

AUTOMATIC ARC WELDING MACHINE

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ABSTRACT: Arc-welding is the most commonly and widely used welding technique for variety of purposes. Welded joint may not be very reliable unless the weld is of reasonably good quality. Improving the weld quality is of prime concern. This paper work is intended to investigate the effect of magnetic field on the structure and properties of weld in arc welding. The objective is to study the effect of welding parameters and to use magnetic field advantageously to improve the weld qualities and properties. However there is lack of information for optimum parameters, very little work has been reported in this direction. A magnetic field externally applied to the welding arc, deflects the arc by electromagnetic force in the plane normal to the field lines. The magnetic field exerts force on the electrons and ions within the arc, which causes the arc to be deflected away from the normal arc path. A set of weld-pieces are tested for various mechanical properties and comparable study is done to know the change in these properties.

I. INTRODUCTION

1. Problem Summary and Introduction:-

The project work subject is one, in which actually we are leaning the theoretical concepts in practical way. Also the practical experience is one of the aims of this subject. For a developing industry these operating performed and the parts or components produced should have its minimum possible production cost, then only the industry runs profitably. There are a number of units having used in industries for various purposes. Arc welding is the fusion of two pieces of metal by an electric arc between the pieces being joined – the work pieces – and an electrode that is guided along the joint between the pieces. The electrode is either a rod that simply carries current between the tip and the work, or a rod or wire that melts and supplies filler metal to the joint. The basic arc welding circuit is an alternating current (AC) or direct current (DC) power source connected by a “work” cable to the work piece and by a “hot” cable to an electrode. When the electrode is positioned close to the work piece, an arc is created across the gap between the metal and the hot cable electrode. An ionized column of gas develops to complete the circuit. Basic Welding Circuit The arc produces a temperature of about 3600°C at the tip and melts part of the metal being welded and part of the electrode. This produces a pool of molten metal that cools and solidifies behind the electrode as it is moved along the joint.

WELDING between two metal parts. The objective of this project work is to study effect of magnetic field on the weld quality and geometry when the field is applied longitudinal to the electrode travel i.e. the field lines are perpendicular to the electrode travel. The weld quality of the pieces will be checked by conducting different weld test as hardness, tensile strength and impact test. The impact test will be conducted on the impact testing machine. Chirpy test will be conducted to check the toughness of the weld-piece. The weld geometries will be checked through the visual inspection and penetration depth, reinforcement height and weld bead width will be considered.

Objective of the project work at a glance:-

- To study the effect of magnetic-field on weld-quality and weld geometry when the field is applied-longitudinal to electrode.
- To compare the process of arc-welding with magnetic-field and without magnetic-field.

2. Problem Identification:-

This machine perform welding operation with required motor & this machine is automatic which is controlled or operated by motor which is run with the help of current. This model of the machine is may be used in industries and domestic operations which can perform mechanical operation like welding between metal parts.

Design of model in 3D view:-

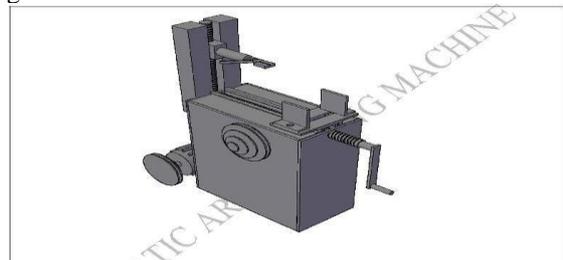


Fig. 2.1 Design of model in 3D view

Working of invention:-

A machine is automation to the welding process. The arrangement is shown in fig.



Fig.2.2 welding machine set-up

The welding electrode with holder is to be operated by a handle which is use to screw drive. When the weld-pieces is set-up on the base moved through the lead screw with a fixed speed. We are used to motor by replaced of handle. The motor is to feed the electrode to work piece for the welding. The electrode is moving on the downward direction which is feed of the motor and electric current was supplied of the electrode. An electric current, in the form of either alternating current or direct current from a welding power supply, is used to form an electric arc between the electrode and the metals to be joined. Metallic rod is also used to provide the electric connection within the work-piece. This rod is so connected that there will be no any gap produce which can fluctuate the electric supply. There is a proper gap maintained within the magnet and work-piece throughout the welding process.

II. OPERATION OF MACHINE

Operation performs by machine:-

Welding is a process in which materials of the same fundamental type or class are brought together and caused to join (and become one) through the formation of primary chemical bonds under the combined action of heat and pressure. The definition found in ISO standard is "Welding is an operation in which continuity is obtained between parts for assembly, by various means". Hence, the welding is the fusion of two or more pieces of metal together by using the heat produced from an electric arc welding machine.

Components of Welding Machine:-

2.4.1 Electrode:-

In arc welding an electrode is used to conduct current through a work piece to fuse two pieces together. Depending upon the process, the electrode is either consumable, in the case of gas metal arc welding or shielded metal arc welding, or non-consumable, such as in gas tungsten arc welding. For a direct current system the weld rod or stick may be a cathode for a filling type weld or an anode for other welding processes. For an alternating current arc welder the welding electrode would not be considered an anode or cathode.

