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Testing and Comparative Study on Stainless Steel (SS 316) and Mild Steel (E250 BR IS 2062) performed by TIG, MIG and ARC Welding Processes

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Abstract: Our study on "Testing and comparative study on stainless steel (SS 316) and mild steel (E250 BR IS 2062) performed by TIG, MIG and ARC welding processes." is basically depends upon three different welding processes i.e. (TIG, MIG, & ARC Welding) and their different parameters which are responsible for creates various welding defects after performing the welding on the material stainless steel (SS 316) and mild steel (E250 BR IS 2062). The dimension and the thickness of the welding material is 150×150×8. The root face is 2 mm and the bevel angle are 60° of the welding materials. The testing performed after welding such as hardness test, tensile and bending test, microstructure, spectrographic, and dye penetration test to determine the improvement in mechanical properties of welding materials. This project examines the behavior of the material under the different welding process. As the result conclusion will be decided under the result value of different test under different condition and the cost of the welding. That can help the industry to increase the turnover ratio as well. In this experiment it will easy to find which is suitable for different applications per requirement for different usage to the Bajaj company and other industries. This project conclusion is depending on the time required for welding, cost for welding. Surface finished after welding, etc. It gives clear idea of the welding to help the industry to choose the suitable welding for suitable welding component.
Keywords: MIG, TIG, Arc stainless steel, mild steel.

I. INTRODUCTION

With ever increasing demand for both high production rates and high precision, fully mechanized or automated welding processes have taken a prominent place in the welding field. The rate at which automation is being introduced into welding process is astonishing and it may be expected that by the end of this century more automated machines than men in welding fabrication units will be found. In addition, computers play critical role in running the automated welding processes and the commands given by the computer will be taken from the programs, which in turn, need algorithms of the welding variables in the form of mathematical equations. To make effective use of the automated systems it is essential that a high degree of confidence be achieved in predicting the weld parameters to attain the desired mechanical strength in welded joints.

To develop mathematical models to accurately predict the weld strength to be fed to the automated welding systems has become more essential. After performing various sawyers in various industrial area. In that surveys we find that stainless steel (SS 316) and mild steel (E250 BR IS 2062) this material is commonly used in engineering and fabrication workshop. These two materials have lots of application in industry

II. LITERATURE REVIEW

A. Study On Arc Welding Processes For High Deposition Rate Additive Manufacturing

1) *IvanTabernero, Amagoia Paskual, Pedro Alvarez, Alfredo Suarez.:* Wire Arc Additive Manufacturing (WAAM) combines arc welding and wire feedstock material for additive manufacturing (AM) purposes. Ti6Al4V and AISI 316L these two materials are selected for the weld with different welding gas. As per requirement .1 to1, 5 kg/h deposition rate was maintained. And size of wire 1.2 mm diameter and 10 mm thickness for both materials. Mechanical properties were evaluated by tensile test specimens which were extracted by electron discharge Machining. Ensile tests were performed in displacement rate of 1.6mm/min and using an extensometer with a gauge length of 25mm. after testing and compering data they find TIG process could be used for small/medium size Titanium and Stainless-steel parts which have medium/high mechanical requirements.

