Public Page

Date of Report: 28 September, 2007

Contract Number: DTPH56-07-T-000003

Prepared for: U.S. DOT Pipeline and Hazardous Materials Safety Administration

Project Title: Hybrid Laser/Gas Metal Arc Welding (GMAW) of High Strength Steel Gas Transmission Pipelines

Prepared by: Edison Welding Institute (EWI)

Contact Information: Lisa Austin at (614) 688-5130 or lisa_austin@ewi.org

For quarterly period ending: September 30, 2007

Progress to Date: Despite significant investment, one-shot welding and power beam processes have failed to achieve real benefits in pipeline construction. New developments in Yb-Fiber lasers have changed the paradigm. Innovative hybrid Laser/arc welding techniques which can complete 5G welds offer the best chance of developing high integrity welding processes. The innovative hybrid Laser/Gas Metal Arc Welding (hybrid welding) process will be developed for application in mechanized welding of high strength steel pipelines.

This project is being funded by the U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration with an expanded project team. EWI will lead the effort in collaboration with CRC-Evans, ExxonMobil, Chevron, ConocoPhilips, Heerema Marine Constructors, Tenaris Tamsa, McDermott, POSCO, and Lincoln Electric.

The major objectives of this program are to:

- Develop hybrid welding process and technologies for pipeline girth welding
- Demonstrate such a system under field conditions
- Develop techniques for variations of power (4-10kW) that have the greatest potential to meet existing pipeline integrity requirements

EWI has worked with CRC-Evans to develop and build a laser-hybrid bug and band system. This system has been installed in the lab and has been integrated with EWI's laser power source. Hybrid Laser-GMAW welds were completed on simulated joints at varying travel speeds, GMAW parameters, and laser powers. Laser parameters were varied to produce full penetration at maximum travel speeds while optimizing the GMAW parameters for surface bead appearance.

Pulsed GMAW welding parameters will be tested next in simulated grooves. After general parameters are established on simulated joints, true two-pipe butt joints will be made. Again, process parameters will be varied to produce visually acceptable welds. After visual bead appearance is acceptable, subsequent welds will be sectioned for analysis of weld properties, penetration profile, and side wall fusion.