

BIAXIAL FATIGUE TESTS IN PWR ENVIRONMENT

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Proceedings of the ASME 2025 Pressure Vessels & Piping Conference (PVP2025)

July 20-25, 2025, Montreal, Quebec, Canada

Paper No.: **PVP2025-151549**; 7 pages

DOI: 10.1115/PVP2025-151549

Published Online: October, 2025 (*expected*)

URL: <https://asmedigitalcollection.asme.org/>

Abstract:

The FABIME2e test rig was developed in CEA in France to perform biaxial fatigue tests on disc-shaped specimens. Previous tests aimed to evaluate the Pressurised Water Reactor (PWR) environment's effect on fatigue life at constant strain amplitude (triangular waveforms) on various stainless steels.

As part of the INCEFA-SCALE project, complementary tests are now being conducted to study the overload effect and assess fatigue behaviour under real plant transient loading conditions. A new pattern of cyclic loading transients called POUL is investigated. It includes an overload at an equivalent strain value of 1% every 1000 cycles. The control system and software of the FABIME2e rig had to be updated to achieve such loading conditions.

The first preliminary tests on 316L stainless steel validated the FABIME2e rig's ability to achieve the Variable Amplitude Loading (VAL) conditions. Moreover, the first results confirmed that overloads tend to reduce fatigue lifetime at room temperature, like in uniaxial tests. The next step is to evaluate its effect in PWR conditions to eventually conclude on the suitability of using uniaxial test data for components evaluation in such conditions.

Keywords: biaxial fatigue, PWR environment, variable amplitude loading, stainless steel



This project has received funding from the Euratom Research & Training programme 2019-2020 under grant agreement N° 945300