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ACTIVATED FLUX TIG WELDING OF SIMILAR MATERIALS STAINLESS STEEL 308

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ABSTRACT
Activated Flux Tungsten Inert Gas Welding is one of the strategies for enhancing penetration functionality of autogenously TIG welding. The floor energetic flux improves penetration of weld which helps to limit the range of passes in weld, an integral requirement for any distinctive weldments. This is done by using utility of flux, firstly in the shape of powder which is transformed into paste and unfold over the location to be welded earlier than beginning the autogenous TIG welding process. The greater temperature in the arc melts the flux which will increase weld depth due to the fact of floor anxiety pushed pressure and constriction of the arc. The goal of contemporary work is to check out the weldability of a comparable aggregate of SS 308 and an accountable depth improving mechanism the use of exclusive aspect oxide fluxes. A-TIG welding method with TWO extraordinary fluxes; TiO2 and SiO2 with acetone as a service solvent was once carried out on a comparable mixture of 4mm thick SS 308 Plate in single ignore for current investigation.

Keywords: Welding, TIG Welding, Oxide Flux, Mechanical properties evaluation.

Introduction

In any manufacturing or fabrication industry, arc welding tactics play a quintessential role. Most often, this type of welding is referred to as Gas Tungsten Arc Welding (GTAW), also known as Tungsten Inert Gas (TIG), which involves arc an electrode made up of non-consumable tungsten between the work piece and a non-consumable gas. It protects the electrode, arc and liquid pool from atmospheric contamination with an inert fuel or mixture of inert gases. The Filler wire (FW) might also or may additionally now not be used relying upon thickness of material. This arc welding method is the most popular since it produces the highest quality weld and the best floor appearance [1-2]. The TIG welding process is used to join thick and thin sections together. In spite of this, every welding approach has some disadvantages when it comes to thick components. Some limitations Many researchers have regarded by many researchers. A-TIG welding turned into as soon as industrialized on austenitic stainless steels as a brand-new version of the conventional TIG device to triumph over TIG barriers. During the E.O Paton Institute Electric Welding, A-TIG welding was developed to counter the disadvantages of TIG welding [3-8].

Experimental setup

All experimental trials have been performed in autogenous mode using leopard GTAW strength source it's far designed as a one among a kind reason computing tool (SPM) for torch motion in X and Y course. The A-TIG welding set-up used for all gadgets of experiments is demonstrated. The DCEN (Direct Current Electrode Positive) polarity used to be used with a mechanized system. In addition, after every trial, the torch motion in the x-axis was once calibrated to make sure the tour pace (cm/sec). The tour pace for all units of experiments used to be saved 1.92 cm/sec, 2.27 cm/sec ,2.77 cm/sec. The arc used to be pushed along the centreline of the flux covered square butt groove and welding was done in a flat (1G) position, as confirmed in discern four.2 A element or the complete flux layer was molten and vaporized at some stage in the A-TIG welding procedure. All through the welding system, modern-day-day and tour speed, identified as welding parameters, are controllable parameters and the arc voltage, regarded to be an uncontrollable welding parameter, was calculated the use of a circuit-related voltmeter.

Experimental procedure

- **Base metal**

Oxygen-unfastened copper (Cu - 99.99wt%, O e 10 ppm, impuritiese0.01wt% max.) strips having dimensions 100 mm x 30 mm x 6 mm, were prepared for bead-on plate have a look at. They have been roughly polished (pinnacle of the plate) with a hundred and twenty, 320 grit (SiC) flexible abrasive papers to take away surface impurities accompanied via cleansing of welding floor the use of methanol. All 13 fluxes selected for A-TIG trials. The fluxes which stood in pinnacle four characteristic have been selected for FB-TIG welding. And for FZ-TIG welding MoO3 and MgO selected for centre vicinity flux even as TiO2, Fe2O3 and Al2O3 were chosen for facet area flux.

- **Oxide fluxes coating**

The fluxes used in activated flux TIG welding, in the structure of chemical powder, are in the main oxides, halides, chlorides or fluorides, relying on their use in the industry. But, oxide-based fluxes are maximum widely used. Many researchers have attempted these fluxes with the A-TIG welding approach in the unmarried factor or multi component shape. Inside the A- TIG welding technique, each flux has unique chemical and physical homes and specific behaviour.

Acetone is extensively used as provider solvents to convert TiO2 and SiO2 powder shape flux into paste. This paste is applied to the metal ground to be welded and the solvent has a temporary evaporation assets. Consequently, inside the A- TIG welding procedure, those alcoholic issuer solvents are very frequently used. In the existing research, Acetone became as soon as used as a provider solvent to convert flux powder into paste.