B. Influence of the Gap Width on the Geometry of the Welded Joint in Hybrid Laser-Arc Welding.

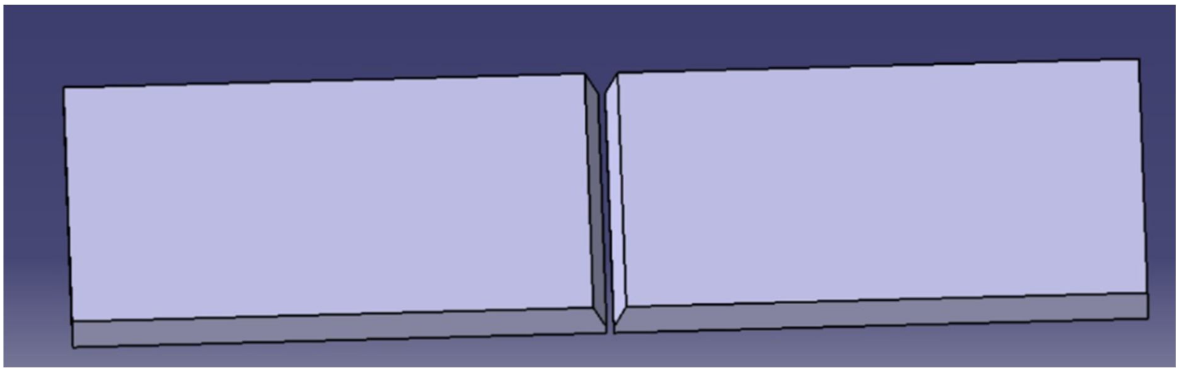
1) *G. Turichin, I. Tsibulskiy, M. Kuznetsov, A. Akhmetov, M. Mildebrath, T. Hassel*: Research was the experimental investigation of the influence of the gap width and speed of the welding wire. For given experiment they chose steel RS E32 (230*70*7) filler wire diameter 1.6mm. Welding was carved out at PA welding position. Experiment was created by varying the gap width from 0 mm to 1.2 mm with step of 0.3 mm while other HLAW parameters were kept constant. Result is that Welds geometry was changed from “cup-shaped” form to “vase-shaped. The maximal efficiency of the HLAW is at the gap width 0 mm. The minimal Efficiency occurs at the gap width 1.2 mm. It can be explained that with increasing gap the welding pool width Increases too, and, therefore the volume of the dropping melting metal is higher. The reason for this is gravity.

C. Study and comparison of gas metal arc welding & gas tungsten arc welding on aluminium.

1) Aamir R. Sayed, Bhushan J. Nagarare, Avesh Selokar, Abhishek R. Karande: The study is based on observation of welding technologies like GMAW & GTAW & variation of the properties of aluminium material grade 5059-H321. Sample are prepared according to ASME code. that the deposition rate is low in GTAW & also is applicable in all welding position. Cost of GMAW is higher than GTAW.

III. PREPARATION OF MATERIAL FOW WELDING

The samples are prepared by cutting the long 8 mm thick sheet into 150 mm × 150 mm area. Each sample is chamfered from one side at an angle of 30 degree such that after joining two respective sample the V groove of 60 degree and root clearance of 2 mm is obtained. The actual samples and detailed drawing are shown below in Fig



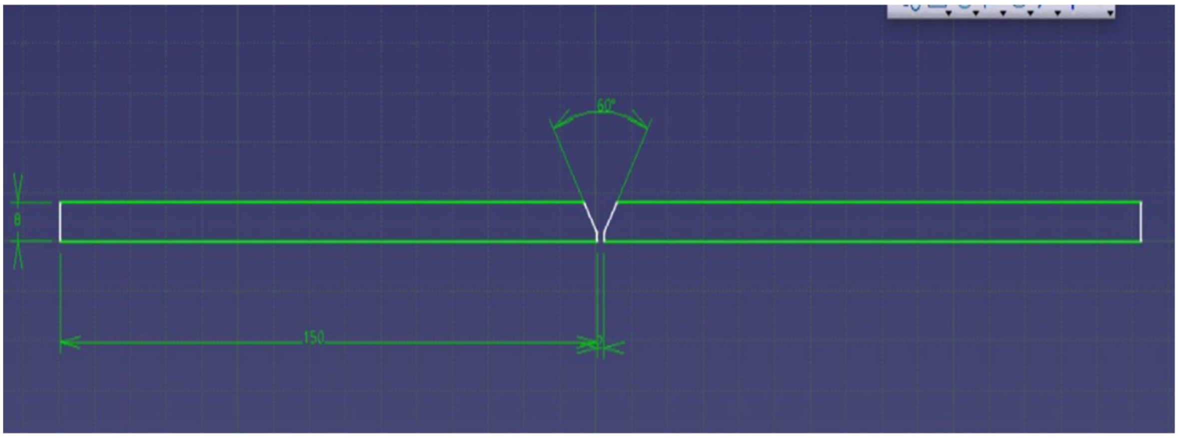


Fig: Detailed drawing of sample

Width and thickness of material are as per standard, so the material is cut by using grinder machine and maintain the size of material 150×150×8. The angle and root are maintaining by using milling machine. Depth of root is 2mm and angle is 30deg. fig show the systematic sketch of workpiece. after proper shaping material are grind as per requirement of welding.

