TRUEFLAW

FORTUM STEAM COLLECTOR

Originally published in: Insight Vol 51 No 5 May 2009

3.2 FORTUM STEAM COLLECTOR PRIMARY COLLECTOR

Fortum Ltd., Loviisa Powerplant (Finland) conducted an ultrasonic qualification for VVER steam generator primary collector during the 2008 summer outage. A schematic illustration of the steam generator is presented in Figure 3.

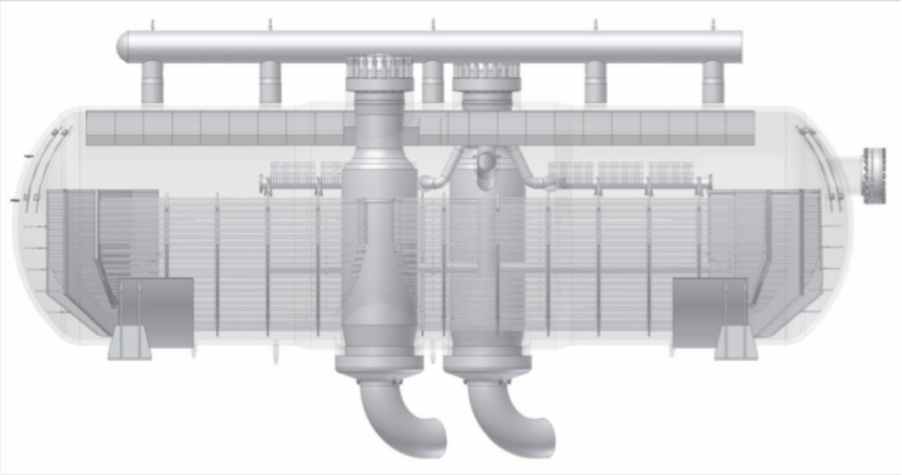

Figure 1
Loviisa powerplant horizontal steam generator.

The area of interest is cracking in M48x5 threaded holes of the primary collector flange. The inspection is done using phased array UT with scanning from top and inner diameter (ID) surface of primary collector. It was decided to use component removed from a similar poverplant, that never went to operation as a test block for the qualification. Figure 4. shows the qualification test block. The flaw types to be detected are shown in Figure 5.

TRUEFLAW

Figure 2
Loviisa test block from vintage material.

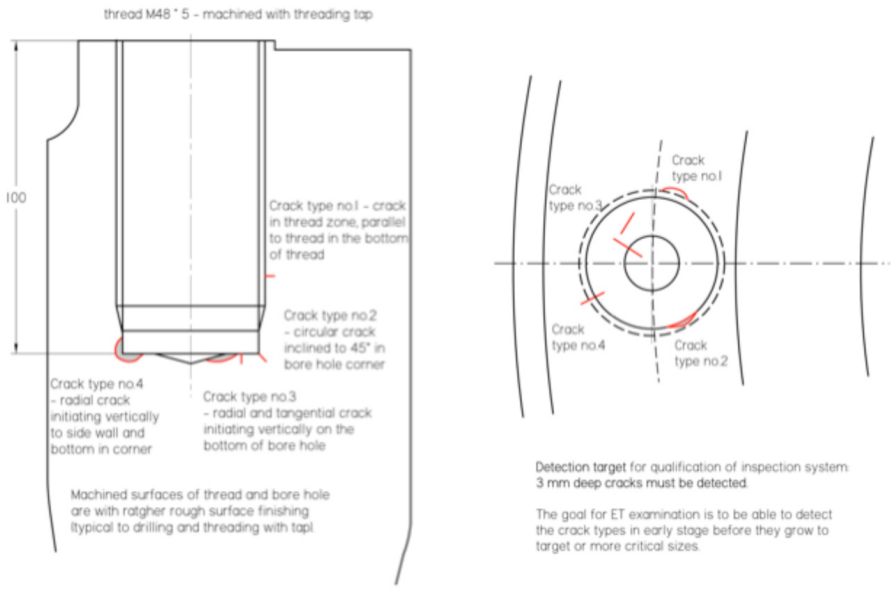

Figure 3
Flaw types to be detected in Loviisa primary collector qualification.

Fortum provided Trueflaw with the target flaw sizes and locations for this very challenging geometry. Flange is a forged ring fabricated from Ti-stabilised austenitic stainless steel. Since the material and geometric conditions are unique, new validation for each crack size was required for reliable flaw production. Material sample was cut out from the test block for validation purposes. A simplified validation sample was machined, that replicated the local geometry conditions of the threaded hole bottom cup.

Trueflaw produced validation cracks for all the desired flaw sizes and locations and supplied destructive evaluation report to Fortum. After accepted validation, the production of the actual qualification defects were done and test block supplied to Fortum. Figure 6 shows an example of a fracture surface from this validation. Thermal fatigue cracks were supplemented with a selection of EDM-notches in different locations.

Figure 4. Fracture surface from a destructively examined validation crack corresponding to crack type 3 in Figure 3.

The open trials on the test block were performed during the 2008 summer outage. All the defects were successfully detected in open trials with UT examination (even the small sizes). Loviisa now has a reliable inspection procedure that is tested with real cracks.