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# Semi-Automated Corner Joint MIG Welding Machine

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***Abstract — in today's edge of technology the demand of precision is increasing. The tradition methods are replaced by the automation to increase accuracy and precision. To increase the quality of welding, incorporation of the semi-automated welding machine is done for certain application. For that different parameters and methods have to be considered from different research paper for the welding machine for selection of mechanism like controller, welding process, weld angle etc. to get accuracy and quality weld. The technical constraint that has to be considered while designing and developing the machine is to achieve the stability, degree of freedom, linear and angular motion, and uniform speed of the welding torch for feed and uniform thickness of weld for quality product.***

***Keywords-* MIG *Welding, Semi Automated, Angular Welding, Corner Joint, Variable Frequency Drive (VFD).***

## I. INTRODUCTION

Welding is a fabrication process used to join materials, usually metals or thermoplastics together. During welding, the pieces to be joined (the workpieces) are melted at the joining interface and usually a filler material is added to form a pool of molten material (the weld pool) that solidifies to become a strong joint.
There is a lots of less advancement in machineries in our countries, like other developed countries. Traditional methods for production is been utilized instead of automated machine. Automation in machine helps lots in the production line. Automation can provide many advantages in the production line such as reducing the time for production, wastage of materials can be easily controls, etc. Besides that automation also provides quality, accuracy, less manpower, etc. Using the traditional methods which is somewhat benefits to the small scale industries, small scale industries do not refers the automation machine or special purpose machine for their required works.

### 1.1 MIG Welding (Metal Inert Gas welding):

MIG welding, also known as Gas Metal Arc Welding (GMAW) is a process that utilizes a continuously fed solid electrode, shielding gas from an externally supplied source, and electrical power to melt the electrode and deposit this molten material in the weld joint. The equipment used automatically regulates the electrical characteristics of the arc. The only manual controls required of the welder for semi-automatic operation are travel speed, travel direction and gun (torch) positioning. Given proper equipment settings, the power supply will provide the necessary amperage to melt the electrode at the rate required to maintain the pre-selected arc length (voltage). For example, an increased stick-out, produced by drawing the torch back from the work piece, results in a reduction in current from the power supply. This maintains the same heating of the electrode and returns the arc length to its present condition. Filler metal selection should be closely matched to the base material being welded. In MIG Welding, the filler metal not only conducts current to the arc zone (resulting in melting the base metal and electrode), but adds reinforcement to the completed weld joint. MIG Welding can be used on a wide variety of metals and in a number of different base metal thicknesses.

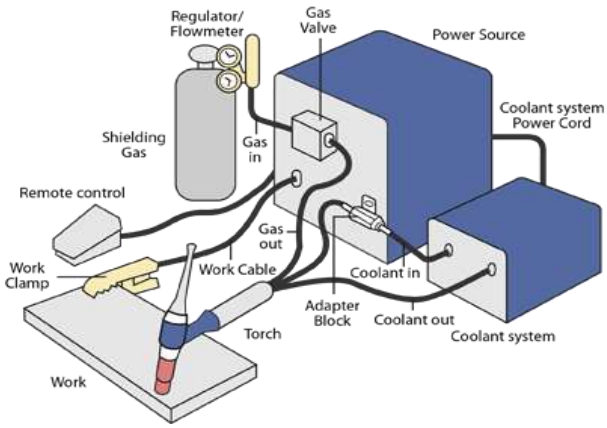


Figure 1. Metal Inert Gas Arc Welding

The angle at which holding the electrode is done, greatly affects the shape of the weld which is important in fillet and deep groove welding. Angular welding is generally done by making proper angle of the welding torch to the weld surface for the accurate welding process. According to the requirements that angle can be changed for proper feeding. A corner weld is a type of joint that is between two metal parts and is located at the right angles to one another. As the name indicates, it is used to connect two pieces together, forming a corner. It is generally done at outer edge of workpiece.

## II. LITERATURE SURVEY

Ramani and Velmurugan[1] studied the effect Of process parameters on angular Distortion Of Mig Welded Plates. Angular distortion is one of the most challengeable issues and pronounced distortion among different types. This is mainly due to non-uniform traverse shrinkage along the depth of the plate welded. Physical controlling of the distortion during welding may generate high magnitude of residual stress. However, these can be reduced by compensating with pre-distortion in the opposite direction to actual distorting direction with the experience of series of experiments. In this study, a statistical method with four factors and five level factorial center composite rotatable design is used to develop a mathematical model to predict angular distortion with MIG welding process parameters. Direct and interaction effects of the process parameters are analyzed. The developed mathematical model could be utilized for optimizing the MIG process parameters by eliminating the defects due to angular distortion.

