MAPAID

Modelling and Application of Phased Array ultrasonic Inspection of Dissimilar metal welds

OBJECTIVES

The goal of the project is to model and validate phased array ultrasonic testing (PAUT) techniques for non destructive evaluation (NDE) of dissimilar metal welds (DMW, e.g. Figure 1) of NPPs. For validation purposes, NPP DMW mock-ups are selected, following both detailed microstructural characterization using Scanning electron microscopy (SEM) / electron backscatter diffraction (EBSD) combined with determination of DMW properties relevant for ultrasonic wave propagation. Results from characterization will serve as an input for modelling and simulation of PAUT of DMW. Both natural and artificial defects inserted in DMW mock-ups (see Figure 2) represents a NDE issue. Each partner then uses its own PAUT inspection system (see Figure 3). The results of simulation are compared with the inspection results. This project enables to quantitatively assess the contribution of phased array techniques to improved NDE performances of such parts, as well as the ability of simulations to support design, optimization and interpretation of such inspections. Moreover, investigation of various PAUT systems increase confidence in these techniques and widen the feedback and knowledge of various partners. In addition to reporting on experimental and simulation tests, conclusions drawn from these studies and analysis of further development are discussed for increased knowledge in the NDE and nuclear community.

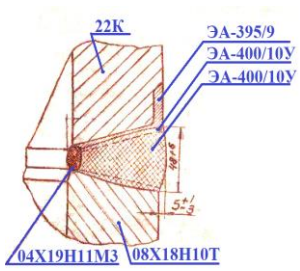

Fig.1: DMW in a VVER reactor

Fig.2: Test block with DMW for PAUT qualification

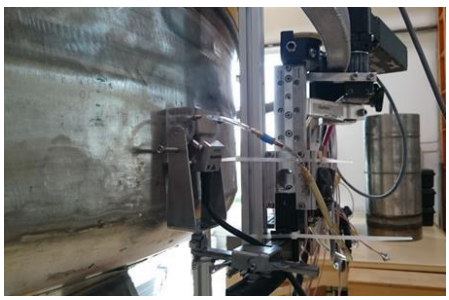

Fig.3: PAUT device

DESCRIPTION OF WORK

The technical work of the project is divided into the 4 work packages (WPs):

- WP1: State-of-art-review and specifications,
- WP2: Material characterization by testing and modelling,
- WP3: PAUT modelling and testing,
- WP4: Road map for further development of the inspection technique.

MAIN RESULTS / HIGHLIGHTS

- State-of-the-art report of ultrasonic inspection of DMWs (public),
- Report on influence of microstucture on reflection properties (NUGENIA restr.),
- Report on simulation of DMW & determination of reflexion properties (NUGENIA restr.),
- Report on microstructural characterisation of mock-ups (NUGENIA restr.),
- Report on PAUT modelling and testing of artificial material discontinuities (public),
- Report on analysis of relationship of mock-ups & natural material discontinuities (public),
- Roadmap for further development of the inspection technique (public).

DURATION

1 April 2015 – 30 September 2016
18 months

CONTACTS

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PARTNERS

BZN / CEA / UJV / VTT

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