

Investigation on the Effect of Vibrations on Weld Pool Solidification Behaviour and Mechanical Properties of Shielded Metal Arc Welded joints

Pravin Kumar Singh*, Sanjay Kumar, Shashi B. Prasad, D. Patel

Mechanical and Automation Engineering Department, AMITY University Ranchi, Jharkhand, India

*Corresponding author

ABSTRACT

The reliability and service performance of welded structure depends upon the mechanical strength of different welded joints. With an aim to improve the mechanical properties of weld joints, an auxiliary vibratory set up has been designed. Vibratory setup is capable to stir the molten weld puddle before it solidifies. In present investigation a comparative study has been done in between Conventional SMAW and Vibratory SMAW process. Various combinations of base metal and filler metals is used for investigation. The mechanical strength has been evaluated using micro-hardness and transverse tensile tests. The results showed that with the application of the vibratory treatment, the values of hardness, yield strength and ultimate tensile strength (UTS) increased. The microstructure study shows that, as compare to the conventional welding process the vibration welding has fine grain structure. The cooling characterization reported that, due to the applied vibration high temperature distribution established and relatively steeper thermal gradients across the Weld zone and Heat affected zone (HAZ) formed. The study also discusses the solidification behaviour during vibratory welding process. Vibratory welding techniques used in the investigation have less investment, more convenient operation, less pollution and shorter manufacturing period.

Keywords: Vibratory welding process, Solidification, Weld properties, Shielded Metal Arc Welding (SMAW) process, Cooling characterization.

