

Integrated Metrology Approach to Reduce Labor Costs and Improve Schedule for Several Ships

Status: Partial Implementation

PROBLEM / OBJECTIVE

In shipbuilding, components are manufactured independently and then integrated into larger builds. Considerable labor is required to address assembly misalignment due to time-lapsed material distortion and variances in stack-up tolerances. Current in-process measurement techniques at Ingalls Shipbuilding (Ingalls) are outdated, do not easily allow for design changes, or are not tied to other component evaluations. This Navy Metalworking Center (NMC) project developed a means of identifying and accounting for misalignment prior to final construction stages.

ACCOMPLISHMENTS / PAYOFF

Process Improvement:

The Integrated Project Team (IPT) developed solutions for two focus areas. For Large Component Verification, the IPT developed a method of independently laser scanning both a single component and the mating ship area and virtually aligning the two scan sets using data translated from the ship coordinate system. This process was demonstrated during the assembly of the DDG 51 shaft struts and is expected to eliminate late-stage corrections needed previously. For Pre-Cut Identification, the IPT developed two methods to accurately identify material removal for ship units to improve erection processes. One method used total station hardware for small or simple geometries; the other used laser scanning as a complementary or stand-alone process for large or complex-shaped geometries. With laser scanning, the IPT developed a novel way of using targeting spheres to accurately capture plate edge data. For both approaches, the IPT worked with a third-party software developer to create macro-like functions to minimize the interface required by Ingalls personnel.

Implementation and Technology Transfer:

Ingalls initiated implementation for Pre-Cut Identification using the total station method in the second quarter of FY15. Ingalls also initiated implementation activities regarding laser scanning for both focus areas that consists of 1) capital procurement for laser scanning hardware, 2) defining computing, storage, and access needs, and 3) conducting yard personnel training on laser scanning processes. Full-scale implementation is expected during the first quarter of FY17 once Ingalls procures the Surphaser laser scanner and trains personnel. Bath Iron Works and U.S. Army TARDEC have also expressed interest in the developed methods.

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An Ingalls accuracy control employee is pictured conducting a laser scan on a DDG 51 shaft strut to verify placement. (Ingalls photo)

Expected Benefits and Warfighter Impact:

Cost savings at Ingalls for all planned hull constructions over the next five years are expected to be \$4.8M:

- \$1.57M for DDG 51 (\$314K/hull)
 - \$1.46M for LHA (\$970K/hull)
 - \$1.24M for LPD (\$828K/hull)
 - \$534K for NSC (\$267K/hull)
- Improve outfitting operations by 12 days

TIME LINE / MILESTONE

Start Date: November 2013
End Date: July 2015

FUNDING

Navy ManTech Investment: \$1.3M

PARTICIPANTS

DDG 51 Program Office
Ingalls
Naval Surface Warfare Center, Carderock Division
NMC
ONR Navy ManTech

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