

Low-Cost FSW System Prototype Delivered to Navy Metalworking Center

Status: Technical Success

PROBLEM / OBJECTIVE

Aluminum alloys are increasingly being used in high-performance ship structures to reduce weight and improve vessel performance. These requirements are crucial for the Navy's Littoral Combat Ship (LCS) Program. Friction stir welding (FSW) offers significant improvements over conventional aluminum fabrication methods by greatly reducing distortion and lowering fabrication costs. In the past, LCS production was supported by an off-site FSW service provider that transported sub-size panels to the shipyard, where the panels were assembled by conventional welding methods. To overcome the barriers to FSW implementation in shipyards, the Navy Metalworking Center (NMC) is leading a project to develop a transportable, low-cost FSW system that produces stiffened aluminum panels by edge-welding extruded aluminum shapes. Compared to past designs, the design and construction of this machine is greatly simplified, resulting in lower capital and operating costs. By locating the system in the shipyard, the panels produced are no longer limited to a size that can be transported by truck. In addition, locating the FSW operation at the shipyard streamlines the entire production process of near-net shape panels.

ACCOMPLISHMENTS / PAYOFF

Process Improvement:

NMC led the Integrated Project Team that designed and constructed a welding system that takes advantage of new welding techniques and design approaches to dramatically reduce the cost of the equipment, while supporting the requirements of the LCS Program and others. An extensive cost benefit analysis predicted rapid recovery of the project cost based upon reduced scrap and labor costs associated with off-site production of panels by FSW. The FSW system shuttles the workpiece instead of moving the welding head, which reduces the overall cost of the machine for the production of large panels.

Implementation and Technology Transfer:

The prototype low-cost FSW system is being demonstrated at NMC facilities in Johnstown, Pennsylvania, followed by transition to potential future production of LCS ships. The system design, including the control system program, will be made available to defense applications, expanding the benefit of the project to multiple DoD applications.



Having completed factory acceptance testing, the prototype friction stir welding machine is at NMC for demonstration testing.

Expected Benefits:

- Significant cost savings to the LCS Program through reduced capital, labor and scrap cost
- Access to system design supports subsequent production of duplicate systems to benefit other DoD platforms
- Transition of FSW technology to mid-tier shipyards.

TIME LINE / MILESTONE

Start Date:	August 2006
End Date:	May 2009

FUNDING

Total ManTech Investment:	\$3.9M
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PARTICIPANTS

LCS Program Office (PMS 501)
Naval Sea Systems Command
American Bureau of Shipping
Lockheed Martin Maritime Systems and Sensors
Marinette Marine Corporation
Bollinger Shipyards, Inc.
Advanced Joining Technologies, Inc.
Friction Stir Link, Inc.
Nova-Tech Engineering, LLC
Navy Metalworking Center

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