Computerised Information Technology Ltd.

20, Potters Lane, Kiln Farm
Milton Keynes, Bucks, MK11 3HF
United Kingdom
Tel: +44 (0) 1908 260082
Fax: +44 (0) 1908 260084

CIT/DR6000 Digital Computed Radiography System

The Objective

The objective of the work package was to develop a Computed Radiography (CR) unit, which would replace conventional film radiography with digital technology.

The Scope of the DR6000 CR Development Work focussed in the following areas:

(1) For CR Plates exposed above 120kV or where the exposure time was in excess of 30 seconds, existing systems often exhibit a residual image left on the imaging plate after the erasure cycle has completed. The image can consist of 20% of the dynamic range of the image and at times 5% of the image range. On repeated exposures the 5% and 20% can accumulate to a ghost image or raise the background noise level in the current radiograph. This can cause a lack of repeatability and result in variations in radiographic density, which is not acceptable.

Solution:

In order to combat this problem CIT had to design and develop a LED based high intensity eraser with homogeneity of +/- 25% across the width of the scanning CR Plate. This was designed, developed and manufactured and subsequent testing using a microfocus source developed by X-Tek within the project showed that all of the problems highlighted in para 1 above were absent. The results concluded that the CR unit was able to function at up to 450kV with no residual images and with noise levels at less than 1% of signal.

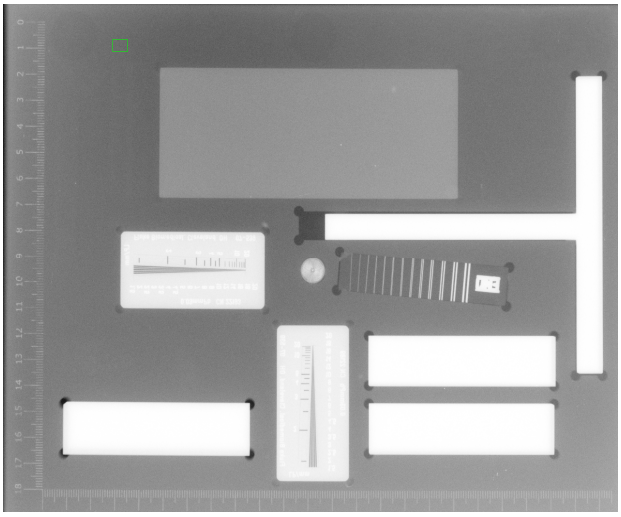
(2) The dynamic range of the CR imaging plates at Low, medium and high density exposures were measured and the parametric values were optimised for inspection of welds, castings, composites and aerospace components.

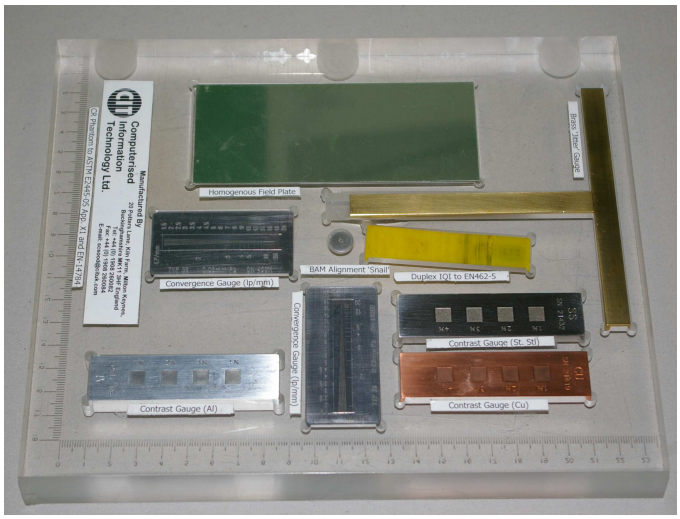
These performances were checked and evaluated by Kevin Skuse from Rolls Royce and a report was submitted confirming that the CR unit met with Rolls Royce RPS720 standards. This concluded that the DR6000 can be used for inspection of aerospace castings and components.

(3) Building on the above achievements, the CR unit was further advanced by the installation of radiation shielding so that the DR6000 could be used as a large area radiographic detector, thus replacing the flat panel detectors. It was established that it was possible to scan 10X12 inch cassettes at 50 microns in less than 60 seconds. It was also confirmed that the detector worked with a 450kV X-Ray source and IR192, Se75 and Yb169 Gamma isotopes.

(4) Results

The digital radiographic images captured with the DR6000 gave a true value of 0-65535 grayscales as an absolute detector. There was no background correction or white level compensation required and no image sharpening or image enhancement was applied. The qualification with the CR Phantom depicted the following:





Exposure settings: **SHR Cassette - 40kV, 3mA, 45 seconds**
STD Cassette - 35kV, 3mA, 40 Seconds

The DR6000 scanner was set to 50 Microns.

Test	Reading	Notes
Duplex IQI EN462-5 with CIT/SHR plate	12th line pair 63 micron wire	Unsharpness = 0.10 Exposure 40kV 3mA SFD 550mm
Duplex IQI EN462-5 with CIT/STD plate	11th line pair 80 micron wire	Unsharpness = 0.13 Exposure 35kV 3mA SFD 550mm
Convergence Gauge (Horizontal)	7 lp/mm	Observed with 5megapixel monitor Exposure 40kV 1mA SFD 550mm
Convergence Gauge (Vertical)	9 lp/mm	Observed with 5megapixel monitor Exposure 40kV 1mA SFD 550mm

The above confirms that the DR6000 achieved a radiographic unsharpness of 125 microns.

Note: The measurements carried out were using the CIT/STD and CIT/SHR imaging plates and the performance measured meets the international standards of ASME code, CEN 1435, RPS720 and EN 462-5. The digital radiographic images were archived as 16 bit tiff files.

(5) Conclusions

1. Digital CR has been proven as suitable to replace conventional film radiography in many sectors of the industry.
2. The inspection of welds, castings, composites using corrosion and condition measurement has been validated during the FilmFree project.
3. CIT has developed CR technology by integrating it into their NDE information archival retrieval technology.