

**Chen, Y., Wang, Y.-Y., Thermal Modeling of Gas Metal Arc Girth Weld with Narrow Groove, Proceedings of 8th International Conference on Trends in Welding Research, 2008, GA, USA**

### **Abstract**

Pulsed gas metal arc welding (P-GMAW) is one of the most effective joining methods for pipeline constructions. With a narrow-groove weld geometry and different electrode and torch designs such as tandem wire and dual torch, the P-GMAW process has several unique characteristics that need to be considered in its heat transfer analyses. This study presents a heat transfer analysis for P-GMAW with a consistent heat source model and its associated thermal boundary conditions. The objective of this study is to extend the existing numerical approaches to cover the situations in current P-GMAW applications in pipeline construction where multiple wires and multiple torches are employed. To validate this thermal model, the predicted temperature histories and cooling rates in the welds under different pre-heat temperatures and different electrode/torch designs are compared to the measurement data, and good agreements are achieved.

### **Keywords**

GMAW, Narrow groove, Heat transfer, Microstructure, Cooling time, Hardness, Finite element analysis