

## Quarterly Report

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Contract Number: *DTRS56-03-T-0010*

Prepared for: US DOT PHMSA

Project Title: Alternate Welding Processes for In-service Welding

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### **Public Page:**

Plans are currently being made to begin the flow loop trials using flowing water backing, with each grade and thickness of X52 and X80 pipe, and the self shielded flux cored, pulsed gas metal arc, and shielded metal arc welding processes. Pipe sections have been prepared for direct deposition and sleeve fillet welding simulations with flowing water backing. This method shall simulate the worst case scenario for in-service welding in terms of HAZ and weld metal critical hardness and their susceptibility to hydrogen delayed cracking. This test will also identify the thickness where the flowing water has little or no influence on the weld cooling rates. Comparisons will be made back to those results achieved in static air conditions.

Sleeves have been fitted and tacked to each test pipe section. Holes have been drilled at the pipe sleeve interface for each fillet weld segment to insert thermocouples and collect thermal histories for each of the test welds deposited. These thermal histories will be used to characterize the weld cooling rate for each welding process and heat input range used. Sections will be extracted from each weld to examine weld and HAZ hardness which will be plotted against the acquired cooling rate histories. The critical hardness / cooling rate relationship will identify the lower heat input range for each process to avoid delayed cracking. Each of these results will be summarized in the ninth Quarter Status Report due the end of September 2005. This data will also be used in the hydrogen cracking delay time calculations to be performed in Task 6B.

For the second phase of this project, candidate gas shielded flux cored and metal cored arc welding electrodes are currently being sourced from the project sponsors for all position welding of X52 and X80 grades. Practical parameters will be established for each position of welding for direct deposition repair and fillet welding of pressure retaining sleeves.