Fig: milling for angle

A. Performance Of Welding

After arranging welding material according to requirement welding is perform. selection of welding is according to requirement of industry. fig show arrangement of material before welding, and after welding. Welding process and electrode according to as par industry.

Fig: performance of welding

IV. OBSERVATION

Observation of welding is shown in below table.

Sr no	Welding process	No of run	Time (min)	Electrode consumption	Electrode for MS+MS	Electrode for SS+SS	Electrode for MS+SS(Arc)
1	Arc	4	10-15	4	AWS-A-5.1 E6013	AWS A/SFA-5.4 E308L-16	AWS A/SFA-5.4 E309L-16
2	MIG	4	7-10	300mm	AWS SFA-5.18 ER 70S-2	-	-
3	TIG	4	5-6	320mm	AWS ER70S-2	ER308-L	ER308-L

V. RESULT

Following table shows the tensile strength of material

A. SS 316

Sample	Ultimate Load (KN)	C/S area (mm2)	UTS N/mm2	Broken at
SS 316 (ARC)	91.55 6	164.2 60	557.409	Base metal
SS 316 (TIG)	89.28	164.43	542.967	Base metal
SS 316 (MIG)	-	-	-	-

Table: Tensile strength of SS 316

B. E 250BR IS2062

Sample	Ultimate Load (KN)	C/S area (mm2)	UTS N/mm2	Broken at
MS E250Br IS2062 (ARC)	71.34	142.5	500.63	Base metal
MS E250Br IS2062 (TIG)	52.98	133	398.34	Weld metal
(M MS E250Br IS2062 IG)	64.14	145.1 6	441.33	Base metal

Table: Tensile strength of E 250 BR IS 2062

C. SS 316 + E 250 BR IS 2062

Sample	Ultimate Load (KN)	C/S area (mm2)	UTS N/mm2	Broken at
SS 316+E250BR IS 2062 (ARC)	66.87	139.8	487.189	Base metal
SS 316+E250BR IS 2062 (TIG)	67.61	144.4	468.49	Base metal
SS 316+E250BR IS 2062 (MIG)	-	-	-	-

Table: Tensile strength of SS 316+E 250 BR IS 2062

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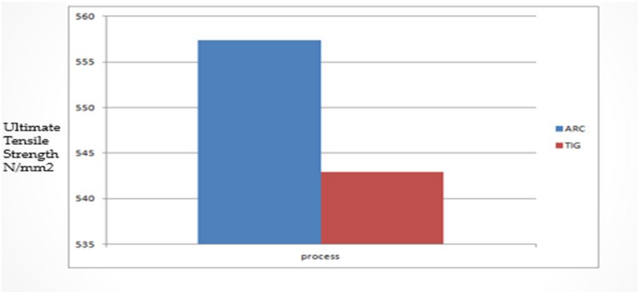
VI. CONCLUSION

Following graph show conclusion of welding
Graph is draw beaten ultimate tensile strength vs process

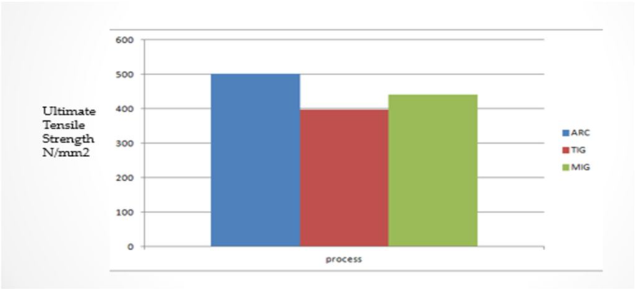
A. SS316



Graph: SS316 comparison

An according to data available during welding observation and welding testing is find that for SS 316 Arc welding superior and time consuming.

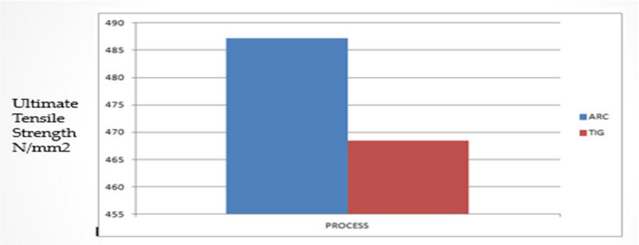
B. E 250 BR IS 2062



Graph: E 250 BR IS 2062 comparison

An according to data available during welding observation and welding testing is find that for MS E 250 BR IS 2062 Arc welding superior.

