

Digital Radiography Transition for Inspection of Welds and Castings

Status: Project Ongoing

PROBLEM / OBJECTIVE

The current film-based radiographic inspection process uses expensive, non-reusable film and chemicals that contain materials (silver) that are potentially hazardous to the environment and wastes thousands of gallons of water every year. This film-based inspection process is also very cycle-time intensive, requiring manual handling of materials throughout the entire process. A previous Newport News Shipbuilding (NNS) project set the groundwork, having successfully used commercially available computed radiography (CR) equipment (detectable to 100 & 50 microns) to extend current technology and develop processes and standards to replace the film-based process in critical naval applications, with one system being evaluated at NNS to validate weld coupons during welder training. NNS identified and acquired state-of-the-art CR capabilities, knowledge and supporting technical resources that are being tested in a practical shipyard environment to assess overall potential benefit. This project is leveraging that effort by ascertaining inspection confidence with isotopes and high energy applications in addition to resolving technical and implementation issues leading to full implementation for specific fabricated part details.

ACCOMPLISHMENTS / PAYOFF

Process Improvement:

The project team is defining tasks for acquiring NAVSEA authorizations for further CR usage, working to revise ASTM standards, coordinating with CR equipment suppliers and users in an effort to improve the technology, and concurrently inspecting and documenting results of approximately 340 production weld locations with low energy X-ray, Selenium-75 and Iridium-192 isotopes. The teams will also develop a plan to evaluate, devise and document meaningful techniques with high energy X-ray used for CR inspections of variable thickness heavy wall castings. Pending development of successful high energy CR techniques for casting inspections, a future offering is planned for longer term concurrent film/CR evaluations and development of digital reference acceptance images.

Implementation and Technology Transfer:

NNS is executing this project in two phases. Phase 1, completed in August 2011, focused on eliminating or greatly reducing gray scale streaking artifacts while evaluating new technologies and acquiring Navy satisfaction with technical inspection processes and



authorization of CR standards. During Phase 2, the project team completed the evaluation of all weld locations, detecting all discontinuities by both film and digital methods. A report of the findings is in progress. NAVSEA has removed the two year trial implementation restriction of digital radiography evaluation of welder qualifications performed at the NNS Weld School. The project team is developing standards for use of digital radiography for evaluation of production welds and castings with the goal of implementing digital radiography in production on nuclear and non-nuclear systems.

It is estimated that this project will result in a cost savings of approximately \$1.5M per CVN. Technology transfer is being facilitated through numerous presentations regarding the plan and progress of this project at conferences and shipbuilding community meetings.

Expected Benefits and Warfighter Impact:

- Ascertain inspection confidence with isotopes and high energy applications using CR
- Resolve technical and implementation issues
- Reduce environmental impacts
- Reduce inspection costs

TIME LINE / MILESTONES

Start Date: November 2010
End Date: May 2012

FUNDING

Current Navy ManTech Investment: \$598K
Previous Navy ManTech Investment: \$1.4M

PARTICIPANTS

PEO Carriers
Newport News Shipbuilding
Center for Naval Shipbuilding Technology