

P2. High-Speed GMA Welding Of Aluminum: Comparison Of Power Supply Performance On Droplet Transfer And Heat Input Characteristics

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Introduction

The development of spatter-free, robust GMAW-Pulse parameters were investigated for high speed welding of aluminum. The current process employs conventional (i.e., non-pulsed) GMA welding utilizing an outdated rectifier power supply. Arc starting problems, spatter, and arc instabilities characterize some of the defects found with the current process. This work, therefore, investigates the capabilities and benefits of using an advanced inverter welding power supply with waveform control.

Experimental Setup

The welding application joins two 6-in.-diameter, 0.25-in. wall thickness aluminum ring specimens with a J-groove weld joint preparation in three continuous passes. The welding torch is fixed at the 12 o'clock position while the rings are rotated below on a rotary positioner. The root, fill, and cap passes are performed simultaneously without stopping rotation.

Analysis

A side-by-side comparison of power supply performance was conducted between the rectifier welding power supply and the inverter welding power supply. Comparison included digital high-speed video, digital thermography, and data acquisition. Synchronized high speed video with data acquisition (dynamic current and voltage) enables rapid optimization of the pulsing parameters to ensure arc stability, consistent metal transfer, and minimization of spatter.

Conclusions

The benefits of using an advanced inverter power supply with waveform control are presented. Improved arc starting, arc stability, and uniformity of metal transfer and reduction in metal spatter are documented.