TOMOWELD - Quantitative radiographic tomography technology for the in-situ inspection of welded austenitic safety critical pipework

Austenitic stainless steel is often used in the construction of critical pipework in nuclear power plants and petrochemical plants due to its resistance to corrosion and its high fracture resistance. Pipelines are usually constructed by joining sections of pipe together, using welding. These welds can host many types of defects that may go undetected if not inspected and, in-service and under stress; these defects can grow and lead to mechanical failure through mechanisms such as fatigue.

Current ultrasonic inspection techniques of austenitic welds are difficult due to the materials' inhomogeneity and anisotropy that cause the beam to scatter at grain boundaries. Currently, conventional film radiography is the technique used for inspecting these materials as the grain structure does not significantly affect the radiographic results. Film radiography is limited due to its long exposure times and the information available from the inspection. This causes the superimposition of internal features (reducing the contrast sensitivity) and the inability to position the depth of defects in the direction of the X-ray beam.

Project objective

The TOMOWELD project proposes to develop a robust mobile X-ray tomographic system for the accurate inspection of austenitic steel welds at the sensitivity levels required in the nuclear industry.

The application of X-ray computed tomography will overcome the limitations of current inspection techniques by providing 3D information of the internal structure allowing detailed cross sectional analysis and dimensional measurements to be obtained.

The design and manufacture of this system requires further development of existing X-ray tomography techniques and algorithms, hardware (mobile X-ray source and digital detector arrays) and robust field manipulators for easy onsite operation. As such, the following objectives will be addressed:

- Development of a robust mobile X-ray tomographic system for the accurate inspection of austenitic steel welds, at the sensitivity levels required in the nuclear industry.
- Application of X-ray computed tomography to overcome the limitations of current inspection techniques, by providing 3D information of the internal structure allowing detailed cross sectional analysis and dimensional measurements to be obtained.

For further information, please visit the project website at **www.tomoweld.eu**.

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TOMOWELD