C. SS316+ E 250 BR IS 2062



Graph: SS316+ E 250 BR IS 2062 comparison

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REFRANSES

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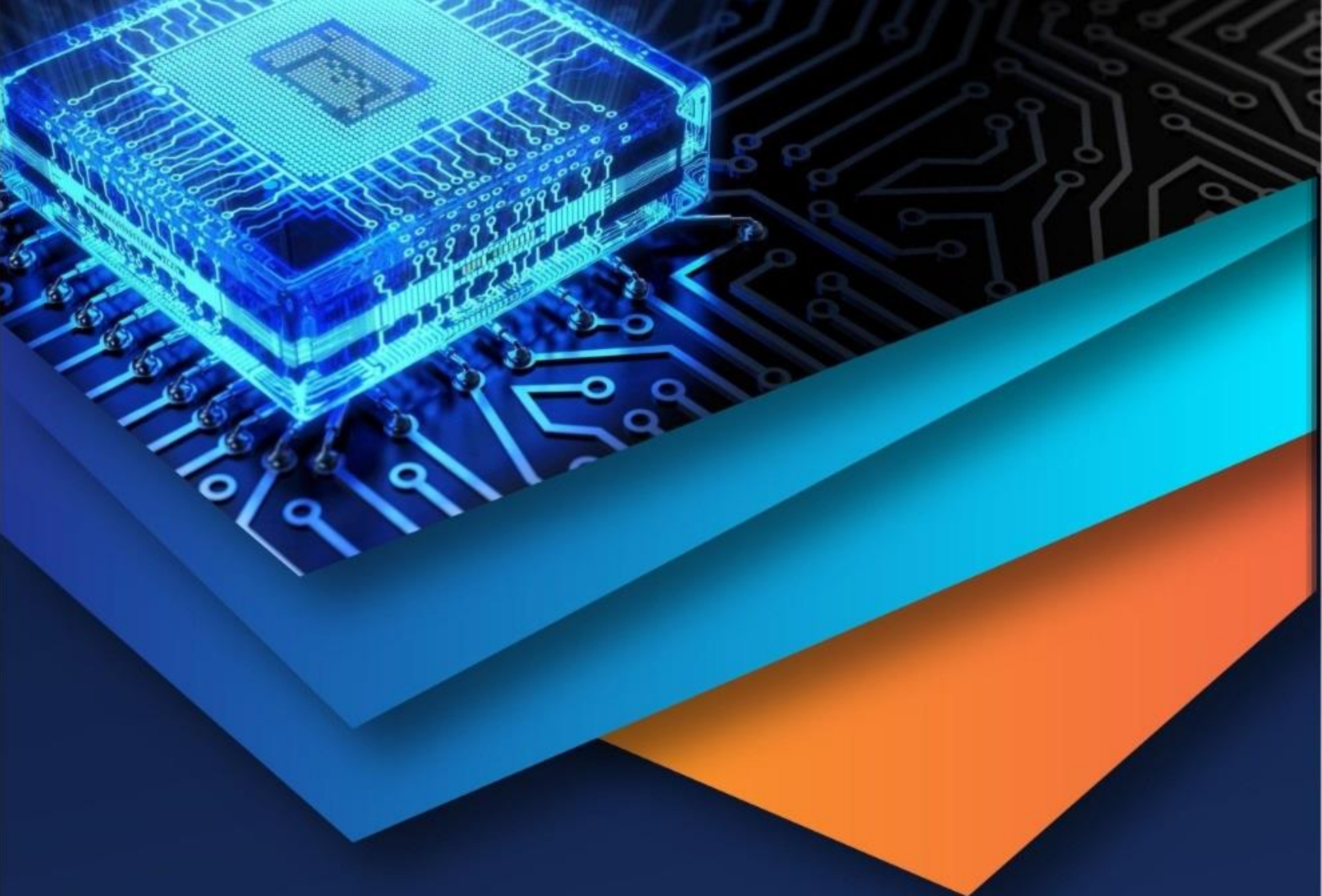

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