

MICRIN+ Mitigation of CRack Initiation

OBJECTIVES

Understanding the ageing and degradation mechanism of structures, systems and components is one of the key aspects of reliable and safe long term operation of nuclear power plants. The components behaviour is strongly linked to its specific fabrication and the interaction with the LWR environment. Critical environmentally assisted degradation mechanisms such as stress corrosion cracking (SCC) can therefore only be effectively mitigated when those parameters are thoroughly considered.

In particular, it is now recognized that the surface quality of the component after the manufacturing and assembly processes is one of the key parameters affecting the susceptibility and the initiation of SCC. However, up to now harmonized international standards to recommend the component surface quality in LWRs are lacking. One first approach would be to review the available codes & standards in order to harmonize them. Such review and harmonization is performed in the present project.

Light Water Reactors (LWRs) generate most of the nuclear electricity in Europe in this century. Therefore, the successful operation and management of the GENII LWRs beyond their originally foreseen license period will be vital. For Long Term Operation (LTO) the vision is to move towards 60+ years of safe and economic operation of nuclear power plants. A key aspect of LTO is understanding the ageing and degradation mechanism(s) of structures, systems and components, In order to predict component behaviour in the LWR environment.

DESCRIPTION OF WORK

A thorough state-of-the-art assessment of the operating experience, existing fabrication specifications, codes & standards is performed. Particularly, a survey among the project partners is conducted. Each project partner reviewed their national rules and recommendation concerning primary component surface quality requirements and recommendations and/or posed the question to the national regulator. If possible, the issue is also discussed with the licensees and/or vendors. In addition a tailored test program using an accelerated test method for determining threshold conditions for SCC initiation that has been recently developed and evaluated in a NUGENIA in-kind project, is performed. This test method is used to investigate the influence of distinct material and or chemistry-related parameters on the initiation of stress corrosion cracking. The respective stress thresholds determined by the accelerated tests should be correlated to suitable parameters for fabrication such as hardness or roughness. In this way these thresholds can be used for component integrity predictions and ageing management.

MAIN RESULTS / HIGHLIGHTS

A NUGENIA position paper on the role of surface deformation on environmentally assisted cracking (EAC) was compiled and is currently under revision. This document summarises operational experience on SCC due to deformation, especially surface deformation, reviews national regulations and rules for surface treatments, and makes conclusions and recommendation for further work.

DURATION

1 March 2015 – 31 August 2016
18 months

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PARTNERS

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