Electrode Holder:-

These cables are connected to the welding machine through its copper end. The electrode holder has a few functions. Firstly, it is used to provide the electricity from welding machine to metal work. It is also used to hold the electrode during the welding operations.

Motor:-

An electric motor is an electrical machine that converts electrical energy into mechanical energy.

Gearbox:-

Most modern gearboxes are used to increase torque while reducing the speed of a prime mover output shaft (e.g. a motor crankshaft). This means that the output shaft of a gearbox rotates at a slower rate than the input shaft, and this reduction in speed produces a mechanical advantage, increasing torque.

C Clamp:-

A C-clamp or G-clamp is a type of clamp device typically used to hold a wood or metal work piece, and often used in, but are not limited to, carpentry and welding.

Welding Cables:-

The electrode cable and the ground cable are important parts of the welding circuit. They must be very flexible and have a tough heat-resistant insulation. Connections at the electrode holder, the ground clamp, and at the power source lugs must be soldered or well crimped to assure low electrical resistance. The cross-sectional area of the cable must be sufficient size to carry the welding current with a minimum of voltage drop. Increasing the cable length necessitates increasing the cable diameter to lessen resistance and voltage drop.

Nuts & Bolts:-

Nuts are almost always used in conjunction with a mating bolt to fasten two or more parts together. The two partners are kept together by a combination of their threads' friction (with slight elastic deformation), a slight stretching of the bolt, and compression of the parts to be held together.

Welding Calculation:-

3.1.1. Welding In Magnetic Field:-

The magnetic field is applied as per the set-up and then the arc welding machine and electrodes are fixed at their respective places. Multi-meter, clamp-meter and gauss-meter are placed and connected to take the readings. As per the semi-automation to the process feed rod is connected with the work-piece motion. The weld-pieces obtained after the process is shown in fig. different readings obtained with the process are tabulated.

Work piece no.	Current (A)	Voltage (V)
M1	110-120	23-26
M2	125-135	18-22
M3	125-135	18-22

Table no.1 welding In Magnetic Field

Weld-pieces with magnetic field:-

Work piece no.	Current (A)	Voltage (V)	Magnetic Field Intensity	Welding Speed
M1	120	24.5	70	60
M2	110	23.7	70	60
M3	115	23	70	60

Table no.2 Weld-pieces with magnetic field

Welding Testing:-

Tensile strength test:-

This test is used to measure the tensile strength of a welded joint. The tensile strength, which is defined as stress in kgf

per square meter. It is calculated by dividing the breaking load of the test piece by the original cross section area of the specimen. The test result which is conducted on universal testing machine is given in the table. The gripping and rupture points located in the figures. This test is used to measure the strength of a welded joint.

Tensile test of the weld-pieces with magnetic field:-

Work piece no.	Tensile Load	Cross- Sectional Area	Tensile Strength
M1	10480	290	354.51
M2	10320	287	352.75
M3	10560	292	354.77

Table no.3 tensile test of the weld-pieces with magnetic field

Hardness test:-

Hardness may be defined as the ability of a substance to resist indentation of localized displacement. A hardness test is used to determine the hardness of weld metal. In the Rockwell hardness test, the specimen is mounted on the anvil of the machine and a load is applied against a hardened steel ball which is in contact with the surface of the specimen being tested. The load is allowed to remain 1/2 minute and is then released, and the depth of the depression made by the ball on the specimen is measured. The resultant Rockwell hardness number is obtained from the dial. The test result of the hardness test was conducted on both type of weld-pieces (with magnetic field and without magnetic field) are shown in the table below.

Hardness test with magnetic field:-

Work piece no.	Parent Metal (RHN)	Weld Metal (RHN)
M1	90	83
M2	92	80
M3	89	84

Table no. 4 Hardness test with magnetic field

Summary of Invention:-

After completing the major project on AUTOMATIC ARC WELDING MACHINE. We are happy and would like to thank our internal guide, guides and experts of the concerned department who have guided us. Automatic arc welding is derived by automatic work of metal parts to welding. Different types of tools and equipment's are of automatic welding machine using sliding mechanism.

Advantages:-

- Operation is performed by only one motor.
- Less man power is required.
- Low manufacturing & maintenance cost.
- Producing weld for high quality.

- Time saving.
- Size is compact therefore it requires less space.

Disadvantages:-

- Not as productive as continuous wire processes.
- Likely to be more costly to deposit a given quantity of metal.
- Flat or horizontal position welding only.
- Relatively high metal wastage.
- Current limits are lower than for continuous or automatic processes.

III. CONCLUSION

- On the basis of different experiments, automation of welding process and effect of magnetic field the following conclusions are derived:
- The welding set-up on lathe provides automatic motion to the work-piece and welder has to provide only the feed to electrode. This provides the smoothness in welding process.
- Effect of magnetic field applied transverse to welding direction affects the bead width of joint and increases it.
- Undercuts, spatter etc. welding defects are reduced.

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