Digital radiography is currently considered to be a new and exciting technique within the field of industrial radiography. Gradually, quality levels and costs of equipment have reached a level where the technique becomes more accessible.

Force Technology started with digital radiography inspection several years ago.

Primarily for use in the maintenance inspection programs with On-Stream radiography, we have now achieved the Quality levels necessary to carry out weld inspection.
Digital radiography has many advantages over conventional film radiography in that it enables inspection of applications that were previously rejected as impossible for examination with radiography.

Advantages are:-
- Reduced exposure time
- Wide Dynamic Range
- The developer process is eliminated
- Archiving and retrieval for future viewing
The exposure time may for a digital radiography may be reduced to only 10-20% of that for conventional radiography.

Wider dynamic range will enable the evaluation of applications with major changes of cross section than is impossible with conventional film. That also means we have a greater flexibility in terms of finding the correct exposure and will need fewer exposures to cover the range of thicknesses, thus increasing the safety factor significantly.

Whatever system we use, the result will be a digital image that is stored electronically. This is without the use of chemicals and the detector (digital film) can be used many times. The digital image can be transmitted electronically and evaluated using appropriate software. This opens up many possibilities in connection with the evaluation, reporting and distribution of the digital image.

Digital images are stored electronically and this is done on servers with backup routines, so that information is easily accessible and securely stored.
On the request from a customer, Force Technology has carried out a method qualification for the digital radiography of flexible risers.

This was performed in two different qualification methods.

The first qualification was carried out with the objective of identifying wire breakages in the outer armoured layer of the flexible Riser.
Force had success with this qualification and the method proved its value.

The qualification was carried out using digital radiography with Iridium and Cobalt isotopes.

The test was performed to cover four different scenarios:
1. Panoramic exposure (source in center of object) with image plates on the outer riser surface
2. Panoramic exposure (source in center of object) with image plates on top of the bend stiffener
3. Double Wall technique on top of the riser
4. Double Wall technique on top of the bend stiffener
The qualification also showed that the method has the possibility of identifying corrosion of the reinforcement layers with a sensitivity of approximately 2% (total thickness) also finding the distance between reinforcement layers, the presence of the carcass and cracks in the outer plastic layer.
The second qualification was for digital radiography of the Riser Termination Head (Flexible Riser End fitting), the aim of which was to identify the presence of the Cargass layer. Due to the large material thickness and limits to exposure times we chose to use a Betatron Accelerator. Force had success with this qualification and the method proved its value.
Exposure time was reduced to 1.5 minutes which achieved an acceptable quality of image. 10 minutes exposure time also achieved high-contrast images and the ability to measure the Carcass profile.

Test images directly on the Riser gave an even better image of the Carcass and enables good measurements of Carcass dimensions.
Conclusions:

Digital radiography together with Cobalt isotopes and a Betatron Accelerator is a suitable method for verifying the integrity of a flexible risers.

- Identifying corrosion
- Identifying breakages in the armour wire
- Carcass presence
- Carcass and armour location and dimensions
- Identifying cracks/breakages in the riser outer sheath underneath the bend stiffener.
Thanks for your attention.

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