



Radiographic Inspection - Film Replacement with Digital Detector Arrays in Aerospace Applications

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Abstract. The new Digital Radiographic Inspection method replace more and more the conventional Film technique. For DDA (Digital Detector Array) systems it is currently necessary to use automated or semi-automated systems. For CR (Computer Radiography) Systems the conventional Film Systems may be used. For this CR technique operators can use same X-Ray Units (Bunker) and same X-Ray equipment.

But on CR technique we have basically the same settings like the Film-based technique. More or less same exposure times and for aerospace application long scanning times for the CR foils. In fact there is no big benefit in capacity or in economical view.

Regarding this issue we thought about the option to use a DDA System instead of a Film or CR System to use the current Film Equipment (Bunker, Generator, Tube..) and replace this 1:1 by a manual system.

In this time only small detectors with fine pixel pitch was available on the market. With this type of DDA´s is was absolutely uneconomical to inspect parts in serial inspection.

Therefore a new generation of DDA´s were developed, which is able to replace Film or CR System 1:1 with adequate economical properties for specific applications.

The new PerkinElmer XRD 1611 Panel has a size of 40x40cm and a pixel pitch of 100µm.

The baseline for the new DDA Panel was the most used X-Ray Film in size 30x40cm. The Pixel Pitch and requirements for Bad Pixel based on the requirements for spatial resolution of the applicable ASTM standards and different customer specifications for castings.

With this new DDA System is it possible to inspect small and medium castings in very short time with excellent image quality. The System is able to process images under 1 minute include averaging.

Images will be transferred by a specific software tool to an offline reading station where certified Level 2 operator can inspect the images. Images will be archived as 16bit DICONDE File. All relevant images information are included in DICONDE File such image parameters, part information, software version, calibration service information.

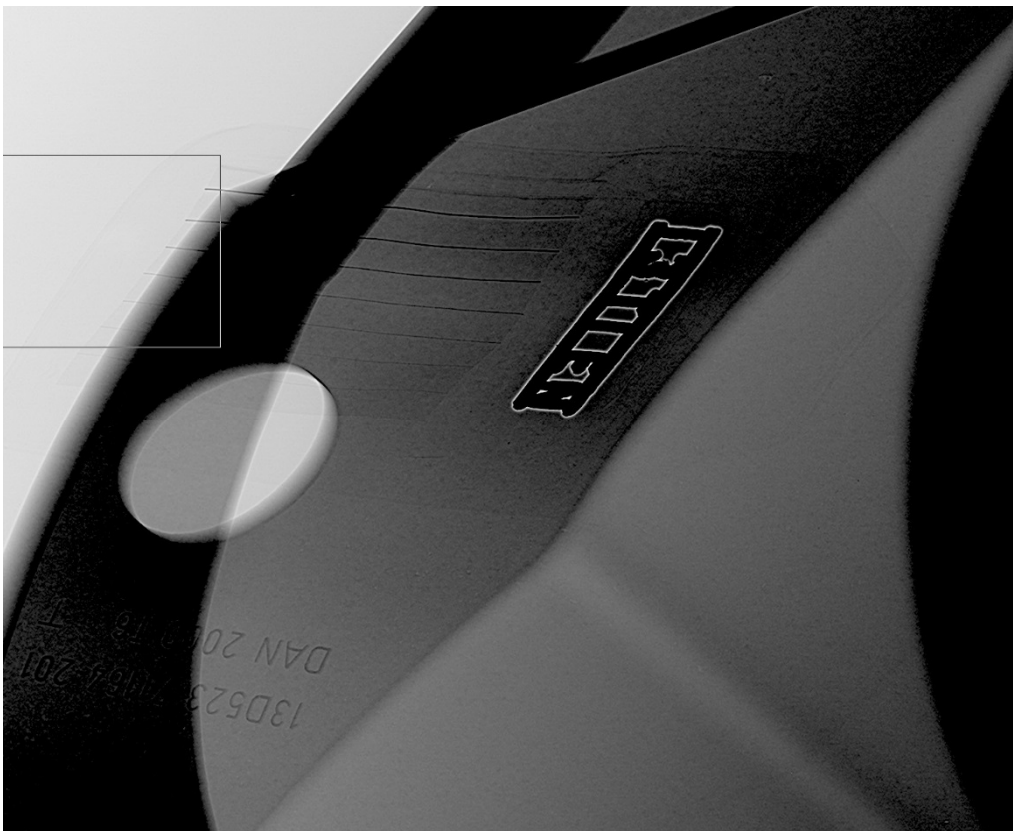


Fact:

