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TENSILE STRENGTH OF WELDED MILD STEEL SPECIMEN ON UNIVERSAL TESTING MACHINE

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ABSTRACT

The aim of my paper is to find the various properties of mild steel specimen which is welded by mainly three welding . Quality and productivity play important role in today's manufacturing market. Now a day's due to very stiff and cut throat competitive market condition in manufacturing industries. The main objective of industries reveals with producing better quality product at minimum cost and increase productivity. Welding is the most vital and common operation use for joining of two similar and dissimilar parts.In the present research paper an attempt is made to understand various welding techniques and to find the best welding technique for steel. Special focuses have been put on TIG , MIG , ARC welding. On hardness testing machine and UTM various characteristics such as ultimate tensile load, ultimate tensile stress, breaking point, % elongation etc. were analyzed.

KEYWORD:ARC,TIG,MIG,UTM,mildsteel.

INTRODUCTION

Weldingis a fabricationor sculptural process that joins materials, usually metals or thermoplastics, by causing coalescence.This is often done by melting the work pieces and adding a filler material to form a pool of molten material (the weld pool) that cools to become a strong joint, with pressure sometimes used in conjunction with heat, or by itself, to produce the weld. This is in contrast with soldering and brazing, which involve melting a lower-melting-point material between the work pieces to form a bond between them, without melting the work pieces.In this Experiment we have performed load bearing test on different specimen which are welded differently . Six specimens were taken of mild steel of same dimensions and out of which 2 specimens were welded lengthwise by TIG welding next two specimens by MIG welding and last two were by Arc welding. After welding perform load bearing test on each specimen individually and find out the load bearing capacity of each specimen. After finding the various values find out the specimen which can bear the maximum load.

Some of the best known welding techniques include:

- Shielded metal arc welding(SMAW) -also known as "stick welding", uses an electrodethat has flux, the protectant for the puddle, around it. The electrode holder holds the electrode as it slowly melts away. Slagprotects the weld puddle from atmospheric contamination.
- Gas tungsten arc welding(GTAW) -also known as TIG (tungsten, inert gas), uses a non-consumable tungsten electrode to produce the weld. The weld area is protected from atmospheric contamination by an inert shielding gas such as Argon or Helium
- Gas metal arc welding(GMAW) -commonly termed MIG (metal, inert gas), uses a wire feedinggun that feeds wire at an adjustable speed and flows an argon-based shielding gas or a mix ofargon and carbon-dioxide(CO2) over the weld puddle to protect it from atmosphericcontamination.

MATERIALS AND METHODS

MIG WELDING:- Metal Inert Gas Welding melts and joins metals by heating them with an arc established between a continuously fed filler wire electrode and the metals.Ar and He are also used as inert shielding gases to protect the molten weld pool. It is often called metal inert gas (MIG). However, non-inert gases, i.e., CO2 are also

used for carbon and low alloy steels.Ar, He or Mixtures of (25%) Ar, (75%) He are used for non-ferrous (mostly Al) as well as stainless and alloy steels.The Ar arc plasma is stable and beneficial for transferring metal droplets through the arc plasma.

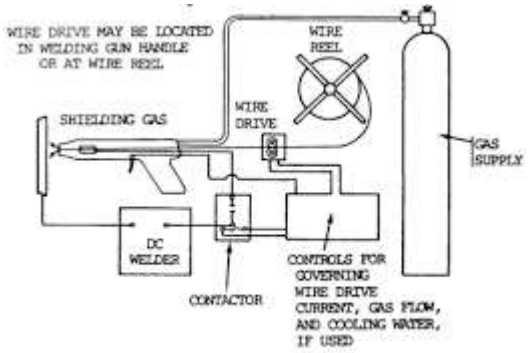

Figure 10-45. MIG welding process.

