Winter 2016

theSIGNAL

A Publication of the Naval Shipbuilding & Advanced Manufacturing Center

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REDUCING THE COST AND TIME TO BUILD & REPAIR **NAVY** PLATFORMS

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Photo by John Whalen
Photo Courtesy of Huntington Ingalls Industries - Newport News Shipbuilding (NNS)

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Phased Array Sector Scan
Photo courtesy of EWI

Shipyard photo
Photo Courtesy Huntington Ingalls Industries - Newport News Shipbuilding (NNS)

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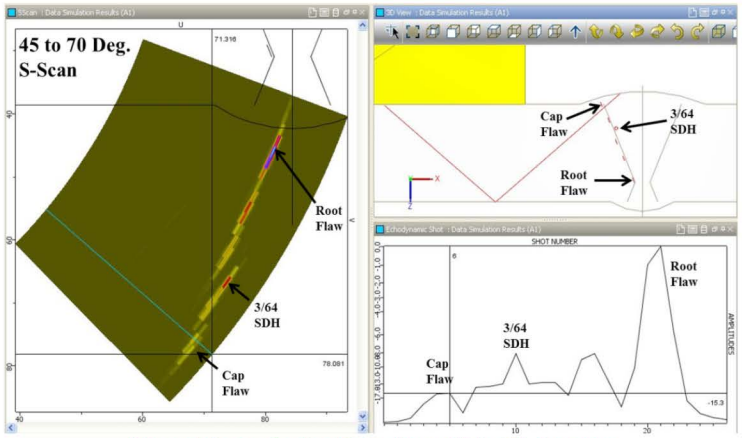
Induction Straightening on Desk Structure
Photo Courtesy of EWI

Submerged Arc Welding in Process
Photo Courtesy of EWI

Sea, Air Space Website Banner
Image Courtesy SAS 2017

Advanced UT Methods of NDT of Hull Welds



Phased Array Sector Scan from 45 to 70 Degrees Showing Detection of Flaws at Different Depths

General Dynamics Electric Boat (GDEB) Quality Assurance personnel have identified the practice of grinding the final weld beads flush with the adjacent plate surface as a significant contributor to VIRGINIA Class Submarine (VCS) construction costs. Design specifications require full volume inspection coverage of hull butt welds with either radiography or ultrasonic testing (UT), which must be capable of detecting weld discontinuities in both the axial and transverse orientations. This necessitates many hull butt weld configurations to be flush ground before conventional UT can be performed. Automated phased array ultrasonic testing and time of flight diffraction (PAUT/TOFD) techniques can be configured for full volume inspection coverage of a weld using multiple transducers simultaneously, allowing an as-welded hull butt to be inspected for discontinuities in multiple orientations with minimal surface preparation.

The project was executed in two phases. During the first phase, the project team determined the technical feasibility of inspecting hull butt welds with PAUT/TOFD technology to satisfy the current specification requirements. The second phase compared the effectiveness of applying the PAUT/ToFD equipment on as-welded VIRGINIA Class submarine (VCS) hull butt welds vs. conventional UT inspection at the GDEB Quonset Point facility. The capabilities of the PAUT/ToFD system and continued research into the non-destructive testing (NDT) and preparation for NDT as it relates to hull welds. The GDEB team is projecting a plausible savings of nearly $318,000 per VCS hull driven by factors of reduced delivery time, reduced grinding time and reduced inspection times. GDEB also applied the logic to the concept of application on the OHIO Replacement Program Class Submarine (OR) hull and came to a possible projected savings of over $476,000 per OR hull. Immediate steps have been taken to lay the groundwork for implementation of 'Advanced Ultrasonic Inspection of Hull Butt Welds' technology at GDEB.

Newport News Shipbuilding Created the Ability to Quickly Analyze Material Impact on Build Strategy Decisions

Material constraints must be an integral part of strategic and tactical build strategy decisions.

The Huntington Ingalls Industries - Newport News Shipbuilding (NNS) 'Synchronizing Material Logistics with CVN Build Strategies' project developed a prototype simulation based material logistics planning tool which employed Discrete Event Simulation techniques to create a library based re-usable application that optimized material logistic scenarios and improved the efficiency of CVN construction. This simulation tool permits Ship Construction Production Control to quickly link a proposed build strategy to those material delivery logistics associated with the involved CVN tasks.

Naval ship construction is an immensely complex logistical activity involving large quantities of highly specialized material, equipment and personnel. All material that ultimately resides in a CVN must be pulled from inventory, staged within a limited footprint and moved to the mechanic's work site along predetermined material paths. Material availability in the right

job site at the right time is a key element in NNS's drive to lower CVN construction costs. Unnecessary movement of material, delays due to material unavailability or blocked material paths or space consumed by unneeded material translate to schedule delays and increased costs.

