Digital Radiography

PROBLEM/OBJECTIVE

Non-Destructive Evaluation (NDE) of a casting during qualification and production is expensive and time consuming. In a typical single safety critical casting, 157 sheets of film are used during inspection. At $2/sheet, that's $314 in film for a single part, not including time and labor. On a yearly basis a single aerospace qualified foundry will consume more radiographic film than a very large metropolitan hospital. Digital radiography technology is becoming increasingly available as an in-house inspection tool for metalcasting quality assessment. However, without accepted digital reference standards, digital radiography cannot be used to certify a part.

ACCOMPLISHMENTS/PAYOFF

Process Improvement:

The Defense Logistics Agency (DLA) ManTech R&D office is working through the American Metalcasting Consortium (AMC) team with DoD Services, industry, and American Society for Testing and Materials (ASTM) to create the required casting reference standards for digital radiography. Reference digital images are being developed based upon the current ASTM film reference radiographs that are the current universally recognized radiographic standards. This will ensure that the digital standards replicate the film standards.

Implementation and Technology Transfer:

Master film radiographs are produced, digitized, and then packaged into a user friendly format. A digital supplement is written and both the written standard and digital images are submitted to the ASTM governing board for approval and acceptance. Once a standard has been approved, ASTM markets the standard worldwide. AMC's support has resulted in:

- ASTM E2422-05: Standard Digital Reference Images for Inspection of Aluminum Castings,
- ASTM E2660-10: Standard Digital Reference Images for Investment Steel Castings for Aerospace Applications,
- Currently developing a digital radiographic standard for ASTM E446: Standard Reference Radiographs for Steel Castings Up to 2 in. (50.8 mm) in Thickness.

AMC has also supported the development of ASTM E2669: Standard Digital Reference Images for Titanium Castings.

Digital Radiography lowers the cost of munitions

Expected Benefit and Warfighter Impact:

The potential time and cost savings for the creation of digital radiographic standards are far-reaching. Digital Radiography eliminates the cost of film production, processing and storage, which can be 5% of the total cost of the casting. Radiographic inspection time could be reduced as much as 50% with real-time three dimensional imaging techniques and the probability of detecting flaws increases from 85% to 97%. The development and application of these radiographic standards will ultimately allow metal casters to reduce time and costs while incorporating the accuracy that digital technology provides. Digital radiographic inspection has been found to reduce inspection times by 1.4 - 2.4 hours per part over current film inspection processes.

TIMELINE/MILESTONES

Start Date: June 2003
End Date: June 2012

FUNDING

DLA ManTech:	$350,000
Industry Cost Share:	$125,000

PARTICIPANTS

- University of Alabama – Birmingham
- American Foundry Society
- Steel Founders Society of America
- The Boeing Company, Howmet, Lockheed Martin, PCC
- AMC & Advanced Technology International
- ASTM International
- Defense Logistics Agency (DLA)