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Prediction Of Weld Bead Geometry Analysis For Disimilar(Al Lm6 &Allm25) Metal Matrix Composites

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Abstract*— Metal matrix composites (MMCs) combine a stiff but brittle phase, typically a ceramic, with a more ductile metal matrix. The correct fractional combination of materials can result in a material with improved stiffness, creep resistance, yield stress and wear resistance relative to the monolithic matrix.LM25 is mainly used where good mechanical properties are required in castings of shape or dimensions requiring an alloy of excellent cast ability in order to achieve the desired standard of soundness. The alloy is also used where resistance to corrosion is an important consideration, particularly where high strength is also required. It has good weld ability. Consequently, LM25 finds application in the food, chemical, marine, electrical and many other industries and, above all, in road transport vehicles where it is used for wheels, cylinder blocks and heads, and other engine and body castings Aluminium LM06 is suitable for most marine 'on deck' castings, water-cooled manifolds and jackets, motor car and road transport fittings, thin section and intricate castings such as motor housings, meter cases and switch boxes, for a very large aluminum casting, e.g. cast doors and panels where ease of casting is essential, for chemical and dye industry castings, e.g. pump parts, and for paint industry and food and domestic castings. It is especially suitable for castings that are to be welded. The main objective of the present work is to manufacture the metal matrix composites, weld using GTAW. The acceptable weld bead shape depends on factors such as power, ampere rating which is the heat energy supplied by an arc to the base plate per unit length of weld, welding speed, joint preparation, etc. To do these precise relationships between the process parameters and the bead parameters controlling the bead shape are to be established.

In this project we will be made many attempts for made test pieces to predict the process parameter of TIG for getting maximum weld element, best mechanical properties and maximize weld deposition. The planned experiments are conducted in the TIG are welding machine; the test piece examination is carried out by following process

***Keywords*— GTAW, LM25, LM06, Metal matrix composites, weld element**

I. INTRODUCTION

Welding is a permanent joining process used to join different materials like metals,alloys or plastics, together at their contacting surfaces by application of heat and or pressure.During welding, the work-pieces to be joined are melted at the interface and aftersolidification a permanent joint can be achieved. Sometimes a filler material is added to forma weld pool of molten material which after solidification gives a strong bond between thematerials. Weld ability of a material depends on different factors like the metallurgicalchanges that occur during welding, changes in hardness in weld zone due to rapidsolidification, extent of oxidation due to reaction of materials with atmospheric oxygen andtendency of crack formation in the joint position

II. EXPERIMENT ANALYSIS

A. Brinell Hardness Test

The purpose of this laboratory is to determine the hardness and the tensile strength of three metal samples: 1020 Steel, 6061 Aluminum and 2024 Aluminum. The Brinell and Rockwell Hardness Tests are used to determine this. With the results obtained from each sample, the engineer will be able to determine how the samples relate to each other. Both the Brinell and Rockwell Hardness Test are considered to be non-destructive.

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Fig:1 Brinell hardness

1) The Brinell Hardness Test Requires The Use Of The Following: 1- Brinell Hardness Tester Model HB-3000B
1- Testing Block with known BHN
3- Metal test samples
1- Microscope of low power
1-Ten millimetre diameter steel ball

The Brinell Test consists of pressing a steel ball of 10-millimeter diameter into the test sample for a standard amount of time, which will be 12 seconds for our laboratory. The 10-mm steel ball will impose a load of 3000 kg for steel samples and1500 kg for aluminum samples. This load will cause a depression to remain on the surface of the sample after the load is removed. The spherical area of the indentation can be calculated from the diameter of the indenter and the diameter of the depression on the surface of the sample. For the Brinell Test, the steel ball must not deviate in diameter more than 0.01 mm and balls of harder material are to be used if the sample has a known BHN greater than 450. Before starting either test, a test block was used on both the Brinell and Rockwell testers in order to verify accurate results. Tests should not be made too close together or too close to the edge of the sample.

TABLE1: (BEFORE WELDING)-TIG

Material name	BHN
LM 6	19
LM25	21

TABLE 2: (AFTER WELDING)-TIG

Volt/Amp	LM6-LM25			
	LM-6	BHN	LM-25	BHN
125/55	4.35	26	4.56	22
150/70	4.4	25	4.36	25
175/85	4.5	23	4.6	21
200/100	4.2	28	4.3	26
225/115	4.36	25	4.3	26
250 /130	4.36	25	4.46	23

B. Non-Destructive Testing

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Non-destructive Test and Evaluation is aimed at extracting information on the physical, chemical, mechanical or metallurgical state of materials or structures. This information is obtained through a process of interaction between the information generating device and the object under test. The information can be generated using X-rays, gamma rays, neutrons, ultrasonic methods, magnetic and electromagnetic methods, or any other established physical phenomenon. The process of interaction does not damage the test object or impair its intended utility value. The process is influenced by the physical, chemical and mechanical. NDT Methods range from the simple to the intricate. Visual inspection is the simplest of all. Surface imperfections invisible to they may be revealed by penetrate or magnetic methods. If serious surface defects are found, there is often little point in proceeding further to the more complicated examination of the interior by other methods like ultrasonic or radiography. The principal NDT methods are Visual or optical inspection, Dye penetrant testing, Magnetic article testing, Radiography testing and Ultrasonic testing.

