

# Inspecting Special Hull Treatment with Impulse Hammers Will Lead to Cost Avoidance for VCS

Status: Implemented

## PROBLEM / OBJECTIVE

During Virginia class submarine (VCS) construction, inspection of the Special Hull Treatment (SHT) adherence to the steel hull is a critical process that detects debonding or delamination, which can degrade durability and performance. Currently, the SHT-to-hull bond is inspected manually, a process that is very subjective to the individual performing the inspection. Inconsistencies in the impulse applied by each operator and the interpretation of the resulting vibration and sound have led to variability in detection accuracy. If the debonded area is found after the ship is delivered, the cost associated with repairing it is greater than if it were repaired during construction. This Navy Metalworking Center (NMC) project improved the accuracy of detecting debonded SHT by developing and transitioning impulse hammer technology into the VCS construction process.

## ACCOMPLISHMENTS / PAYOFF

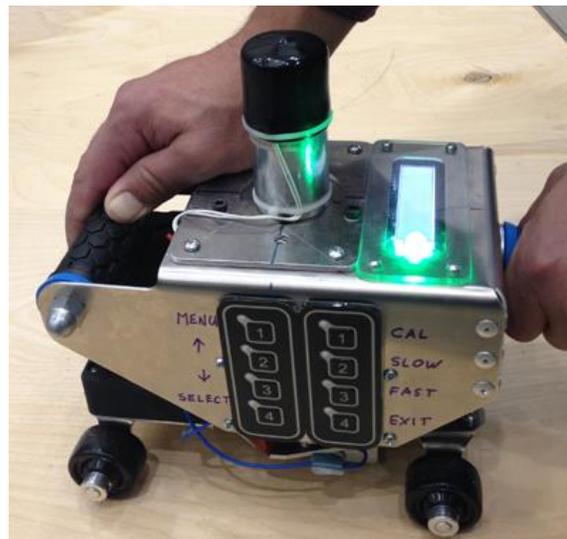
### Process Improvement:

NMC fully defined metrics for an impulse hammer system, identified candidate system components and used them to develop an inspection process. NMC then developed a prototype system that minimized variability and increased test speed. NMC continuously improved the system through a series of prototype units that were evaluated on VCS production units to verify the effectiveness of detecting debond under SHT. The final prototype system was delivered to the VCS Program Office.

### Implementation and Technology Transfer:

General Dynamics Electric Boat (EB) implemented the prototype impulse hammer system in February 2014 on an SSN 787 module and plans to use it next on SSN 784. NMC also fabricated a second prototype system for evaluation by other shipyards in their production environments. Strategic/Attack Submarines PMS 392 and the Naval Surface Warfare Center, Carderock Division (NSWCCD), personnel successfully demonstrated the impulse hammer system at Pearl Harbor Naval Shipyard, Portsmouth Naval Shipyard, and Puget Sound Naval Shipyard. Personnel at those shipyards have expressed an interest in using the device on in-service submarines, which will include both VCS and Seawolf class.

S2363 SHT Debond Detector  
Rev A (OCT14)



Use of impulse hammers to identify debonded SHT areas during VCS construction is significantly less costly than correcting the problem after delivery. NMC Photo

### Expected Benefits and Warfighter Impact:

An estimated cost avoidance of \$348K per hull may be realized by repairing SHT debonds during construction as opposed to after delivery. Cost avoidance is attributed to additional effort required to set up the equipment and staging area and to establish the proper environment in a dry-dock environment. The inspection device is also expected to be used on in-service boats, which will provide additional benefits.

## TIME LINE / MILESTONE

Start Date: October 2010  
End Date: December 2013

## FUNDING

Navy ManTech Investment: \$938K

## PARTICIPANTS

PMS 450	Portsmouth Naval Shipyard
NSWCCD	Puget Sound Naval Shipyard
EB	Pearl Harbor Naval Shipyard
NAVSEA 04X	NMC

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