Optimization of Metal Inert Gas Pulse Brazing Process on Galvanized Steel Sheets Based on Taguchi Method

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Abstract

The purpose of this research was to identify the optimal conditions of the galvanized steel sheets based on the Metal inert gas pulse brazing process (MIGPBP). The study used the Taguchi method to experimentally design the L_{25} orthogonal array, including five main parameters: 1) wire feed speed, 2) arc voltage, 3) travel speed, 4) peak current, and 5) pulse frequency. Each of these parameters consisted of 5 levels, and thus the experiment runs 25 times with 3 replications (75 experiments in total) to find the characteristics of the MIGPBP that were considered important parameters and were exhibited significantly, including: 1) zinc coated balance of joint (ZB), 2) area for penetration of filler metal into the fit-up (ARP), and 3) tensile shear strength (TSS). The results demonstrated that the optimum conditions of the MIGPBP of galvanized steel sheets for the ARP and TSS were 4 meter/minute wire feed speed, 18 V arc voltages; 0.6 meter/minute travel speed, 450 ampere peak current and 35 Hz pulse frequency. For the ZB, the finding indicated the wire feed speed at 3.25 m/min, the arc voltages at 18 V, the travel speed at 0.9 m/min, the peak current at 425 A, and the pulse frequency at 35 Hz to be such optimal conditions which effected the quality of zinc coated balance of joint.

Keywords : Metal inert gas pulse brazing process, Taguchi method, Galvanized sheet steels, Optimal conditions

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