Use of Digital Radiography for Final Part Acceptance of Aerospace Castings

PROBLEM/OBJECTIVE

Non-Destructive Evaluation (NDE) of a casting during qualification and production is expensive due to the rise in film costs of 9-20% per year over the past 5 years. The two largest US consumers of radiographic film are aerospace foundries; PCC and Howmet. Digital radiography technology is becoming increasingly available as an in-house inspection tool for metalcasting quality assessment. However, without proven equivalency to film, accepted digital reference standards, industry standard training, and standardized implementation requirements, digital radiography cannot be used as a final part acceptance inspection method in the aerospace industry.

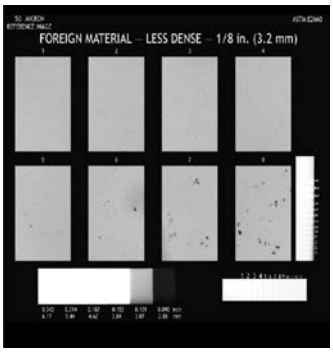
The objective of this program was to clear the technical and administrative barriers to widespread use of this technology within the aerospace community. This program addressed the development of ASTM standard reference images, common aerospace implementation requirements, demonstration of the use of digital X-ray systems, and approval of digital X-ray techniques for final acceptance by the OEMs.

ACCOMPLISHMENTS/PAYOFF

Process Improvement: The team has successfully: verified that digital inspection is equivalent to film inspection; digitized/standardized reference images for titanium, aluminum, and steel; developed level II & III radiographer training; produced a guidelines document for use of digital radiography in the aerospace industry; and developed digital part inspection procedures for 50+ components.

These achievements have addressed key barriers to implementation of digital radiography in the aerospace industry. Aerospace OEMs have begun issuing their specifications for use of digital radiography as a final part acceptance method.

Implementation and Technology Transfer: Casting suppliers have generated an implementation plan for digital radiography which brings about full transition in 2-4 years. The M1 Abrams AGT1500 engine diffuser and F135 engine stator castings will be converted to digital inspections in late 2011, while the guidance section casting for the Hellfire Missile converted in October 2011.



Expected Benefits and Warfighter Impact:
It is estimated that nearly $2.4 million is spent on X-ray film each year between the two major aerospace foundries for inspection of DoD components. From an environmental perspective, roughly $350,000/year can be saved by not using chemicals involved with developing film. This translates to a total DoD cast component savings of ~$80M over 10 years. Digital radiography will also be an enabler for other technologies which require digital data (i.e. ICMSE, assisted defect recognition, etc.).

TIMELINE/MILESTONE

Project Kickoff	October 2008
ASTM Reference Image Acceptance	June 2009
First OEM DR Specification Issued	July 2011
First Implementation	September 2011
Project End	January 2012

FUNDING

ManTech	$1,400K
Metals Affordability Initiative	$1,225K

PARTICIPANTS

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