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A REVIEW PAPER ON PARAMETRIC OPTIMIZATION OF METAL INERT GAS WELDING ON MEDIUM CARBON STEEL BY RSM METHOD

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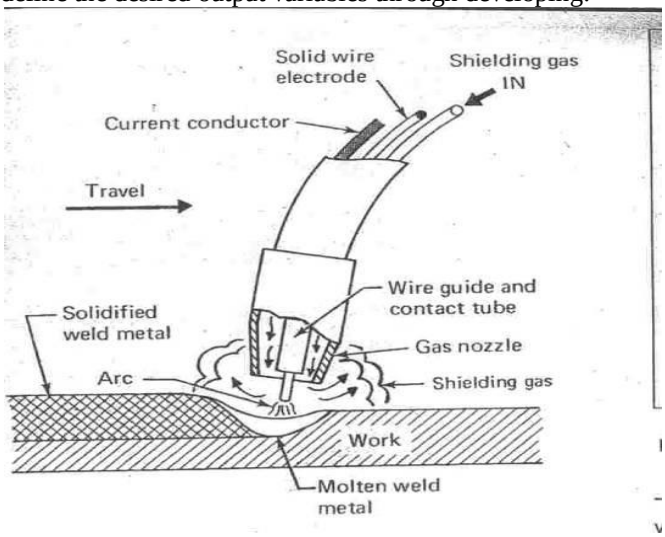
Abstract: Quality and productivity play important role in today's manufacturing market. Now a day's due to very stiff and cut throat competitive market condition in manufacturing industries. The main objective of industries reveal with producing better quality product at minimum cost and increase productivity. Metal inert gas welding widely used to permanently join for carbon steel. For parametric optimization so many variable parameters are available. In this work consider Current, Nozzle to plate distance, Welding speed, Gas flow rate parameter for optimization and buy using this parameters first construct the Metrix on which practical will be performed and then it optimize by RSM method.

I. INTRODUCTION

The problem that has faced the manufacturer is the control of the process input parameters to obtain a good welded joint with the required weld quality. Traditionally, it has been necessary to study the weld input parameters for welded product to obtain a welded joint with the required quality. To do so, requires a time-consuming trial and error development method. Then welds are examined whether they meet the requirement or not. Finally the weld parameters can be chosen to produce a welded joint that closely meets the joint qualities. Also, what is not achieved or often considered is an optimized welding parameters combination, since welds can often be formed with very different parameters. In other words, there is often a more ideal welding input parameters combination, which can be used. In order to overcome this problem, various optimization methods can be useful to define the desired output variables through developing.



Design of experiment (DOE) techniques has been applied to carry out such optimization. RSM Fig1. GMAW method have been adapted for many applications in different areas.

II. RESEARCH METHODOLOGY

The aim of the study is to explore the optimum values of process parameters in the Gas Metal Arc Welding. Medium carbon steel used as base metal which dimensions are 250mmx75mmx6mm. Input parameters are Current, Nozzle to plate distance, Welding speed, Gas flow rate parameter to optimize the Ultimate tensile strength and Heat affected zone. Design the experimental runs and find the optimal process parameter combination by using Response Surface Methodology. After the number of experiments ANOVA and MINITAB 16.0 used to generate validate the optimum values.

