REDUCE

Justification of Risk Reduction through In-Service Inspection

OBJECTIVES

Effective in-service inspection (ISI) is essential to justify continued safe operation of NPPs. Degradation is occurring in NPPs by different mechanisms (e.g. stress corrosion cracking, see Figure 1) and a variety of non-destructive testing (NDT) methods are used to monitor the extent of degradation by various mechanisms and to confirm the absence of unexpected degradation. It is important to determine an ISI strategy (positions, NDT methods, intervals) such that defect growth will not threaten structural integrity during the interval between inspections. At the same time there is a huge amount of welds and components in a NPPs, and it is essential to have efficient processes in order to arrive at relevant inspection plans. Methods for risk-informed planning of in-service inspection (RI-ISI) have been developed to meet this challenge. The REDUCE project has the purpose to develop guidance for the assessment of the risk reduction achieved by different inspection strategies. The risk reduction from alternative ISI strategies will be investigated for different situations typical for NPP piping systems (see Figure 2). Main influencing parameters will be systematically analysed by use of different structural reliability models, considering a range of dimensions, materials, degradation mechanisms, loading conditions, NDT reliabilities (assessed through Probability of Detection (PoD) curves, see Figure 3) and inspection intervals. Sensitivity analyses will be performed to identify key influencing parameters under foreseeable variations and uncertainties. The project will develop supporting documents to the ENIQ framework document on RI-ISI with guidelines for assessment of risk reduction and ISI optimization strategies.

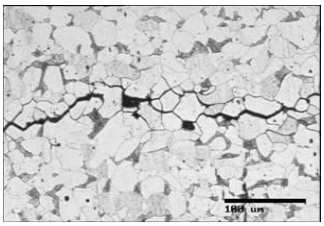

Fig. 1: Stress corrosion cracking

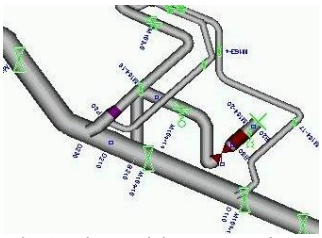

Fig. 2: Primary piping system of NPP

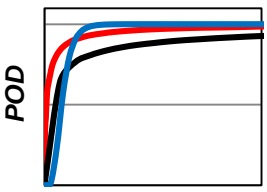

Fig. 3: Typical PoD curves

DESCRIPTION OF WORK

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

- WP1: Definition & development of type cases (leader: VTT)
- WP2: Baseline risk reduction by ISI for piping type cases (leader: Inspecta)
- WP3: Evaluation of influence from key parameters on the risk reduction (leader: CEA)
- WP4: Development of guidelines for assessment of risk reduction by ISI (leader: LEI)

MAIN RESULTS / HIGHLIGHTS

- Minutes of monthly meetings / teleconferences (consortium restricted).
- Report on definition of conditions for the baseline computations.
- Report on the benchmark study including sensitivity analyses.
- Guidelines for assessment of risk reduction by ISI.

In addition to above deliverables, the consortium is planning for additional technical reports with detailed computational results and conference papers & articles in peer-reviewed journals.

DURATION

1 April 2015 – 30 September 2016
18 months

PARTNERS

Inspecta / VTT / CEA / LEI

CONTACTS

Technical Project Leader:
Jens Gunnars (Inspecta)
jens.gunnars@inspecta.com

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