

# Hybrid Laser Arc Welding Implemented as a Single-Sided Production Welding Technique

Status: Implemented

## PROBLEM / OBJECTIVE

A review of joining processes used in commercial shipbuilding worldwide revealed that Hybrid Laser Arc Welding (HLAW) can reduce the welding heat input used to join metals, minimizing distortion and resulting rework cost. Huntington Ingalls-Ingalls Shipbuilding (HII-Ingalls) understood that the processes must be characterized and accepted by NAVSEA for shipbuilding seam weld applications.

## ACCOMPLISHMENTS / PAYOFF

### **Process Improvement:**

Working closely with HII-Ingalls Welding Engineering, EWI developed robust HLAW parameters for three different material types. By demonstrating similitude between the PEMA system built for HII-Ingalls and a EWI HLAW welding system, EWI was able to weld qualification test specimens while the PEMA system was designed and built. EWI and Naval Surface Warfare Center - Carderock Division conducted qualification testing while the PEMA system was installed at the shipyard. This similitude effort enabled HII-Ingalls to obtain NAVSEA procedure qualification shortly after the PEMA system was installed. Through demonstration and production trials at HII-Ingalls, HLAW proved to be an optimized welding process that reduces the welding heat input, minimizes distortion, and reduces rework requirements and associated costs. Benefits of lower heat input induced by HLAW has significantly decreased the amount of distortion in post-seam welded panels. With the significantly flatter panels moving to downstream processes, joining decks to bulkheads, stacking units, etc. can be accomplished with far fewer fitting aids reducing overall fitting costs at these workstations.

### **Implementation and Technology Transfer:**

This process, as developed and demonstrated at project completion in March 2020, integrates the highly optimized HLAW process resulting in significant time reductions across all current Navy and Coast Guard platforms constructed at HII-Ingalls. These reductions are estimated to result in a potential five-year savings of \$23.31M for the combined DDG-51, LPD, and LHA acquisition programs.

Although 90% of the targeted use cases was achieved, coordination between HII-Ingalls and technical warrant authorities is ongoing to identify opportunities for expansion of the use case of this highly beneficial technology for other shipboard panels.

### **Expected Benefits and Warfighter Impact:**

- Reduced welding labor
- Reduced fitting labor
- Reduced distortion

## TIME LINE / MILESTONES

Start Date: January 2017  
End Date: April 2020

## FUNDING

Current Navy ManTech Investment: \$2.37M

## PARTICIPANTS

Navy ManTech  
Huntington Ingalls-Ingalls Shipbuilding  
EWI  
Naval Shipbuilding and Advanced Manufacturing Center  
Naval Surface Warfare Center - Carderock Division

