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ANALYSIS AND EXPERIMENTAL INVESTIGATION OF WELD CHARACTERISTICS FOR A TIG WELDING WITH SS304L & SS410

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Abstract : The analysis and optimization joining two analogous grade ss410 & ss304l of pristine sword by using by TIG welding process and mechanical testing. compass of TIG welding has to been increased colorful engineering field like aerospace and dangerous surroundings bear completely automated system. In this work trial has to be carried out on ss410 & ss304L pristine sword plate are using tungsten inert gas process the argon gas are using condemned of trials pristine swordspecimen.In the welding assiduity the common operation of different part with hotting the material applying pressure or using the padding material adding productivity with lower time of cost current gas inflow rate of welding speed responsive parameter welding speed hardness of testing the weldment ss410 and ss304l are using TIG welding. Two different grade of two plates of welding are successful to weld of pristine sword and ultrasonic testing, Uradiographic testing micro structure testing experimental work is to see the effect of palpitated current on the characteristics of weldment.

Keywords: Radiographic testing, micro structure testing, Ultrasonic testing, tensile testing, crack analysis

1.Introduction:

Tungsten Inert Gas(TIG) welding uses the heat generated by an electric bow struck between anon-consumable tungsten electrode and the workpiece to fuse essence in the common area and produce a molten weld pool. In an inert gas guard to cover the weld pool and the non-consumable electrode. The process may be operated autogenously, that is, without padding, or padding may be added by feeding a consumable line or rod into the established weld pool. TIG produces veritably quality welds across a wide range of accoutrements with density up to about 8 or 10 mm. It's particularly well suited to sheet material.

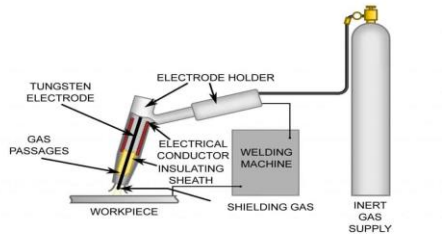

Fig 1 Tig welding setup

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Introduction: Material used – SS304L & SS410

Stainless steel 304L(SS304L) is an extra low-carbon variation of SS304 with a 0.03% maximum carbon content that eliminates carbide precipitation due to welding.

Table 1 composition of ss304L

		c	Mn	Si	Ps	S	Cr	ni
Grade	min	-	-	-	-	-	0.08	-
	max	0.03	2	0.75	0.45	0.03	18	8

SS 410 is a heat treatable martensitic chromium stainless steel. Melt practice is controlled to develop a surface nearly free from defects. It provides the best combination of wear resistance and corrosion resistance.

Table 2 composition of ss410

		c	Mn	Si	Ps	S	Cr	ni
Grade	min	-	-	-	-	-	11.5	0.75
	max	0.15	1	1	0.04	0.03	13.5	0.75

2.Methodology:

In this process the material ss304L and ss410 are named as work piece accoutrements for the trial and the plates are cut in to the needed confines of 110 mm x 50 mm with consistence of 5mm.After that buffing is done on the face of material to remove any kind of external material.

fig 2 Sample of ss304L&ss410 with double v-joint

After the medication of sample the two plates are fixed in working table by using clamps. In this trial tig welding is used as and tungsten electrode periphery of3.0 mm is used.

Table 3 welding parameters

Parameters	Welding current	Voltage	Speed	Distance From tip to weld	Gas flow rate	Current type	dimensions
Range	160	60	3mm/s	3mm	9L/min	Ac	110mmx 50mm x 5mm

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Fig 2.1 After welding sample

3.Testing of material: Accoutrements testing helps to understand and to specific material is suitable for a particular operation. With the variety of accoutrements and treatments available in the business, testing can help constrict down the choices to the most applicable selection for the use.

3.1Radiography test:

Radiographic Testing is anon-destructive testing system which uses eitherx-rays or gamma shafts to examine the internal structure of manufactured factors relating any excrescencies or blights.

Table 4 Radiography test

Source : x-ray	Activity: 2.5ma Energy/voltage 16kv
Material: ss304l&ss410, 5mm thickness	Size focal spot: 2x2mmm weld process: GTAW
IQI: ASTM : 12 , Wire: ASTM 1A	Film: AGFA-D7 S.F.D :70CM
Density : 2.0 -2.8, Sensitivity: 2-2T &2%	P b screen fort : 10mm Back : 0.15mm
Process ref : ASME SEC-IX-2021 Acc std : ASME SEC-IX-2021 QW -191	EXP Time : 1.0 min Tech : sws

