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PWR EFFECT ON CRACK INITIATION UNDER EQUI-BIAXIAL LOADING DEVELOPMENT OF THE EXPERIMENT

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ABSTRACT

The lifetime extension of the nuclear power stations is considered as an energy challenge worldwide. That is why, the risk analysis and the study of various effects of different factors that could potentially represent a hazard to a safe long term operation are necessary. These structures, often of great dimensions, are subjected during their life to complex loading combining varying mechanical loads, multiaxial, with non-zero mean values associated with temperature fluctuations and also PWR environment.

The methodology for fatigue dimensions of the Pressurized Water Reactor components (PWR) (ASME, RCC-M, KTA, ...) is based on the use of design curves established from test carried out in air at 20°C on smooth specimens by integrating safety coefficient that covers the dispersion of tests associated with the effects of structures.

To formally integrate these effects, some international codes have already proposed and suggested a modification of the austenitic stainless steels fatigue curve combined with a calculation of an environmental penalty factor, namely F_{en} , which has to be multiplied by the usual fatigue usage factor.

The aim of this paper is to present a new device "FABIME2E" developed in the LISN in collaboration with EDF and AREVA. These new tests allow quantifying accurately the effect of PWR environment on semi-structure specimen. This new device combines the structural effect like equi-biaxiality and mean strain and the environmental penalty effect with the use of PWR environment during the fatigue tests.

Keywords: multiaxial fatigue/ PWR environment effect/ austenitic stainless steel.