

D. Development Of High Quality Orbital GTAW For Aluminum Process Piping *by Ian D. Harris, Edison Welding Institute*

Introduction

Aluminum process piping is not new, but the requirements for a system capable of operating in a uranium enrichment plant lead to the development of piping systems with welds of the highest integrity. The use of state-of-the-art welding equipment, combined with stringent cleanliness requirements for tubing and welding consumables resulted in development and qualification of high quality aluminum piping butt joints for a range of pipe sizes and wall thicknesses. Other aspects included materials sourcing, development of pulled tees for piping branch connections, and welding of pipes to flanges

Technical Approach

Aluminum piping system fabrication for this application requires the implementation of best practice material handling, cleaning, and welding practices, including mixed acid etching of tube ends and filler wire. Orbital GTAW is a natural process choice for developing high quality pipe joints, but the porosity requirements for thin-walled piping in Schedule 5 and 10 require particular care when meeting radiographic quality acceptance criteria.

Results/Discussion

Welding procedures were developed using GTAW-VP and GTAW-P techniques for piping ranging from 1-in Sch. 5 to 4-in Sch. 10. These procedures were adapted for welding pipe branches to pulled tees, the latter being developed using two distinct techniques. Weld inserts were developed from aluminum welding wire and otherwise autogenous welding procedures were developed from those using filler wire addition. A significant finding was that DCEN GTAW-P welding procedures performed better in qualifying to RT requirements than did procedures developed using GTAW-VP

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Radiographic acceptance criteria were met for the range of pipe sizes required, for welding 1-in Sch. 5 tubing to 4-in Sch. 10 pulled tees representing manifold material, and V-band flanges were welded to 1-in Sch. 5 piping.

A recommended practice guide was developed for piping and module subcontractors to use as a quality assurance tool. Electronic software from around the world was reviewed and evaluated for maintenance of welding procedure and welder qualification records to assist in the quality assurance and full traceability of welding procedures and individual welds.

Conclusion

State-of-the-art fabrication practice and orbital GTAW procedures were used to develop and qualify piping butt joints, branch connections and flange to pipe welds in a range of pipe diameters and wall thicknesses.