

# Boiler tube weld inspection with ultrasonic phased array technique



A large number of welded tube joints are found in a typical boiler. Therefore rapid and reliable detection of welding defects is essential. Boiler tube seam weld inspections of newly built (or repaired) welds is usually executed with radiography (RT). Radiography is limited to the need for evacuation of the workers from the area during exposure and the delay related to film development. Other planned activities will come to a standstill.

## Ultrasonic phased array technique

An alternative traditionally applied for radiography is ultrasonic phased array technique. KEMA has developed a semi-automatic inspection solution based on phased array ultrasound technology that can be deployed in lieu of radiography. It is not necessary to vacate the boiler when using the ultrasonic phased array (PA) technique.

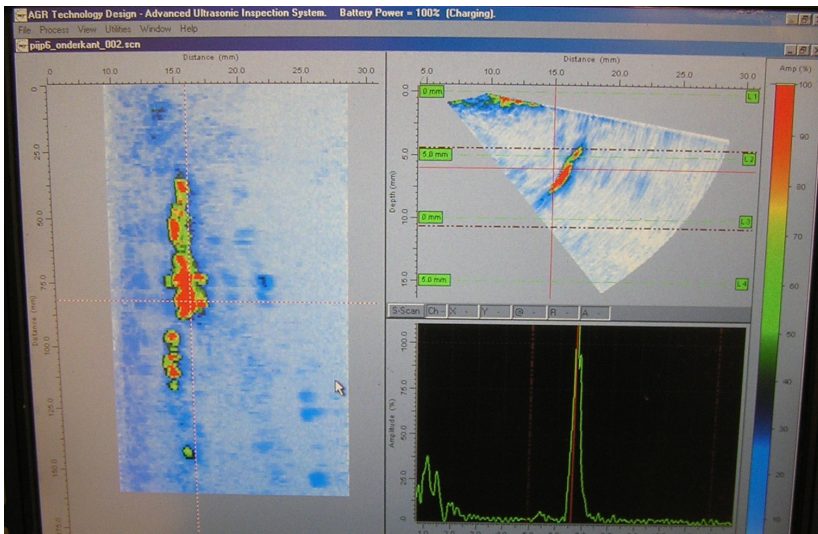
An ultra flat manually moved manipulator is used to perform the PA measurements. The manipulator and probes are fastened from one side around the tube. The seam weld is inspected from both sides of the weld. KEMA has experience with this type of measurements and performance validation of the method: a standard procedure is available.

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Technical innovation is at the heart of much of what we do. Our teams of more than 1,800 professionals in more than 20 countries are dedicated to delivering customized solutions.



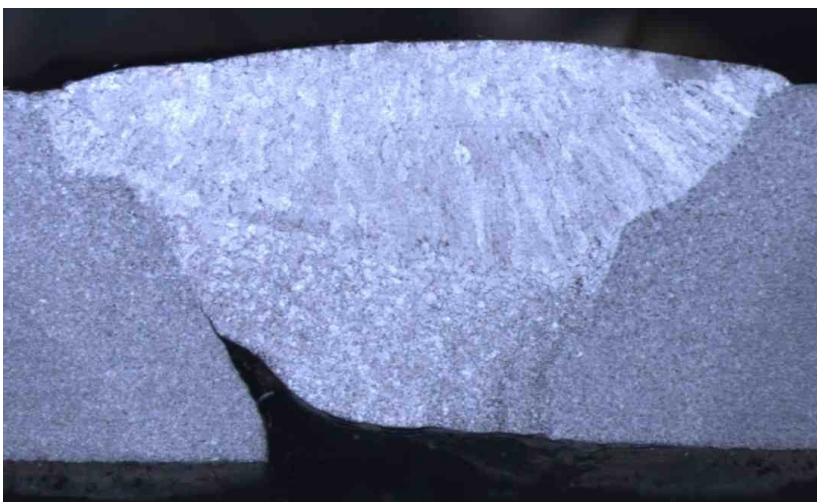
Performance validation is necessary to obtain equal or better probability of detection for radiography as for ultrasonic PA. Furthermore, calibration welds/ pipes must also be available. In the picture below the various weld defects are clearly visible.



### Specifications boiler tube weld inspection with phased array technique

- > Pipe diameter range: 0.5-4" (12.5-100 mm)
- > Clearance between tubes needed: 0.6" (15 mm)
- > Inspection possible with two 32 element PA probes from both sides of the weld simultaneously
- > Scan time per weld: approximately 30 seconds, the NDT operator can keep with the welder
- > Number of boiler tube welds evaluated in a 10-hour shift: 40-150
- > Evaluation is performed after the inspection by another operator within a few minutes: direct feedback to welder possible (radiography: more time needed)
- > KEMA has software for checking the bundle overlap in the weld and HAZ

Insufficient weld penetration/lack of fusion can be seen in the picture below.



### Key benefits

- > No vacation of boiler needed during ultrasonic PA measurements
- > No radiation dose
- > Only single-sided access needed for the operator(s)
- > Evaluation of results within a few minutes: feedback to welder possible
- > NDT costs radiography and ultrasonic PA comparable

KEMA  
 Utrechtseweg 310  
 6812 AR Arnhem  
 The Netherlands  
 T +31 26 3 56 35 00  
[www.kema.com](http://www.kema.com)  
[emea@kema.com](mailto:emea@kema.com)