PROCEEDINGS PAPER

DEVELOPMENT OF A ROBUST PROCEDURE FOR THE EVALUATION OF STRIATION SPACINGS IN LOW CYCL E FATIGUE SPECIMENS TESTED IN A SIMULATED PWR ENVIRONMENT

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Abstract:

A pressurized water reactor primary environment can have a deleterious effect on the fatigue lifetime of austenitic stainless steels. There is a need to develop a greater understanding behind the effect of a pressurized water reactor primary environment on the fatigue behaviour of austenitic stainless steels. One of the ways that we can improve our mechanistic understanding is by carrying out striation spacing analysis.

Striation counting is a widely used technique in fatigue failure investigations where it is typically used to infer information on crack progression, including the estimation of propagation rates and number of applied loading cycles. Standardised procedures for performing striation counting are uncommon, especially for environmental fatigue in a high temperature pressurized water reactor primary water environment where differences in fracture surface morphology and oxide coverage can lead to additional complications in performing an analysis.

One of the main goals of the EU Horizon 2020 INCEFA- SCALE project is to develop an improved mechanistic understanding of fatigue in these systems through extensive characterisation of laboratory tested specimens. As part of this work, this paper describes the development of a standardised and robust striation counting procedure for the low cycle fatigue of austenitic stainless steels operating in both air and simulated pressurized water reactor environments. Additionally, results are presented from round robin exercises that involved eight partners of the INCEFA-SCALE consortium.

Keywords: environmentally assisted fatigue, pressurized water reactor, stainless steel

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