

Reduction of Cross Contamination by Welding Process for M.S. and S.S

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Abstract - Cross Contamination Defect is Occurred in Generally Metal Joining Process. In this Process Cross Contamination is Occred in Joining of Mild Steel and Stainless Steel. This Defect is occurred by Mixing of mild steel and stainless steel by arc welding process. Stainless steel is used to made of Pressure vessels, but stainless steel is high cost material, so for reducing of cost by metal joining process of ms and ss is necessary. but when metal joining process is directly done the cross contamination is occurred. For reducing this defect slots are making on ms plate and ss plates and then ss 316L is poured on it and then arc welding is done on it. To using this process in metal joining process cross contamination defect is reduced and this metal joining process mixture of SS316L and MS IS2062 is ready to made of pressure vessels. for checking of chemical composition of both metals testing procedures are required..

IndexTerms – MIG welding, TIG welding, Hardness testing, Chemical testing

I. INTRODUCTION

We all know that stainless steel is used for dairy purpose, pharmaceutical industries, for chemical storage and bio-medical application. For this applications only non ferrous materials are used. The reason of using stainless material is that it is corrosion resistance material and having high strength and hardness. Welding is one of the fabrication processes that is used for joining the metals, by causing coalescence which replaces other joining processes like bolting, riveting. A good joint will be obtained through TIG welding and a preferred by most of the manufactures for mechanical assemblies. Generally filler material is used in metal joining processes, even in TIG welding.[2] Now a day's welding is mostly used in fabrication of many components including critical shapes and structures. TIG welding is also known as Gas Tungsten Arc Welding (GTAW) in which an arc is maintained between the base metal and the non consumable tungsten electrode.[2] Stainless steel is a candidate material for the structural material in fusion reactors. Rewelding of irradiated materials will have a large impact on the design and the maintenance scheme of in-vessel components. Recently, joining technology with irradiated structural materials has been investigated, using tungsten inert gas

(TIG) welding.[4] Mild steel is considered a material of choice in diverse industrial and structural applications, and used for a wide range of equipment due to its relatively low cost and good mechanical strength.[6]

SS316 and SS316L is the contact part material SS316L is better than SS316 because low carbon contain in SS316L. For cost cutting process the joining of mild steel and stainless steel material is used but there is some defect is occurred called cross contamination defect. Cross Contamination: When joining of mild steel and stainless by welding process some content of mild steel is mixtured in stainless steel and corrosion defect may be occurred, this defect is called cross contamination defect. Welding technique: Carbon dioxide welding, Arc Welding, TIG Welding, MIG Welding are used in this metal joining process.

II. EXPERIMENTAL WORK

In this process mild steel is taken as a base plate and stainless steel plate is welded over the mild steel by making slots on stainless steel and weld on it. But, slots are only on stainless steel plate not on mild steel plate. Spot welding is done on stainless steel plate which is welded over the mild steel plate. And then rolling process is done on that plates, after rolling process After rolling process mild steel material is mixing on the stainless steel material plate. So cross contamination defect is occurred. For reducing the defect slots are taken on both MS and SS plates and then SS316L weld is done on it. by this process if materials are mixture as a same plate ss316 L so cross contamination process is reduced. Using this process cost is reduced and mechanical strength is maintained. There are many type of material used in metal joining process in steel grades. Welding Process is Thermistor type Arc welding.

Testing Methods

- Mechanical Testing
- Chemical Testing

Material

- SS 304, SS 316
- Components of SS 316 : Fe, C, Cr, Ni, Mo, Mn, Si, P

Sample1	Sample2
MS -220*220mm	MS -220*220mm
SS-200*200mm	SS-200*200mm
MS Thickness-8mm	MS Thickness-8mm
SS Thickness-3mm	SS Thickness-3mm
No Hole Required	Hole Required-3mm
Welding-Co2 Welding	Welding-Co2 Welding
Filler Wire-SS 316L	Filler Wire-SS 316L



Fig. Sample1. Without Hole in MS Plate

This sample is created without hole in mild steel plate. So the cross contamination process is occurred because of mixing of mild steel and stainless steel.



Fig. Sample2. With hole in MS Plate

Cost Analysis

1 Using only SS 316 Plate

Material Weight Formula

Volume * Density

= $220 \times 220 \times 11 \times 0.000008$ (SS 316 Density 0.000008)

= 4.25 kg.

Cost of SS 316 per kg = 240 Rs./kg

So, $4.25 \times 240 = 1020$ Rs

1020 Rs is Material cost and labour cost should be counting.

1020 rs

+ 300 rs

1320 Rs

2. Using MS IS2062

Volume * Density

= $220 \times 220 \times 8 \times 0.00000785$ (MS IS2062 Density 0.00000785)

= 3.03952 kg.

Cost of MS IS2062 per kg = 40 Rs/kg

So, $3.03952 \times 40 = 121.58$ Rs.

121.58 Rs + 300 Rs labour cost = 421.58 Rs.

SS plate

= $200 \times 200 \times 3 \times 0.000008 = 0.96$ kg

So the cost of SS plate is $0.96 \times 240 = 230.40$ Rs

The whole sample is completed in between $421.58 + 230.40 = 651.98$ Rs So, the difference between the two sample is $1320 - 651 = 669$ Rs.

Chemical Testing Report

Sample1

Sr. no.	ID.No.		%C	%Si	%Mn	%P	%S	%Cr	%Mo	%Ni
		Min	-	-	-	-	-	16.00	2.00	10.00
		Max	0.080	1.00	2.00	0.045	0.030	18.00	3.00	14.00
1	Parent Metal		0.026	0.397	0.922	0.019	0.001	16.54	2.03	10.16
2	Weld Joint		0.032	0.545	1.42	0.023	0.001	17.64	2.58	11.24

Sample2

Sr. no.	ID.No.		%C	%Si	%Mn	%P	%S	%Cr	%Mo	%Ni
		Min	-	-	-	-	-	16.00	2.00	10.00
		Max	0.080	1.00	2.00	0.045	0.030	18.00	3.00	14.00
1	Parent Metal		0.027	0.387	0.927	0.015	0.001	16.58	2.02	10.09
2	Weld Joint		0.034	0.533	1.48	0.001	0.001	17.58	2.93	11.49

Hardness Testing Report

Sample1

Sr.no.	Component	Hardness(HV10) Observed	Hardness(H30) Observed
01	Weld	210,209	-
02	HAZ	221,216	-
03	Parent Metal	-	157

Sample2

Sr.no.	Component	Hardness(HV10) Observed	Hardness(H30) Observed
01	Weld	225,254	-
02	HAZ	243,238	-
03	Parent Metal	-	178.3

III. CONCLUSION

- The cross contamination defect is reduced, it is shown in hardness test, because the cross contamination is reduced than hardness is increased.
- The process of metal joining of mild steel and stainless steel is properly welded because of modern process.
- Cost of specimen used in this work is half that of when whole specimen made of stainless steel plate material.
- By modern joining procedure of metal joining of mild steel and stainless steel is better than conventional process in terms of reduction of cross contamination with increase in joint hardness.

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