e-ISSN: 2349-9745
p-ISSN: 2393-8161
Scientific Journal Impact Factor (SJIF): 1.711
International Journal of Modern Trends in Engineering and Research
www.ijmter.com

A Review on Analysing Parametric Effect in SAW

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Abstract—In any fabrication industry Submerged Arc Welding (SAW) is used as a heavy metal deposition rate welding process. The process is characterized by the use of granular flux blanket that covers the molten weld pool during operation. Protection through atmospheric contamination of the weld bead and slower cooling rate, achieved by this arrangement can enhance mechanical properties of the weld ment. Selection of process parameters has great influence on the quality of a welded connection. Welding input parameters play a very significant role in determining the quality of a weld joint. The joint quality can be defined in terms of properties such as weld-bead geometry, mechanical properties, and distortion. Generally, all welding processes are used with the aim of obtaining a welded joint with the desired weld-bead parameters, excellent mechanical properties with minimum distortion. This paper presents the exhaustive research review on effect of arc welding parameter on quality of welds. This review includes selection of parameters, data analysis and experimental verification.

Keywords- Sub merged arc welding (SAW), Mechanical Properties, Weld-bead geometry, Distortion, Cooling rate

I. INTRODUCTION

Submerged arc welding or sub arc welding is one of the most widely used welding techniques in shipbuilding, windmill construction, in pressure vessel construction etc. Sub arc welding is quite prominent because of its inherent advantages of deep penetration, smooth bead and superior quality. The most common problem which an engineer faces is the, optimization of the parameters, which affect the weld quality. Submerged arc welding (SAW) process uses heat generated by an electric arc established between a bare consumable electrode wire and the work piece. Since in this process, welding arc and the weld pool are completely submerged under cover of granular fusible and molten flux therefore it is called so. During welding, granular flux is melted using heat generated by arc and forms cover of molten flux layer which in turn avoids spatter tendency and prevents accessibility of atmospheric gases to the arc zone and the weld pool. The molten flux reacts with the impurities in the molten weld metal to form slag which floats over the surface of the weld metal.

II. LITERATURE SURVEY

Abhay Sharma, Navneet Arora, Bhanu K. Mishra[5] , while doing the analysis of Flux Consumption in Twin- Wire Submerged Arc Welding Process with unequal wire diameters concluded that flux accomplishes different functions including covering the arc, elimination of spatter and smoke, control of arc stability, governing the bead shape and influencing weld chemistry. Therefore, the flux consumption remains a function of process parameters and directly influences the productivity of the process. Unequal wire diameters lead to more stable magnetic file with less deflection, thus, results in lesser flux consumption.

P**.** Kanjilal, T.K. Pal and S.K. Majumdar[6],while studying the combined effect of flux and welding parameters on chemical composition and mechanical properties of submerged arc weld metal concluded that the results show that flux mixture related variables based on individual flux

ingredients and welding parameters have individual as well as interaction effects on responses. Amongst welding parameters, polarity is found to be important for all responses under study.

Dr. P. Ravinder Reddy, N.L.S. Himaja, M.Vijaya Bharathi, P. Naveen Kumar[1], while dealing with the Parameter Optimization and Prediction of Bead Geometry of SAW Using Response Surface Methodology The feed and speed contribute most to the penetration of the weld bead whereas voltage and speed contribute most to the bead width. All weld bead parameters increases with an increase in wire feed rate and decrease with increase in weld speed. Penetration reduces as voltage increases, but bead width increase considerably with the increase in voltage. As the nozzle-to-plate distance increases all bead parameters decreases except bead width. Interaction effects show that the effect speed on bead width is low at lower voltages and high at higher voltages.

Vinod Kumar[2], while studying with the Modeling of Weld Bead Geometry and Shape Relationships in Submerged Arc Welding using Developed Fluxes Open circuit voltage had a negative effect on penetration, but more significant negative effect was observed on reinforcement. Voltage had a significant positive effect on bead width, weld penetration size factor and weld reinforcement form factor. The interaction of voltage and current had significant effect on reinforcement and weld reinforcement form factor effect as compared to its effect on other response parameters. Reinforcement decreased with the increase in voltage for all values of current whereas WRFF increased with voltage for all current values. Positive effect of voltage was more dominant in WRFF as compared to negative effect of current for the trends in case of WRFF, whereas reverse is the case for reinforcement. This increasing trend of WRFF at higher current was due to more positive effect of voltage on WRFF. Thus it is seen that with in the present experimental domain, using the developed flux prepared from waste flux dust had no adverse effect on bead geometry. Detailed experimentation on the effect of developed flux on mechanical properties and metallurgical characteristics of the weldment to be rigorously done. If the outcomes becomes positive, then developed flux prepared this way can be recommended to use as an alternative to fresh flux in practical situations to yield „waste to wealth".

Krishankant, Mohit Bector, Rajesh Kumar C and Jatin Taneja[3], while studying the application of response surface modeling for determination of flux consumption in submerged arc welding by the effect of various welding parameters Flux consumption increased with the increase in open circuit voltage and very small increases with increases in current. Welding speed has negative effect on flux consumption. Flux consumption also small decreases with the increase in nozzle to plate distance. RSM can be used effectively in analyzing the cause and the effect of process parameters on response. The RSM is also used to draw contour graphs for various responses to show the interaction effects of different process parameters.

Uma Gautam, and Mohd. Abbas[4], while doing the analysis of weld bead geometry in sawand modeling using ccd ,The momentum of incoming metal droplets Increases when Nozzle-to-plate distance increased, which increases the penetration but reduces the bead width. The welding current has appreciable positive effect on all the bead parameters. Welding speed has negative effect on the bead parameters. Increased arc voltage results in spreading out of arc cone at its base and leads to increase in bead width but lesser penetration and bead height. This effect of arc voltage with nozzle-to-plate distance is evident from the interaction plots where the value of the weld parameter reaches a maximum and then drops down to minimum value. Most of the interaction effects of the process variables on the bead parameters show generally convincing trends between cause and effect.

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