PRESS RELEASE

Automated UT Inspection of Thick Section Welds

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James Fisher NDT (JF NDT), KANDE International and James Fisher Nuclear (JFN) teamed up to develop an inspection technique for containment vessel welds on the Westinghouse AP1000. The project, supported by the UK Technology Strategy Board (TSB) looked at alternatives to code radiography for the weld inspection.

The containment vessel of an AP1000 nuclear power plant is a steel cylinder with domed ends. The cylinder is 40m in diameter, 60m tall and has a wall thickness of 44mm. The containment vessel holds the nuclear reactor and steam generation equipment and is designed to contain the reactor and its contents in the event of any deviation from normal operation. The vessel is manufactured from steel plates which are welded together, meaning each weld has to be inspected to ensure there are no defects.

The standard code of inspection for this class of structure is a 100% radiographic inspection of the weld. Because of the relatively thick section and the limitations on the size of site radiography sources, this is a slow process and runs on a single shift per day basis, taking 16 months to complete the inspection.

An ultrasonic inspection of the weld is acceptable if it can be demonstrated to fully characterise any critical defect in the weld area. The first step was therefore to establish a worst-case credible defect description, and then model the inspection with a range of ultrasonic techniques to identify a method which would fully inspect the weld. The inspection was designed to be compliant with ASME code, the additional requirements of the USNRC, and also to meet the requirements of ENIQ.

A prototype inspection scanner was designed based upon an off-the shelf weld track and trolley with a bespoke mounting of an array of probes in fixed positions for speed, reliability, simplicity and practicality.

A Zetec Zircon portable UT acquisition unit was used to gather the probe data.

A test piece was purchased which incorporated a range of critical defects in the weld. Defects were orientated both longitudinal and transverse to the welding direction and include lack of fusion, crack-like and volumetric defects. The test block was inspected “blind” with RT and UT by qualified NDT technicians to act as a comparison baseline.

Trials with the prototype scanner indicated that at 1 metre per minute, it was effective at identifying all of the defects with multiple redundancies, whilst code RT only identified 20%. Defects could be sized to +/- 5mm. The trials were carried out by recording the data and post-processing through the proprietary Insight software tool. The analysis process was demonstrated to be sufficiently rapid to be able to be carried out in real time. Areas of concern could therefore be automatically identified and with the addition of a paint marker to the scanner, the area of concern can be visually marked to facilitate inspection and repair follow-up.

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Notes to editors:

JF NDT offers a range of products and services addressing non-destructive testing and non-destructive examination and radiological protection requirements for the aerospace, nuclear, defence, homeland security, chemical, oil and gas, and other industries.

For more information see: www.jfndt.co.uk

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