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# INVESTIGATION OF MECHANICAL STRENGTH OF AISI 1010 MILD STEEL USING TUNGSTEN INERT GAS (TIG) WELDING-A REVIEW

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## ABSTRACT

Tungsten Inert Gas welding is likewise appertained to as Gas Tungsten Arc Welding( GTAW), is an strengthen bow welding system grow to be a notorious desire whilst a inordinate stage of weld. first- rate or sizeable perfection welding is needed still. The predominant troubles of TIG welding system are its sluggish welding haste and confined to drop consistence fabric in unattached pass. In this proposed work, autogenously TIG welding done on 1010 moderate essence plate with out the use of any padding fabric. Wide variety of welding contemporary and test haste could be acquiring a complete penetration welding. Actuated flux could be used to enhance the weld depth. After acting welding with the aid of using conserving one- of-a-kind hole among the plates to be welded, weld blob figure and tensile electricity of the could be delved .

**Keywords:** - Tungsten Inert Gas welding, Activated flux, Tensile test, Hardness test and A - TIG welding process.

## 1. INTRODUCTION

In the 1940s, magnesium and aluminum could be joined together via tungsten inert gas (TIG) welding, which quickly became popular. This method was a very appealing alternative to manual metal arc welding and gas welding since it used an inert gas shield rather than a slag to protect the weldpool. Aluminum is now widely used in structural applications and high-quality welding thanks in large part to TIG.

**1.1 Process characteristics-** An arc is created during the TIG welding process between the workpiece and a pointed tungsten electrode in an inert argon or helium atmosphere. For fine and precise welding, the pointed electrode's small, powerful arc is perfect. The TIG welder does not need to balance the heat input from the arc as the metal is deposited from the melting electrode as the electrode is not consumed during the welding process. If filler metal is needed, it needs to be introduced to the weldpool individually.

**1.2 Power source-** A DC or AC power source that droops and maintains a steady current is required to run TIG welding. In order to prevent abnormally high currents from being pulled when the electrode is short-circuited onto the workpiece surface, a constant current power source is necessary. This may occur accidentally while welding or on purpose during arc initiation. Any contact with the workpiece surface would harm the electrode tip or fuse the electrode to the surface if, as in MIG welding, a flat characteristic power source is utilized. In DC, the electrode is always negative polarity to prevent melting and overheating because arc heat is distributed around one-third at the cathode (negative) and two-thirds at the anode (positive). Nevertheless, the positive polarity DC electrode connection to the alternate power source has the benefit of cleaning the workpiece's surface of oxide contaminants while the cathode is there. Because of this, AC is utilized for welding materials like aluminum that have a persistent surface oxide deposit.

**1.3 Arc starting-** By creating a short circuit on the surface, one can initiate the welding arc. The primary welding current won't flow until the short-circuit is broken. Nonetheless, there's a chance the electrode will adhere to the surface and result in a tungsten inclusion in the welded joint. The 'lift arc' technique, in which the short-circuit forms at a very low current level, can help minimize this risk. The TIG arc is most frequently started using HF (High Frequency). High voltage sparks with a few thousand volts and a brief duration are what make up high frequency radiation (HF). The electrode - workpiece gap will ionize or disintegrate as a result of the HF sparks. After the formation of an electron/ion cloud, current can flow from the power source**.**

## 2. LITERATURE REVIEW

TIG welding is widely used for different types of metal & alloy and still lots of research workis going for better performance by TIG welding process.

**Krishnan et al. [6]** done experiment to analyze the microstructure and oxidation resistance at different regions in the mild steel weld by TIG welding. During welding process a sharp change in the microstructure due to complex thermal cycle and rapid solidification was observed. This micro-structure change also affects the mechanical properties and

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oxidation resistance of the mild steel weld. Autogenous TIG welding was performed on 12 mm thick mild steel with 200 A current, 19 V voltage and 100 mm/min welding speed. Finer grain size was obtained at weld metal and heat affected zone.

**Raj and Varghese [7]** Prognosticate the deformation developed during TIG welding of low carbon sword. In their study, have developed three dimensional finite element model like longitudinal, angular or transverse deformation. deformation in welding produced due tonon-uniform heating and cooling. To validate the model welding was performed with welding current 150 A, electrode gap 3 mm, gas inflow rate 25 l/ min, electrode periphery0.8 mm and Argon as shielding gas. They concluded that, maximum deformation occurs at face contrary to the weld and along X direction of weld compare to other two directions.

**Abhulimen and Achebo [8]** performed Trials to identify the provident welding parameters using Response face methodology( RSM) during TIG welding of mild sword pipe. Welding Parameters considered were gas inflow rate 25 to 30 l/ min, welding current 130 to 180 A, bow voltage10.5 to13.5 volt and argon as shielding gas. Results showed that, by using TIG welding of mild sword outside tensile and yield strength of 542 MPa and 547 MPa was achieved independently.

**Mishra et al. [9]-** have done comparison of mechanical parcels between TIG and MIG.

welded different joints. Mild sword and pristine sword different material joints are veritably common structural operati on.These different joints give good combination of mechanical parcels like sharp resistance and,tensile strength with l ower cost. Welding parameters considered for MIG welding were welding current 80-400 A and voltage 26- 56 volt. TIG welding was performed with 50- 76 A current & 10- 14 volt voltage. TIG welded different common give better tensile strength becauseof lower Porosity.Both different joint have stylish rigidity & yield strength for TIG and MIG welding.

**Fujii et al. [10]** developed an advanced actuated TIG welding system for deep penetration of weld joint. Maragoni convection convinced on the molten pool by face pressure grade. In order to control Maragoni convection small quantum of oxidizing gas was used.

Welding process done with welding current 160 A, welding speed0.75 mm/ s, electrode gap of 1 mm and Ar- O2 shielding gas. They observed that Maragoni convection changes from inward to outside and weld shape come wide and shallow.

## 3. EXPERIMENTAL PLANNING AND PROCEDURE

For the present work aggregate trials were performed in three different phases In first phase autogenous TIG welding of 5 mm thick mild sword plates were performed without using any padding rod at different welding current and checkup speed condition to see the effect of welding & speed and to gain a current and speed range for approximate welding.

In alternate phase TIG welding of 5 mm thick mild sword plate was performed after applying a subcaste of $TiO_2$ flux and compared the weld parcels with the welding done without flux.

In third phase, TIG welding was performed by maintaining different gap between the workpieces to be welded and study the effect of this gap on the welding performance substantially weld blob figure and tensile strength of the weld.

## 4. CONCLUSION

Findings of the present disquisition can be epitomized into following points

- The results of the conventional TIG welding process performed at minimal welding speed and maximum current.
- When the same procedure is repeated with fresh application of $TiO_2$ flux, we will be calculated depth of penetration increases or dropped in comparison to the conventional welding.
- we planned welding speed, another set of trials will be done through maintaining a gap between workpiece and welding flux.

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