- **Welding**

SS 308 base metallic plates of measurement 100mm X 70mm X 4mm had been taken for welding. Tack welds have been made at ends of plate to put together specimens for the work. Initially two extraordinary oxide fluxes specifically TiO2 and

SiO2 have been used on the core of tack welded plates. The parameters used for all experiments had been stored the same. The important points of process, flux, plate dimension and pattern. After welding with these fluxes, visible inspection turned into as soon as carried out to check ground discontinuities like porosity, slag, crack and incomplete fusion.

Mechanical properties evaluation

➢ Tensile Testing

Tensile testing was performed on weld joints welded using the A-TIG and TIG method to determine the mechanicalproperties of the welded joint. The sample selection was done as shown in Fig. 1

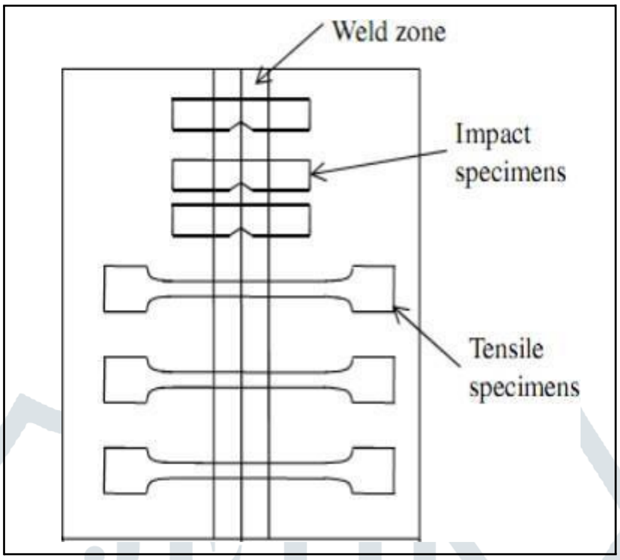

FIGURE 1: Sample selection for tensile test.

Tensile testing, in which a sample is subjected to controlled tension before fracture, is commonly used to determine the mechanical properties of welds. Tensile testing was used to evaluate the mechanical properties of the welded joints, such as yield strength, ultimate tensile strength, and ductility. The transverse tensile specimens were prepared according to ASTM Standard E 8/ E 8M – 08: Standard Test Methods for Tension Testing of Metallic Materials. The Universal tensile testing machine having 1000 KN load capacity having servo facility with front open crossheads and hydraulic grips was used to measure tensile properties at room temperature. The machine was equipped with a 32-bit microcontroller for basic testing and closed loop servo control for controlling and executing the load rate and crosshead travel rate in order to control and monitor the induced strain rate. For each condition, three specimens were examined at room temperature for each plate. During testing, the crosshead speed was set to produce a strain rate of 3.3 x 10-4 sec-1. For the purposes of measurement, average values were used.

➢ Hardness Testing

The Rockwell test is generally easier to perform, and more accurate than other types of hardness testing methods. The Rockwell test method is used on all metals, except in conditions where the test metal structure or surface conditions wouldintroduce too much variations; where the indentations would be too large for the application; or where the sample size or sample shape prohibits its use.

The Rockwell method measures the permanent depth of indentation produced by a force/load on an indenter. In this testingwe use ball indenter and red scale.

TABLE 1: Input Data for Hardness Test

	Scale	Indenter	Load Kgs.	Dial
S1-S9	G	1/16" ball	150	red

Result

SAMPLE ID	GAS FLOW RATE (L/min)	TRAVEL SPEED (cm/sec)	CURRENT (Amp.)	PULSE (Hz)	TENSILE STRENGTH (KN/mm2	HARDNESS HAZ ZONE	HARDNESS WELD ZONE
1	8	1.9	160	120	0.502	78	79.5
2	8	2.27	170	140	0.439	80	81
3	8	2.77	180	160	0.577	76.5	88
4	10	1.9	170	160	0.491	65	65
5	10	2.27	180	120	0.639	57.5	66
6	10	2.77	160	140	0.493	62.5	51
7	12	1.9	180	140	0.633	62.5	67.5
8	12	2.27	160	160	0.463	63.5	77.5
9	12	2.77	170	120	0.581	65	78.5

Conclusion

In the existing study, the A-TIG welding procedure with two distinct oxide fluxes used to be carried out to put together comparable weld joints between stainless metal 308. The impact of fluxes on weld morphology used to be analyzed. Also, the metallurgical and mechanical residences have been studied and in contrast with the effects of the A-TIG process.

1. The intensity of penetration up to 4 mm changed into as soon as performed with A-TIG welding process the usage of SiO_2 and TiO_2 fluxes and it is able to be efficaciously applied for comparable welding of stainless metal 308 the use of SiO_2 and TiO_2 fluxes.
2. The mechanical houses (hardness, tensile energy, and breaking absorbed strength) have been no longer decreased the use of ATIG welding.
3. Activated TIG welding was once determined to be weld homes such as extended hardness and penetration arerequired.

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