III. LITERATURE SURVEY

D.S. Nagesh et al (2002). performed the experiment on gray cast iron using mild steel electrodes showed that penetration and bead geometry are important physical characteristics of weldments, some process parameters like welding current, voltage, arc travel rate influence the penetration and bead geometry. Depth of penetration increased with an increase in current, but decreased with a decrease in voltage [1]. Erdal Karadeniz et. al. (2007) was performed experiment to show the effects of various welding parameters (welding current, arc voltage, welding speed) on welding penetration in Erdemir 6842 steel having 2.5 mm thickness welded by robotic gas metal arc welding. As a result it showed that increase the current increase the depth of penetration. Moreover the effect of the current is much than voltage effect [2]. Haken et. al. (2007) was performed the experiment in which low carbon steel plates (15 x 150 x 450 mm) were welded under 180 A and 28 V. A Mig/Mag welding machine was used, and CO2, Ar and O2 mixtures of three gases were used as the shielding media. The flow rate of the shielding gas was 15 l/min, and the experiment was performed by setting the contact tip to the workpiece distance of 15 mm. The electrode wire has a diameter of 1.2 mm. A test conducted to analyze the mechanical properties in these experiments. Artificial neural networks (ANNs) using for prediction of gas metal arc welding parameters. Input parameters of the model consist of gas mixtures, whereas, the outputs of the ANN model include mechanical properties such as tensile strength, impact strength, elongation and weld metal hardness, respectively. The study was shown the

possibility of the use of neural networks for the calculation of the mechanical properties of welded low alloy steel using the GMA method [3]. Sukhomay Pal et. al. (2008) was performing their experiment on pulsed metal inert gas welding process. In this experiment Six process parameters, namely pulse voltage, background voltage, pulse duration, pulse frequency, wire feed rate and the welding speed. UTS of the welded plate are considered as the output variable Furthermore, the output obtained through multiple regression analysis is used to compare with the developed artificial neural network (ANN) model output. It was found that the welding strength predicted by the developed ANN model is better than that based on multiple regression analysis [4]. H.H. Na et. al. (2011) worked in GMA welding were input variables are welding current, welding voltage, welding speed to achieve optimal bead geometry (bead width, reinforcement height, left leg length, right leg length) through the analysis of experimental data. In this Taguchi technique was used to design and perform the experiment and optimize the process parameter as well as bead geometry was predicted using a Neural Networks (LM) learning algorithm [5]. R.P. Singh et. al. (2013) made their experiment on Shielded Metal Arc Weld Where the input parameters are Welding current, welding speed, welding voltage and external magnetic field while the depth of penetration and weld bead width as output parameters. In this experiment 25 runs have been taken for experiments, in which back propagated feed forward artificial neural network model was trained to predict the output.parameters. If four input process variables were fed to the trained model it provided the output variables having values very close to the experimental values [6]. Rajesh P Verma And K. N. Pandey conducted two different welding process manual metal arcs (MMA) on 6061-T6 aluminium alloy and metal inert gas (MIG) on 5083-O aluminium alloy. Plates of 6061-T6 and 5083-O aluminium alloys with dimensions of 250mm×100mm× 8mm were joined by means of MMA welding and MIG welding with same parameters. Square butt joint for MMA welding (b) Single V-groove for MIG welding. AA5356 grade filler wire is used for MIG welding process. Argon used as shielding gas in MIG welding. The Fatigue test of weld joints carried out where the MIG weld joint shows greater life than the MMA weld joint. Investigation concluded that Grain size influences the fatigue life of welded material. Increased fatigue life is obtained in fine grained structure. MMA welding is not an alternate option for MIG welding of Aluminium Alloy [7]. Izzatul Aini Ibrahim1 et. al. In this study, the effects of different parameters on welding penetration, micro structural and hardness measurement in mild steel that having the 6mm thickness of base metal by using the robotic gas metal arc welding are investigated. The variables that choose in this study are arc voltage, welding current and welding speed. For the experimental studies, mild steel having the 100mmx 100mmx6mm sizes were used as the base metal. The penetration, microstructure and hardness were measured for each specimen after the welding process and the effect of it was studied. As a result, it obvious that increasing the parameters value of welding current increased the value of depth of penetration. Other than that, arc voltage and welding speed is another factor that influenced the value of depth of penetration. The microstructure showed the different grain boundaries of each parameter that affected of the welding parameters [8].

IV. CONCLUDING REMARKS

- In this literature survey have been concluded that current is as effective parameter in welding.
- After that welding speed and voltage can affect the welding.
- For Design of Experiments various methods are available but for more process parameters RSM is suitable for optimization.

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