

INCEFA+

INcreasing safety in NPPs by Covering gaps in Environmental Fatigue Assessment

OBJECTIVES

US NRC and ASME guidance for environmentally-assisted fatigue (EAF) assessment can result in calculated high fatigue usage factors that are inconsistent with NPP experience. To address this issue, the overall aim of the project is to develop new or modified guidelines for the assessment of EAF damage susceptibility for NPP components. The project has the following specific objectives:

- Identify the most significant differences between conditions producing EAF damage in NPPs and laboratory tests
- Test representative materials to improve understanding of the sensitivity to these differences on fatigue life in PWR primary environment
- Develop a new or modified procedure for assessing fatigue degradation in reactor coolant under plant conditions to avoid excessive conservatism inherent in current US NRC guidelines and draft ASME Code Cases

DESCRIPTION OF WORK

The project is divided into two main parts. The first is focused on the characterisation of a limited selection of typical austenitic stainless steel alloys employed in NPPs, testing for the effects of mean stress/strain, hold time periods and material surface finish on fatigue endurance. Sensitivities to these three parameters will be mainly tested in LWR environments. Tests in air for all types of specimen are restricted to only those necessary to cross reference the LWR results with the data already available for fatigue endurance in air and forming the majority of data used to underpin existing guidance (NUREG/CR-6909). The three experimental parameters were selected as common priorities by the proposed collaborators based on an in-kind project through which a description of the current state-of-the-art for this technical area was developed. The second part of this project involves the development of a modified or new procedure for estimating the fatigue degradation of the materials based on the experimental results of the first part of the project. This methodology is supposed to take better account of the effects of mean stress/strain, hold time and surface finish. This will enable better management of nuclear components, making possible the LTO of NPPs under safer conditions.

MAIN RESULTS / HIGHLIGHTS

The main deliverable of the project is a fatigue analysis procedure that will incorporate new data generated within the project:

- New parameters that have effects on the fatigue degradation
- New and more representative fatigue curves (S-N)
- New or tentative modification to the expressions for environmental factor assessment
- Guidelines for fatigue assessment of components of NPP

In addition to a new/revised fatigue analysis procedure, INCEFA+ will also establish a new fatigue data format standard. For that purpose the workshop FATEDA has been initiated as part of the European Committee for Standardisation (CEN). More information on FATEDA can be found here:

<https://www.cen.eu/work/areas/ICT/eBusiness/Pages/WS-FATEDA.aspx>.

DURATION

1 July 2015 – 30 June 2020
5 years

CONTACTS

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PARTNERS

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