The project team delivered the CVN Construction Material Logistical Planning Tool that allows the material logistic controllers to manage the adjacent lay down areas in an optimal manner. The tool illustrates by reports how a specific build (construction or outfitting) strategy will impact material resources, thus allowing CVN management to determine the optimum plan chosen from several potential alternative plans each having been analyzed using the simulation tool.

The tool we be implemented at NNS during 2Q of 2017. Once implemented it will provide the user the ability to quantitatively compare different staging and material supply stream scenarios choosing those that best support the constantly changing requirements as ship construction matures. It will also reduce construction schedule delays caused by material logistics issues by allowing those decision makers to rapidly adapt to the dynamics of ship construction, thus ensuring that construction capacity is efficiently utilized. This technology will reduce lost trade time and reduce CVN Acquisition cost by an estimated $3.08M per CVN Hull.

Induction Straightening for CVN

Current aircraft carrier (CVN) construction employs flame straightening techniques to straighten deck and bulkhead panels to achieve the required tolerances. Although effective, the process is time consuming and allows for variability in application. It requires numerous application zones across the full area of the panel and often necessitates multiple treatments. The objective of the 'Induction Straightening for CVN' project is to develop an acceptable process for deploying induction heating to straighten deck and bulkhead panels within required tolerances without adversely affecting material properties and to quantify the potential cost savings associated with implementing induction straightening at Huntington Ingalls Industries - Newport News Shipbuilding (NNS).

Induction Straightening on Deck Structure

The NNS and EWI team is executing the project in two phases. The first phase will determine technical acceptability testing and execute a test plan to develop induction straightening parameters that do not adversely affect HSLA65 material properties. The second phase will determine the effectiveness of the developed induction heating parameters to straighten a representative mock-ups of ship structure. Upon successful and timely completion of the 'Induction Straightening for CVN' ManTech Project and acceptance of the technology and associated business case by the acquisition Program Office, the results will be transitioned to the NNS facility. This technology, once implemented, could potentially save an estimated $2M per CVN hull.

High Deposition Submerged Arc Welding for FORD Class Aircraft Carriers

Compared to the NIMITZ-class, the FORD-class aircraft carriers have changed the thickness of plating resulting in increased welding hours for CVN 78. To meet CVN 79/80 cost reduction goals, Huntington Ingalls Industries—Newport News Shipbuilding (NNS) is actively modernizing its welding infrastructure with the intent of transitioning to new more capable equipment and shifting to more efficient welding processes. This NNS-led project works to identify and implement ultra-high deposition submerged arc welding (SAW) variants and expand the use of SAW to increase productivity. The objective of this project supports the NNS's welding infrastructure improvement effort by piloting and validating these advanced commercial SAW technology/equipment.

Submerged Arc Welding In Process

This project is divided into two distinct phases, with the first phase determining baseline requirements for ultra-high SAW welding technology and candidate SAW processes. In collaboration with the Technical Warrant holders, the second phase will evaluate and quantify the performance of candidate SAW processes relative to current SAW processes at NNS. Project results will be used to determine the technical feasibility of implementing new SAW technology in FORD-class aircraft carrier fabrication at NNS. Following this, the preferred process will be targeted for implementation at NNS. This technology, once implemented, could potentially save an estimated $3.4M per FORD Class hull.

NSAM Did You Know:

Recent NSAM project successes:

- The Naval Shipbuilding and Advanced Manufacturing (NSAM) and Newport News Shipbuilding (NNS) team recently completed development of an innovative tool that provides the ability to quickly analyze material impact on build strategy decisions. The "Synchronizing Material Logistics with CVN Pier & Dry Dock Build Strategies" project met all technical objectives and is targeted for full implementation in the first quarter 2017. NNS forecasts an anticipated labor reduction of over 25,000 hours and associated cost savings of over $3.08M per CVN hull, with good potential of the tool's use for the VIRGINIA Class submarine and OHIO Replacement acquisition programs.
- The "Dynamic Change Awareness" project with the Naval Shipbuilding and Advanced Manufacturing Center and Ingalls Shipbuilding team is nearing completion with an estimated cost savings of $3.3M per DDG hull. The team has recently identified an additional $2.3M one-time savings on the LHA-8 platform, not expected at the project's commencement. Ingalls Shipbuilding has realized that the project will result in a significant improvement to their overall PLM integration process and believes that even more savings will be identified during the post-project implementation process.

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To date, NSAM project efforts have led to over $500M in total savings, measured as "per hull" cost reductions across several U.S. Navy platforms.