A 2 kW continuous wave fiber laser was constructed by P. Bhargava *et al.* [2] integrated with the 5-axis workstation to understand the effect of various processing parameters (laser power, welding speed, beam spot size and chamfer at welded edges) on depth of penetration, angular distortion and welded bead surface profile during autogenous laser welding of 6 mm thick austenitic stainless steel type 304 plates. Full penetration with reduced weld bead surface undulation (o100 mm) and least angular distortion (0.81) was achieved for butt joints having chamfered edges of 0.8 mm. The microscopic studies revealed grossly defect-free fusion zone with a few porosities at isolated locations. The microstructure at the fusion zone was largely austenitic with few ferrites and the direction of growth was epitaxial towards the fusion line. The measured values of micro hardness at base material and fusion zone were 20874 HV 0.1 and 235710 HV0.1 respectively. The tensile testing of laser welded samples indicated the ultimate strength 4605 MPa and these samples could be bent for an angle 41701 without noticeable crack during bend test. The study opened the avenues for the deployment of fiber laser welding technology for applications demanding critical values of surface weld bead profile and distortion.

In order to realize the automatic welding of pipes in a complex operation environment, an automatic welding system has been developed by Z. Huilin *et al.* [3] by the use of all-position self-shielded flux cored wires due to their advantages, such as all-position weldability, good detachability, arc's stability, low incomplete fusion, no need for welding protective gas or protection against wind when the wind speed is <8 m/s. This system consists of a welding carrier, a guide rail, an auto-control system, a welding source, a wire feeder, and so on. Welding experiments with this system were performed on the X-80 pipeline steel to determine proper welding parameters. The welding technique comprises root welding, filling welding and cover welding and their welding parameters were obtained from experimental analysis. On this basis, the mechanical properties tests were carried out on welded joints in this case. Results show that this system can help improve the continuity and stability of the whole welding process and the welded joints' inherent quality, appearance shape, and mechanical performance can all meet the welding criteria for X-80 pipeline steel; with no need for windbreak fences, the overall welding cost will be sharply reduced. Meanwhile, more positive proposals were presented herein for the further research and development of this self-shielded flux core wires.

The automation in sheet metal TIG welding process examined by R. Ttulankar and S. Dehankar[4]. It deals with the designing of mechanism, which can weld the silencer shells of sheet metal in a linear motion with an improved degree of fineness and are relatively less cumbersome than traditional welding process. The technical constraint that has to be considered while designing and developing the mechanism was to achieve the stability, linear and uniform speed of welding torch and uniform weld thickness for quality product. The details of testing on various silencer shells are given in this study.

An attempt is to be made to describe a novel approach of MIG (Metal Inert Gas) Welding as implemented in a control system based SPM at Gabriel which is the largest manufacturer of shock absorbers in India by J. Yang *et al*[5]. The function of the SPM is to weld a knuckle bracket on the circular shaft of the shock absorber. It efficiently helps to fully automate the process of Welding. The paper provides the description of the components implemented in the control system along with the flow of working of various components. The system is controlled by means of a PLC.

MIG welding process which is semi automatically, the factors affecting the welding process is derived experimentally by S. Utkarsh [6] *et al.* using the doe (Design of Experiment) method. And the experiments carried out on the st-37 material like low carbon steel, medium carbon steel, mild steel and takes the welding parametrs like current, voltage, gas flow rate, wire feed rate, nozzle to plate distance welding voltage and check out the relations between the welding dilution, welding speed and the ultimate strength of ST-37 Low alloy steel and concluded by different experiments that Tensile strength is depends upon the welding speed and the current. Welding speed depends upon the welding plate and nozzle distance.

[7] The optimization of MIG Welding Using taguchi's DOE method for increase the productivity and quality , was carried out by S. P. Chavda *et al.* which suggested that cost of welding are affected by different parametrs like welding current, voltage , Gas flow rate ,Wire feed rate etc. And the experiments are done on MEDIUM CARBON STEEL because the experiments are done very less on this material. And by the experiments conclude that combination of the welding parameters and increase the welding productivity quality. Like the experiment of welding current and the depth of the penetration are depended on each other respectively, and study the doe process parameters. so basically Taguchi's doe method used for the Medium carbon steel for optimization technique to know the process parameters like mechanical properties like welding current, welding voltage, Gas Flow rate, Shielding gas etc and checking out the effect on the weld bead geometry.

## III. CONCLUSION

The study suggests that the number of parameters affected the quality of weld. In case of linear and angular welding, angular welding is much more difficult than linear welding. In order to get the desire quality of weld one has to give accurate feed, which is one of the most important parameter. This can be provided by semi automation which gives the advantage of accurate feed, reduce the time of work, less skilled labor required for the work. The researches will look to adopt the semi automation for angular corner joint Mig welding by providing six degree of freedom for linear and angular motion of welding torch for feeding, and with suitable controllable method for weld accuracy.

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