1) Ultrasonic Testing: Concrete Ultrasonic inspection is a nondestructive method in which beams of high frequency sound waves are introduced into materials for the detection of subsurface flaws in the material. The sound waves travel through the material with some attendant loss of energy and are reflected at interfaces (cracks or flaws). The reflected beam is displayed and then analyzed to define the presence and location of flaws or discontinuities. Ultrasonic testing is used to find out the size and location of the defects. The most commonly used ultrasonic testing technique is pulse echo, wherein sound is introduced into a test object and reflections are returned to a receiver from internal imperfections or from the parts geometrical surfaces.

Fig: 2 Ultrasonic testing equipment

2) Ultrasonic Result

TABLE 3: ULTRASONIC TEST REPORT

S.NO	ITEM NO/ LOCATION	MATERIAL Components	THICKNESS	INDICATIONS	RESULT
1.	TP1	LM6&LM25	10 MM	ICP	--
2.	TP2			Por	--
3.	TP3			NI	ACCEPT
4.	TP4			NI	ACCEPT
5.	TP5			SL	---
6.	TP6			EP	--

LEGENDS:

NI –No Indications Cr – crack
Inc – Inclusion EP – Excess penetration
SI – Slag U/C – Undercut
Por – Porosity Con – Concavity
Lam – Lamination Lof – Lack of fusion
Lop – Lack of penetration ICP – Incomplete penetration

C. Depth Of Pnetration

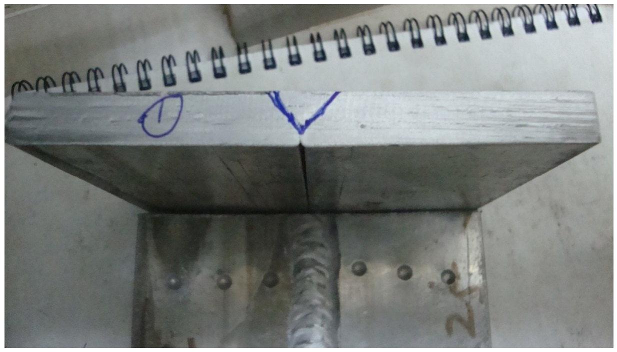

Fig:3 image of welded material

Inadequate weld bead dimensions such as shallow depth of penetration may contribute to failure of a welded structure since penetration determines the stress carrying capacity of a welded joint .To avoid such occurrences the input or welding process variables which influence the weld bead penetration must therefore be properly selected and optimized to obtain an acceptable weld bead penetration and hence a high quality joint . To predict the effect of welding process variables on weld bead geometry and hence quality researchers have employed different techniques

Contents of ImageJ folder:

ij.jar This JAR (Java Archive) file is the platform-independent core of ImageJ. It is the only file changed when you upgrade using the Help>Update ImageJ command.

ImageJ.exe This is the ImageJ launcher for Windows.

macros This folder contains example macros. The StartupMacros.txt file in this folder contains macros and macro tools that are automatically installed when ImageJ launches. To run a macro, drag and drop it on the ImageJ window and run it by pressing ctrl-r (Macros>Run Macro).

Plugins This folder contains a small sample of the hundreds of plugins available for ImageJ. The plugins in this folder are installed in the Plugins menu when ImageJ starts.

Luts This folder contains LUTs (LookUp Tables) that are installed at startup in the Image>Lookup Tables menu. Use the Image>Color>Display LUTs command to view all the LUTs in this menu.

TABLE 4: VARIOUS SIZES OF BEAD WIDTH,DEPTH OF PENETRATION AND HEAT AFFECTED ZONE

TEST SAMPLE	7 85.731 LOCATION	234.487 Area	-91.102 Mean	6.118 Min	Max	Angle	Length
SAMPLE-1	BW	0.441	188.788	99	215.917	-91.023	6.999
	DOP	0.882	177.664	129.333	196.333	0	14.121
SAMPLE-2	BW	0.363	172.277	85.731	234.487	-91.102	6.118
	DOP	0.709	190.705	74.353	230.993	1.123	12.001
SAMPLE-3	**BW**	**0.458**	**186.538**	**42.778**	**219.042**	**-90.796**	**8.091**
	DOP	**10.225**	**10.225**	**10.225**	**10.225**	**10.225**	**10.225**
SAMPLE-4	DOP	0.433	175.529	86.667	208.333	-90	7.441
	BW	0.652	170.535	150.917	180.979	-0.597	11.163

SAMPL-5E	DOP	0.433	175.529	86.667	208.333	-90	7.441
	BW	0.652	170.535	150.917	180.979	-0.597	11.163
SAMPLE-6	0.358	0.358	138.449	62	168	-90	6.874
	0.662	0.662	125.34	48.667	148.333	0	12.706

III.CONCLUSIONS

TIG welding can be used successfully to join dissimilar weld of LM 6 and LM25. The processed joints exhibited better mechanical and metallurgical characteristics. The joints exhibited 90-95% of parent material's Hardness value. The specimen failures were associated depending upon the improper changes of heat value it creates so many metallurgical defects and it is identified by using NDT testing. In our experiment we found out the input parameter value of peak and base current 175A/85V is the best value and it does not create any major changes and failures in the testing process. The Depth of penetration value of the TIG welded LM6 and LM25 value was comparatively nominal value (175A/85V) than other value. It also induces high tensile strength. Finally I concluded that in this project investigation the 175A/85V is the best parameter for 10 MM thickness plate for (lm6 &LM25) obtain the good weld element state.

IV.ACKNOWLEDGMENT

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