

ENHANCING THE STRENGTH OF WELD BEAD AND REDUCING THE COST IN SUBMERGED ARC WELDING BY USING RED MUD

A.Arunkumar¹, R.Vijayashankar², G.Seenivasagan³

¹ PG Scholar, Kalaignarkaranidhi institute of technology, Coimbatore, India

² Assistant professor, Kalaignarkaranidhi institute of technology, Coimbatore, India

³ Assistant professor, Kalaignarkaranidhi institute of technology, Coimbatore, India

Abstract:

Red mud is a waste product produced during alumina extraction from bauxite by the Bayer's process and has become a major issue in connection with its disposal. As the aluminium demand in the world is increasing, the disposal of red mud waste into the environment also increases, bringing with its environmental issues coupled, however, a potential for the waste to generate a huge amount of unutilized resources still contained in the red mud, such as TiO_2 , Fe_2O_3 , Al_2O_3 , SiO_2 and others. As a possible useful utilization of the disposable waste, red mud can be used as a submerged arc welding flux for welding purpose. Here granular flux is about to be used. By mixing Red mud with Flux in Submerged arc welding, the welding cost maybe considerably reduced to its extent. The strength of weld bead is about to be increased and it is found by using Destructive test and Non Destructive test.

Keyword: Saw, Red mud, Flux, Submerged arc welding

1. Introduction:

Submerged arc welding (SAW) is a common arc welding process. It requires anon-continuously fed consumable solid or tubular electrode. The Molten weld and the arc zone are protected from atmospheric contamination by being "submerged" under a blanket of granular fusible flux consisting of lime, silica, manganese oxide,

calcium fluoride, and other compounds. When molten, the flux becomes conductive, and provides a current path between the electrode and the work. This thick layer of flux completely covers the molten metal thus preventing spatter and sparks as well as suppressing the intense ultraviolet radiation and fumes that are a part of the shielded metal arc welding process.

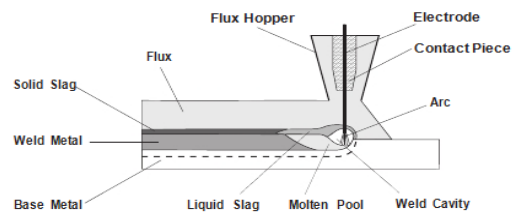


Fig. 1 working of submerged arc welding

2. Parameters of SAW:

Table 1: Parameters of SAW

PARAMETERS	SPECIFICATIONS
Wire Feed Speed	2.5 to 10 m/min
Welding Speed	120m/min to 1800 m/min
Capacity Of Flux Container	Min 5 kg
Welding Current Range	150 to 1200 Amps

Welding Voltage	DC voltage 20 to 46 volts
Max Welding Current	1000 Amps to 1140 Amps
Wire Diameter	2.4mm to 6.3mm
Nozzle Tip Clearance	2.5 to 6mm

3. Red mud:

Red mud is a waste product produced during alumina extraction from bauxite by the Bayer's process. It is a solid waste Residue of digestion of bauxite ores with caustic soda for Alumina Production. Its disposal remains a worldwide issue in terms of Environmental Concerns. During the past decades, extensive work has been done by a lot of researchers to develop various economic ways for the utilization of red mud. The cost of red mud available is about Rs 30. It is majorly available in Madras Aluminium Company, Hindustan Aluminium Company in Alappuzha, Belgam and Ranchi.

4. Objective:

Following are some of the objective which is as follows,

- Reuse the Waste and Convert into Reasonable Use.
- Reduce the cost of flux which induced in SAW.
- Increase the of strength of the weld bead

5. Preparation of flux:

Red mud used in this project is from Hindalco (Aditya Birla Group) Belgum, Karnataka. Initially Red mud has moisture content. And it is dried through atmospheric air. Then the foreign particles are removed by using sewing process. Then flux is allowed to be heated at the temperature of 260°C for the duration of 2 hours. Then flux is kept at 200°C for an hour. It is used

as flux for submerged arc welding to take over the welding parameters.



Fig. 2 flux oven

6. Preparation of specimen:

Initially Mild steel is choosing as a parent metal for SAW. Then surface is made to polished, it is done because to remove the rust.



Fig. 3 Preparation of specimen

7. Welding:

Welding is done with the different combination of flux. Initially Red mud is used as a flux without heating but weld bead is not good. Then the Red mud is treated with furnace after treating the Red mud the weld bead improves compare than the previous one. Then the Red mud is mixed with the Flux like as the range between 50 % - 80%, and welding is done.

