MODERN

Methods & Tools for Fatigue & Fracture Assessment

Figure 1: EDF R&D Fatigue-Corrosion Device (FATCOR2)

Structural Integrity assessment of Nuclear Power Plants relative to fatigue and fracture mechanics of metallic components is one of the key points for life time extension. New methods and tools are then required to address these issues.

The main objectives of the MODERN project is to contribute to consolidate and justify new codification in fatigue by taking into account environment effect for austenitic stainless steel and to provide advanced methods and tools to perform fracture analysis.

Figure 2: CGN-SNPI environmental fatigue test facility

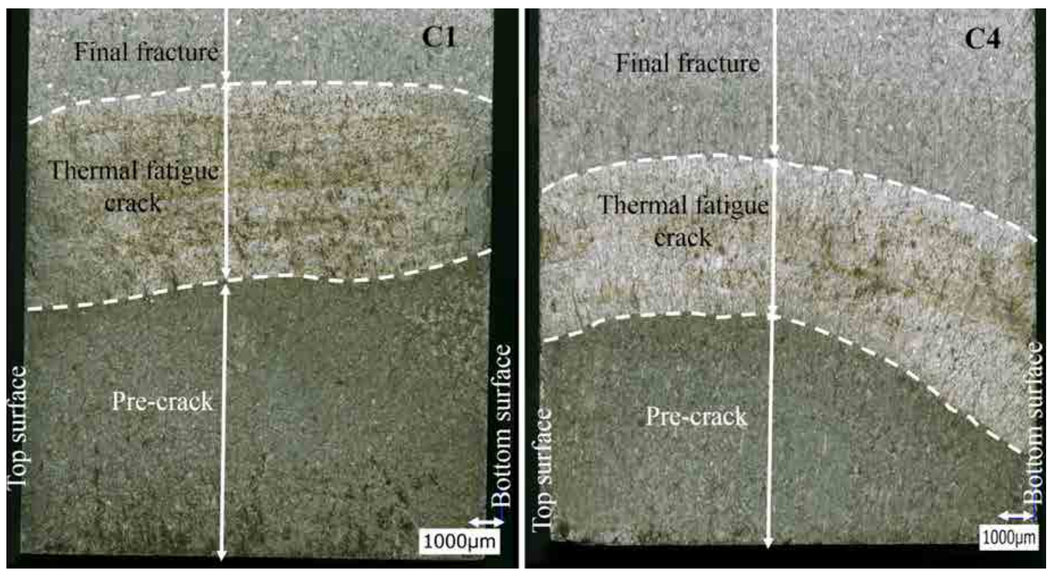

Figure 3: Illustration of fracture surface after a thermal fatigue crack growth test done on the PACIFIC device: from pre-crack to final fracture

In order to study the effect of the environment (primary water) on the fatigue life of austenitic stainless steels, an experimental program has be defined by EDF and CGN. The first tests have shown results in good agreement with the literature. Further tests will focus on the effect of the surface finish, time hold period, strain amplitude and mean stress on the fatigue life. These tests will supply the new fatigue rules integrated in RCC-M code.

In addition, fatigue crack growth rates in extended plastic conditions (LSY) have been studied experimentally on standard specimens and on the experimental PACIFIC device and have been analysed with advanced modelling. For both tests, the observations of the fracture surface have shown that the crack propagation mechanism is similar to that observed in small scale yielding (SSY) conditions. An incremental model was proposed to predict fatigue crack growth in LSY conditions and identified using fatigue tests under mechanical loadings.