

Digital Radiography

A Less Expensive, Less Hazardous Alternative to Film-Based Radiographic Inspection



High Resolution CR System and Controller Station

This Northrop Grumman Shipbuilding-Newport News (NGSB-NN) project is successfully using commercially available computed radiography (CR) equipment as an alternative to the current film-based process in critical naval applications. With over half of the 400 welder certification coupons complete, computed radiography technology appears to have developed to a level comparable to current film methods of non-destructive testing.

Film-based radiographic inspection process uses expensive, non-reusable film and chemicals that contain materials (silver) that are potentially hazardous to the environment. In addition, the film developing process wastes thousands of gallons of water every year. The traditional film-based approach to inspection is also very labor intensive, requiring manual handling of materials throughout the entire process. NGSB-NN has identified and acquired state-of-the-art CR capability, knowledge and supporting technical resources that are being tested in a practical shipyard environment to assess overall potential benefit. The most common use of the technology is to determine the acceptability of completed welds, but it also has potential for use in inspecting castings and assessing the pipe condition during overhaul,

maintenance and repairs. The project team continues to test and develop key CR system features, techniques and control parameters that sustain current naval radiographic imaging requirements without compromising performance. To date approximately 240 weld coupons (from both structural and pipe samples) have been evaluated using side-by-side comparisons of computed radiography and film, with very favorable results.

Project results are having an impact beyond naval construction. Considerable progress has been made toward industry-wide acceptance by pursuing standardization through the American Society for Testing and Materials (ASTM). In a parallel effort, the NGSB-NN Principle Investigator developed ASTM E-746 "Standard Practice for Determining Relative Image Quality Response of Industrial Imaging Systems." ASTM has approved this document and will publish it in their International Book of Standards. Major revisions to the ASTM E2007 "Standard Guide for Computed Radiography" were also submitted and are awaiting final approval. This standard represents a major evolution for CR technology as it contains core descriptions of key process elements as well as standardized terms and definitions.

NGSB-NN continues to evaluate the ability of CR technology to provide equivalent or improved image qualities, area-of-interest coverage and discontinuity detection when compared to current methods. The final 160 original weld coupon samples will be evaluated with computed radiography and film using low energy X-ray radiation. The team will also explore additional technique innovations involving radiation sources (specifically Cobalt 60 and high energy X-ray) that may lead to other techniques for achieving acceptable image quality. If adequate techniques are established with these isotopes, the project team will initiate concurrent evaluations of thicker welds and castings. Finally, all naval CR standards and training materials will be updated to incorporate the latest technology refinements for weld and casting inspections as the team continues to seek approval of ASTM E 2033- "Standard Practice for Computed Radiography".

About CNST

CNST is a Navy ManTech Center of Excellence, chartered by the Office of Naval Research (ONR) to identify, develop and deploy, in U.S. shipyards, advanced manufacturing technologies that will reduce the cost and time to build and repair Navy ships. For additional information on this and other CNST projects, please visit www.cnst.us.

