SPB2. Benchmark Testing Trends Of GMAW-CV And Pulsed Power Sources

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Introduction

Companies that specialize in the manufacturing of robotic welding equipment need to recommend suitable power sources for customer's welding needs. Therefore, the purpose of this study was to determine the travel speed capabilities and gap welding capabilities of two power sources. The objectives were 1) to develop and carry out an experimental methodology designed to compare the travel speed, and gap welding capabilities of two modern power sources, 2) to recommend a suitable power source for a thin plate steel welding application and 3) to make objective recommendations for future testing based on the observations and data collected.

Technical Approach & Results

The task of analyzing the travel speed capabilities of each power source was accomplished using the Arcwise method, and was implemented in the DC/CV and pulse modes of both power sources. The Arcwise method is a systematic approach used in determining the welding productivity of a consumable arc welding process. An Arcwise Travel Speed Test was used to develop a nominal parameter weld matrix for 3 mm mild steel lap joints using WFS/TS methodology. This was carried out utilizing the sponsor's nominal weld size, varied by ± 20 percent to create weldability window for acceptable welds. Next a gap weldability study was conducted with a central composite D.O.E for gap analysis used WFS, TS, and Gap as the inputs and fusion and penetration as outputs. This statistical approach was used to determine how variation of welding parameters affected the outputs of weld characteristics while minimizing the welds that had to be made. The D.O.E matrix and output values for experimental welds were entered into Minitab to obtain regression equations, which were plotted using Sigma Plot. The results were then used to recommend a suitable power source for the marketing with the sponsor's robotic welding systems.

Conclusions

- Power source B outperformed power source A in the DC/CV mode, while power source A outperformed power source B in the Pulse mode.
- Power source A outperforming power source B in both fusion ratings and penetration ratings at a constant travel speed of 27.5 ipm.
- Travel speed analysis illustrates the sponsor's recommended weld size to be adequate in determining maximum travel speeds for obtaining acceptable welds.
- The effects of electrode placement inside the weld joint may be employed in future studies exploring the option of implementing variable polarity power sources for thin sheet metal welding.