TIG WELDING:- Gas-tungsten arc welding (GTAW) is a process that melts and joins metals by heating them with an arc established between a non-consumable tungsten electrode and the metals.The tungsten electrode is normally contacted with a water cooled copper tube, whichis connected to the welding cable to prevent overheating.The shielding gas (Ar, He) goes through the torch body and nozzle toward the weld pool to protect it from air.Filler metal (for joining of thicker materials) can be fed manually or automatically to the arc.It is also called tungsten inert gas (TIG) welding.

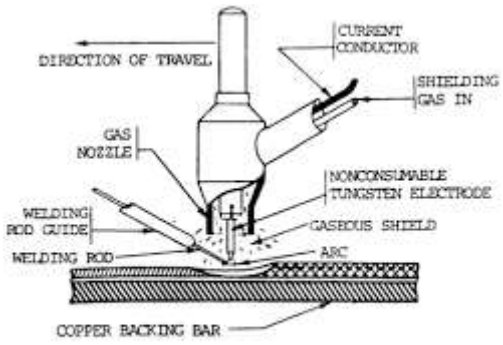

Figure 10-32. Gas tungsten arc (TIG) welding (GTAW).

ARC WELDING:- Arc welding is a type of welding that uses a welding power supply to create an electric arc between an electrode and the base material to melt the metals at the welding point. They can use either direct (DC) or alternating (AC) current, and consumable or non-consumable electrodes. The welding region is usually protected by some type of shielding gas, vapor, or slag. Arc welding processes may be manual, semi-automatic, or fully automated.

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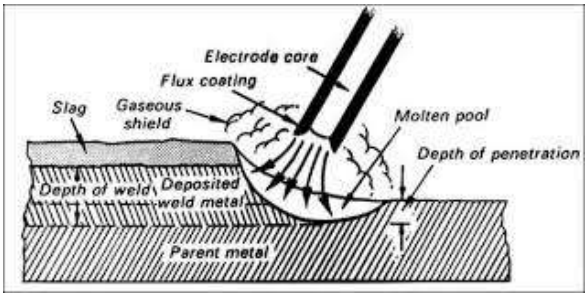

procedure

1. Take specimen of mild steel of dimension (15cm*2cm*0.8cm)
2. Take 6 specimen of same dimension .
3. Join 2 specimen together by Welding(Tig, Mig and arc welding).
4. Use 1 kind of Welding to join 2 specimen.
5. After joining all specimen by different kind of Welding place them on U.T.M (Universal Testing Machine).
6. On U.T.M apply various kind of load on the Welded specimen .
7. After applying load on the specimen take out the readings and graphs on the software .
8. Do this on other specimen also.

TEST CARRIED ON UTM (Universal Testing Machine)

It is one of the most widely used mechanical tests machine.A tensile test help determining ultimate tensile strength, yield stress, % elongation, % reduction in area and modulus of elasticity.

RESULTS AND DISCUSSION

Formulas used in tension test:

i.Yield stress = Load at yield / original area (A0)

ii.Ultimate tensile strength = Ultimate Load (Pmax) / Original Area (A0)

iii.% Elongation = (LF–LO) / (LOx 100)

iv.% Reduction = (A0 –AF) / (A0x 100)

v.Young's Modulus Of Elasticity, €= Stress at any point / Strain at that point

Table:

PARAMETER	TIG	MIG	ARC
Ultimate tensile load(N)	4120	1200	4240
Ultimate tensile stress($N/mm^{2)}$	32.18	9.375	33.125
Displacement at ultimate load(mm)	80.556	25.128	101.100
Maximum displacement(mm)	278.543	75.531	300.300
Percentage elongation(%)	4.842	2.345	8.696

Breaking load(N)	4100	1120	4080
Breaking stress(N/mm$^{2)}$	30.23	8.750	31.875

CONCLUSION

- Ultimate tensile load of MIG welding is greater than TIG welding and arc welding.
- Percentage elongation is ARC>TIG>MIG
- ARC welding specimencan bear higher load and tensile strength.
- As per the experimental result all parameters in ARC welding is better. Therefore, ARC welding is best suitable for mild steel specimen.

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