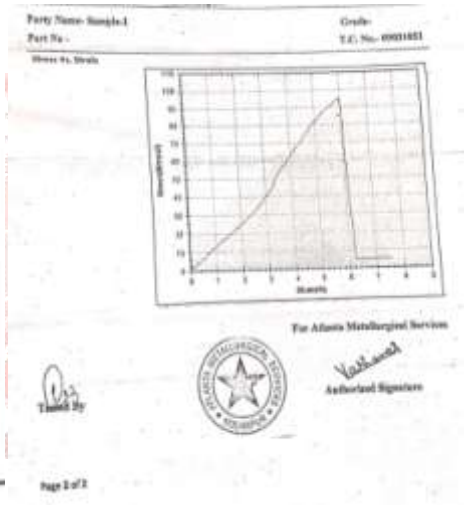


Fig.5.1 Test Result for sample no 1 **Fig.5.2 Graph for sample no 1**

5.2 All the test reports are taken and summary of 6 samples is given in following table no 5.1

And 5.2 respectively.

Table No.5.1 Test results for 1 mm thickness

No. of samples	Overlap length (mm)	Tensile strength (N/mm2)	Yield stress (N/mm2)
1.	15	95.00	76
2.	30	106.33	86
3.	40	123.33	96.33

Table No.5.2 Test results for 1.2 mm thickness

No. of samples	Overlap length (mm)	Tensile strength (N/mm2)	Yield stress (N/mm2)
1.	15	175.00	132.22
2.	30	196.00	76.00
3.	40	210.55	136.94

6.0 Conclusion:

1. From the graph it is observed that increasing the overlap length ,there is increased in strength upto critical limit of load and strain ,afterword's the value of stress falls down.
2. For 1mm thickness of Al 6061 plate ,for overlap length 40mm we have highest tensile strength 123.33 N/mm^2.
3. For 1.2mm thickness aluminum 6061 plate ,for overlap length 40mm we have highest tensile strength 210.55 N/mm^2.
4. We observed that more the overlap length more is the tensile strength ..
5. From all combinations the welding remains strong and the plates are broke above the weld.

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