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REDUCING THE COST AND TIME TO BUILD NAVY SHIPS

CNST
Center for Naval Shipbuilding Technology

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Measure, Layout and Install Ship Components Using 3D Laser Scanning Tool

Eliminating expensive manual targeting and staging requirements

The Center for Naval Shipbuilding Technology (CNST) has awarded General Dynamics Electric Boat (EB) a rapid response project to identify and recommend the most cost efficient and least labor intensive solution to install ship components with the use of a 3D laser scanning tool. EB has significant experience in this area and believes the commercially available metrology systems are now mature technologies that could support EB imaging demands. EB has been evaluating 3D laser scanning tools since 2001 to support SSGN conversion ship checks. Current evaluation of the 3D laser scanning tools show a marked increase of functionality to capture more accurate spatial orientation data and there are more advanced post processing software applications commercially available now to quickly process 3D as-built models. The desired 3D laser scanner is a non-contact measuring device, which eliminates expensive manual targeting and staging requirements; this is a potential labor savings opportunity, as collecting the data today requires manual intervention processes.

This project will involve leasing vendor services with laser scanner rental and post processing of data. It will also involve combining commercial technologies to meet requirements, selecting equipment, and conducting a cost benefit analysis for each potential solution. Process metrics will be defined to collect, document, and report for the process using the 3D laser scanning tool and post processing software applications. An implementation path is in place, as EB is targeting system use for fabrication activities as soon as possible, anticipating a late spring trial use and expedient new construction and repair applications already identified. EB expects to use the metrology system(s) at their Groton facility and potentially at their Quonset Point (QP) facility as well. EB anticipates a conservative savings of $63K per VCS hull.

CNST Project Transition / Implementation Update:

The previously completed CNST *Digital Radiography* project conducted with Newport News Shipbuilding continues to provide benefits to both the Navy and the shipbuilding industry. We are pleased to share this short implementation update on this CNST success:

- Completed in September 2008, Newport News Shipbuilding (now NNS, formerly NGNN) had proposed to Naval Sea Systems Command (NAVSEA) to use a lower energy isotope, Selenium-75 (Se-75) to conduct radiography, reducing the 'exclusion area' around the radiography test, drastically reducing the interference/ interruption impact on production activities, allowing radiography to be accomplished without adjacent work stoppage. NAVSEA has approved the use of Se-75, applicable to all shipyards and is valid for NAVSEA 250-1500-1 and TP-271 radiography applications. This authorization was approved for material thicknesses up to 1.6 inches; this enables an even greater range of Se-75 radiography shots. NNS has recently implemented use of Se-75 in appropriate applications.
- NNS has continued validating the use of computed radiography (CR) in order to validate use of CR for welder qualifications. NAVSEA had imposed a two-year restriction on the use of CR for inspection of welder qualification coupons. At NAVSEA's request, NNS forwarded a letter to NAVSEA 08 and 05 requesting unrestricted use of digital filmless CR as an alternative to film. To date, NNS has performed approximately 1500 welder qualifications using the digital method with Government oversight (since it was implemented in May, 2010). NNS anticipates receipt of unrestricted NAVSEA authorization for digital inspections of welder qualifications in the coming months.

Support of Advanced Coatings

The Center for Naval Shipbuilding Technology (CNST) awarded a new project, *Support of Advanced Coatings*, to General Dynamics Electric Boat (EB). This two-phase project, to be executed over a period of 24 months, will provide technical expertise to support an Institute for Manufacturing and Sustainment Technology (iMAST) led project, *Improved Interior Finish Coatings.*

Preservation is a significant cost driver when considering total ownership costs of Navy Ships, and there is great potential to reduce additional costs associated with fleet unit repairs. The appearance of interior and exterior painted surfaces is important to the Navy, and a substantial amount of money is spent on reapplying finish coatings solely for cosmetic reasons. This is true in both new construction and repair. The cost associated with routine application of finish coatings to repair cosmetic damage goes well beyond the material and labor cost associated with application of the paint. Surface preparation (hand sanding, brush blasting, power-tool cleaning, solvent wipe, etc.) is labor-intensive. Masking and cleanup of dust or paint also increases the cost associated with cosmetic over-coating. This project aims to improve toughness, abrasion resistance, and cleanability of interior finish coatings to help reduce or eliminate over-coating, which will reduce both acquisition and total ownership cost (TOC).

Interior finish coatings currently in use have (predominantly) been developed to meet environmental regulations and cost constraints. Current trends in marine maintenance coating formulation are toward high-build rapid-cure coatings and extended corrosion protection. However, simply improving coating longevity will not necessarily reduce cost when repair coating operations are performed for cosmetic reasons alone. To reduce TOC, an interior finish coating (or coatings) must be developed that will eliminate the need to paint for strictly cosmetic reasons.

The first phase of this project is an investigative task into design and formulation of improved interior coatings. The requirements and optimal characteristics of finish coatings will be identified, and materials will be acquired and incorporated into an experimental design. The second phase will focus on the demonstration and qualification of an optimized interior finish coating. A candidate coating (or coatings) will be produced to perform a shipyard demonstration. Following a successful demonstration, a request to qualify letter will be sent to NAVSEA 05M to initiate the qualification process. Once tested and qualified, the coating advances are expected to yield $465K/VCS Hull in acquisition cost savings, with greater potential for savings over the submarine life cycle as well as any other Navy platform.

Government Furnished Material Improvement Process

Streamlining GFM Processes

This General Dynamics Electric Boat (EB) project, which was kicked-off in July, aims to streamline the government furnished material processes associate with the construction of VIRGINIA Class Submarines (VCS). The objective of this project is to pilot a streamlined GFM process that establishes common material identification between EB, SUPSHIP, Navy Program Acquisition Resource Managers (PARMS), and Navy-contracted GFM vendors.

The existing GFM process at EB results in significant rework and high cycle times. The current process results in a mismatch between incoming GFM identification provided by the Navy or Navy-contracted suppliers and the previously-identified requirements in EB's technology data systems. This mismatch requires significant manual intervention and increased labor hours to be incurred, as the GFM material moves through the receiving, procurement quality analysis, inspection, and storage processes. A Future State Value Stream Map will be developed to identify the desired GFM process. These maps will support conduct of a Gap Analysis review, which will be performed to compare the Current State and Future State Process Maps, and review the Problems/Issues Matrix to identify the most significant areas of opportunity to streamline GFM process flow, and produce improvements in cost and cycle time performance. This list of opportunities will be documented using a prioritized GFM Improvement Action Plan, resulting in projects that will be executed in order to achieve the task goals. Acting on the prioritized GFM Improvement Action Plan, the project team will execute process changes to achieve the task objectives:

(1) Prototype a common material identification between EB, SUPSHIP, PARMS, and Navy-contracted GFM vendors.

(2) Establish a "mainstream process, similar to the current contractor furnished material process, that will eliminate significant manual intervention (and associated VCS labor hours) required to receive and issue GFM to the manufacturing and installation trades.

The GDEB project team expects to save as much as $758K per VCS hull at the conclusion of this 17-month project, with results potentially applicable to the Ohio Replacement Program and any other shipyard/ activity using GFM.

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