Journal Européen des Systèmes Automatisés

Volume 54, Issue 2, 2021, Pages 335-344

Arc Welding Current Control Using Thyristor Based Three-Phase Rectifiers Applied to Gas Metal Arc Welding Connected to Grid Network

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Abstract: The purpose of the welding operation is to ensure the continuity of the materials to be assembled in large industrial sectors. This study aims to suggest a topology of the Thyristor based three-phase rectifiers applied to the Gas Metal Arc Welding (GMAW) process connected to the grid network, the output currents are controlled and using various pulsed forms such as square, annealing, and spike pulse operations and investigate and compare between the effects of the three references welding currents structures on the welding current, welding voltage, droplet diameter, and welding quality. To have the best pulse operation, the amplitude and frequency are kept the same for all operations, the application of meshing graphs in the references of welding currents structures, welding current, welding voltage, and droplet diameter can illustrate a clear comparison between them. The simulation results show that the square pulse operation is the best among them. The Single-Sided Amplitude Spectrum (SSAS) method is also applied to the welding current and droplet diameter of the three operations under slow and rapid droplet detachment rates to estimate the droplet detachment frequency. The results show the great success of the SSAS in estimating the precise frequency.

Keywords : Gas Metal Arc Welding, three-phase rectifier, grid network, SSAS method, welding current, welding voltage, droplet diameter, detachment frequency