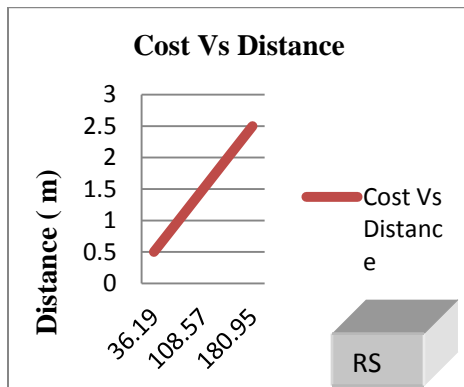


Fig. 4 Experimental Setup

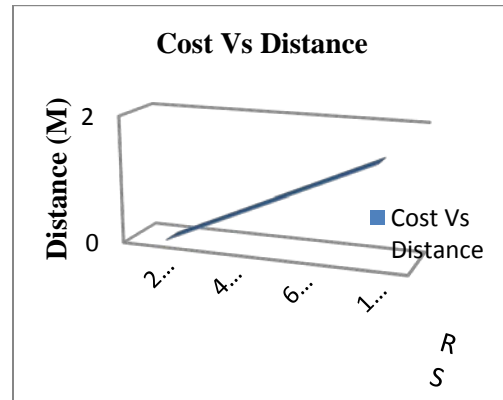
For an every 0.5 meters nearly 0.5 Kg of Flux is about to be consumed. Incase if Red mud is utilized for this type of flux, then nearly cost of the welding can be considerably reduced to its extent.

The following graph 1 show the Cost Vs Distance, it denotes for an every 0.5m the amount of cost consumes Rs.36.19. Incase red mud is utilized for this purpose, the cost can be reduced to considerably as high Percentage.

The percentage of improvement is calculated by that for a 1 m the amount of normal flux consumed is Rs 72.38 while when the Red Mud is added with the flux than the welding cost is Rs 42.7. Therefore the improvement is about to be 40 %.



Graph 1: Cost Vs Distance



Graph 2 : Cost Vs Distance

8. Conclusion:

The Waste Product from Bayer's Process is about to be used in an effective way. The mixture of Red mud and the flux is 70% and 30 % respectively. This mixture shows the better weld bead compared with 80 % and 20% mixture of Red mud and flux respectively. Further different combination will be tested. And also destructive test and non destructive test will be carried out.

Reference

- [1]Aniruddha,SomnatChattopadhyaya,Das.R.K, Sarkar.P.K, "Prediction of submerged arc welding Yield Parameters through Graphical Technique", Procedia Engineering, Vol.10, 2011, pp.2797-2802
- [2]EdwinRajaDhas.J,Kumaran.S, "Optimization of parameters of submerged arc weld using non conventional techniques", applied Soft Computing, Vol.11, 2011, pp.5198-5204.
- [3]Kulwant Singh, Sunil Pander, "Recycling of slag to act as a flux in submerged arc welding", Conservation and Recycling, Vol.53, 2009, pp.552-558

- [4] Krishankant, Sandeep Jindal, Shashi Kant Shekhar, "Determination of Flux Consumption in submerged arc Welding by the Effect of Welding parameters by Using R.S.M Techniques", *Mechanical and Mechanics Engineering*, Vol.12, 2012, pp.0975-5861
- [5] Lopez Hirata, paniagua Mercado, Elvia Diaz Valdez. "Effect of TiO₂ Containing fluxes on the mechanical properties and microstructure in submerged Arc weld steels", *Materials Characterization*, Vol.60, 2009, pp.36-39
- [6]Mukhopadhyay.J, "Neutralization and utilization of red mud for its better waste management" *ARCH.ENVIRON.Sci*(2012), 6,13-33
- [7]Narandra.Mohan Dr, "Development of cost effecting agglomerated flux from waste flux dust for submerged arc welding", *World Congress on Engineering*, Vol.1, 2009, pp.241-246
- [8]PingWang,"Physical and chemical properties of sintering Red mud and Bayer Red mud and the implications for beneficial utilization" Vol.63, 2012, pp.346-352.
- [9]Senthil Kumar, Kannan.T.K, "Sensitivity analysis of Flux cored arc welding process variables in super duplex stainless steel claddings", *Procedia Engineering*, Vol.64, 2013, pp.1030-1039.
- [10]Subash Chandra Mishra, "Progress of Red mud utilization", *American Chemical Science journal*, Vol.54, 2014, pp.255-279.