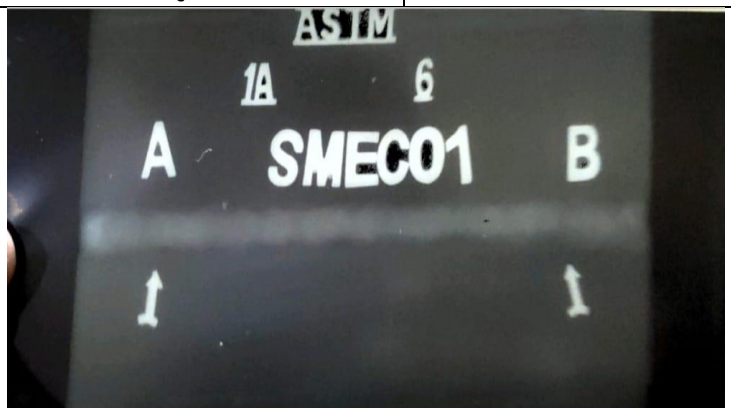


Fig 3.1 X-ray of sample

3.2Ultrasonic test: Ultrasonic testing is a fashion grounded on the propagation of ultrasonic swells in the object or material tested. In utmost common UT operations, veritably short ultrasonic palpitation- swells with centre frequentness ranging from0.1- 15 MHz, and sometimes over to 50

MHz, are transmitted into accoutrements to descry internal excrescencies or to characterize accoutrements .

Table 5 ultrasonic test

S.no	Probe	Frequency	Input pulse	Waves	Couplant	Pulse energy db	Calibration block	sensitivity
1	Angle 70^0	04MHZ	8X9mm	Shear waves	Oil	60db (50 +06db)	V2 block	v-notch

3.3Microstructure test: Microstructural examination is generally performed using optic or surveying electron microscopes to magnify features of the material under analysis. The quantum or size of these features can be measured and quantified, and compared to acceptance criteria.

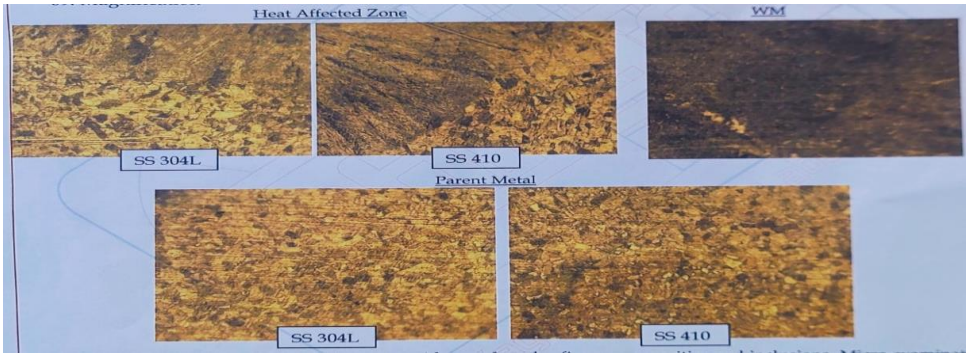
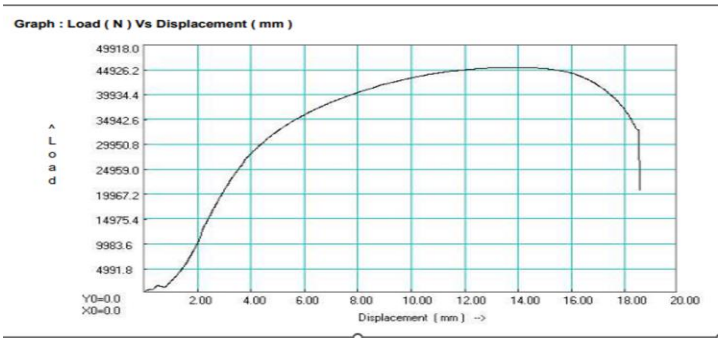


Fig 3.3 micro test sample

3.4Tensile test :Tensile test of the welded joint was performed with universal tensile testing machine with maximum cargo capacity of 600KN. Grounded on the observation the tensile test strength of the weld was advanced also base material.



3.5: Crack analysis

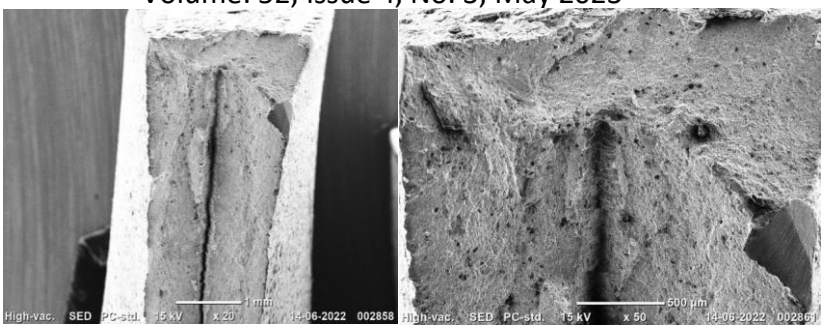


Fig 3.5Micro scope image of crack fig 3.5 crack portion

4. Conclusion: The reused joints exhibits asked mechanical and face characteristics. The process parameters play a vital part in barring the blights as micro test report shows that no attestations of cracks, crevices, porosities and eliminations. Micro examination of the weld also shows complete penetration and good emulsion in the weld HAZ and the weld is set up is respectable. The ultrasonic test report is also set up satisfactory as per std.

5. Future scope: This type of weld accoutrements have good strength and they're used in numerous engineering diligence and Aircraft, as well as spacecraft, machine assiduity.

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