- Reduce exposure time
- No running material costs (Film, Chemicals, Foils)
- No Film artefacts (i.e. lead foil, scratches)
- No additional equipment necessary (Development machine, Scanner)
- No additional exposures for different wall thicknesses necessary regarding 16 bit dynamic range
- Full traceability / Reduction of “Human Factor”
- Automatic calibration system for Long-Term Stability iaw. ASTM E 2737
- Enhancement of capacity
- Benefit for environment

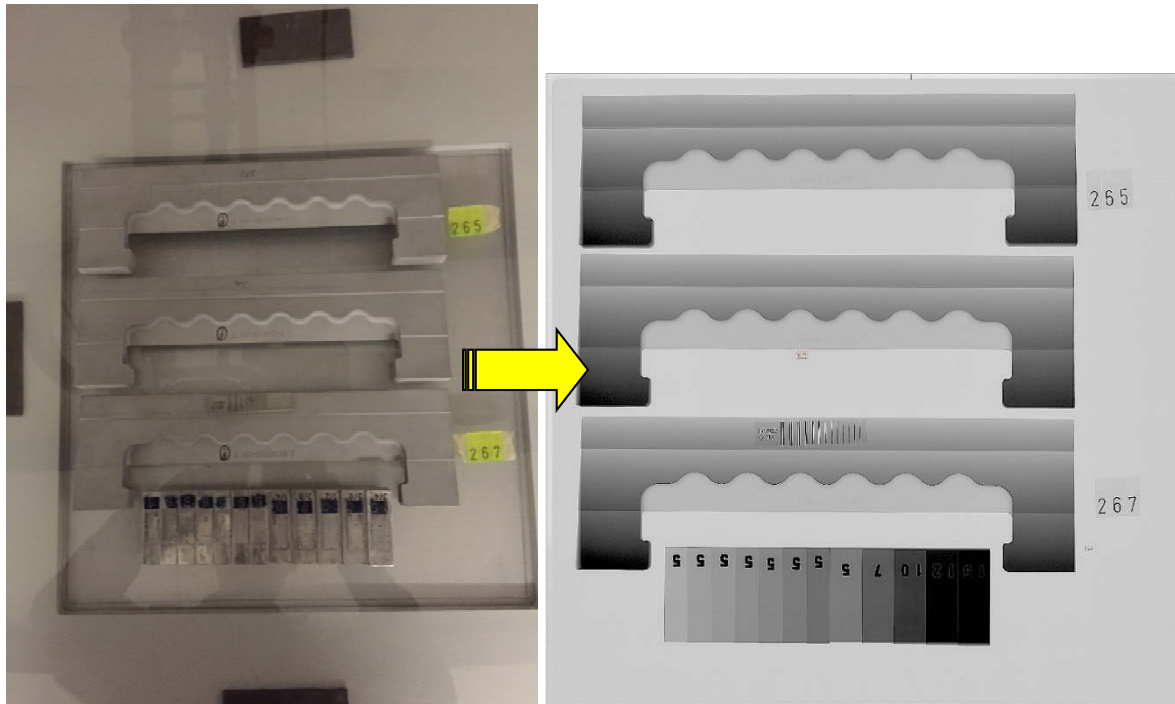
Limit of Technique:

- A DDA is not flexible. In cases where films or CR Foils have to be positioned direct in the part, it is not possible to use a DDA Panel.



DR Image with PerkinElmer XRD1611 100 μ DDA Panel and YXLON Image3500 Image Software
Aluminum Casting 2mm wall thickness W19 iaw. EN ISO19232-1 visible.

Typical Setting on XRD 1611 Detector – Parts are more or less direct in contact with the DDA panel.



Exposure set up on XRD1611 Detector

DR Image 160KV 4,00mA 333ms

References

- [1] Images by Alcoa Power & Propulsion TITAL, Bestwig / Germany
- [2] Information by YXLON International, Hamburg / Germany