



State of the art on environmental assisted fatigue within different codes and standards

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Summary <p>Environmentally assisted fatigue (EAF) is one of the several degradation mechanisms of materials in nuclear power plant. Since being observed for the first time about 50 years ago, laboratory research to understand and quantify the effect have been widespread. On the contrary, operating experience does not support all penalty factors derived from laboratory findings. Uncertainties in transferability of small-scale data to plant components remains an open question. Equally important are the difficulties in performing laboratory experiments in simulated reactor coolant. They make it challenging to verify and quantify complex environmental (and associated) effects.</p> <p>Lack of proper consensus has steered the most important International Codes and Standards to adopt different approaches to tackle the potential issue in a safe and conservative manner. While ASME (USA), RCC-M (France), JSME (Japan) and KTA (Germany) all share common roots in fatigue design, they do not share common practices when it comes to EAF. The root cause of this divergence lies in the conservative and generic approach of the NUREG/CR-6909 report, which serves as an international default reference for state-of-the-art and F_{en} environmental fatigue correction factors.</p> <p>This report summarizes the evolution of Codes and Standards from the perspective of fatigue and EAF with an emphasis on comparing ASME and RCC-M. Experimental evidence and its disparity to operating experience are examined. Publicly available historical data is collected to summarise the technical basis behind the existing or proposed methods, which may or may not yet have regulatory approval. Technical consistency of the various methods is reviewed to the extent that public documents make it possible.</p> <p>The aim of this report is to provide ONR with an objective and unbiased review of EAF within various Codes and Standards, to inform its own decision making. Therefore, no recommendations or endorsements to any specific methodology are provided, and final conclusions are at the discretion of ONR.</p> <p>This report is a corrected version that replaces research report no. VTT-R 00332-23.</p>	
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