

**Call for application for research scholarships
for post-graduate international candidates**

RESEARCH PROJECT N. 6

Title

Numerical evaluation of Stress Intensity Factors in ultrasonic Very-High-Cycle Fatigue tests

Scientific responsible (name, surname, role)

Massimo Rossetto, Full Professor (massimo.rossetto@polito.it)

Short description of the research activity (max 250 words)

The continuous enhancement of reliability and durability requirements for many machinery components is significantly pushing the experimental research on the Very-High-Cycle Fatigue (VHCF) response of metallic materials. In order to significantly reduce testing time, ultrasonic testing machines are widely adopted when carrying out VHCF tests.

The correct computation of the Stress Intensity Factor (SIF) in ultrasonic VHCF loading conditions is a key issue when investigating the crack growth rate curve with pre-cracked specimens or when evaluating critical SIF values from fracture surfaces of failed specimens. Dynamic conditions related to the resonance of the vibrating specimen, contact nonlinearity between crack faces and stress singularity at the crack tip make the SIF computation difficult and cumbersome. Generally, numerical computation through Finite Element Models (FEMs) under non-linear dynamic conditions makes use of direct integration methods (implicit or explicit). However, in the high frequency regime of ultrasonic VHCF tests, the procedure may lead to an unacceptable computational time. In order to reduce the computational time, an innovative hybrid procedure based on FEM substructuring and on the Harmonic Balance Method (HBM) has been recently implemented by the research group.

The present research aims to enhance the potentialities of the implemented code and to perform numerical analyses on the fracture surfaces of specimens failed during ultrasonic VHCF tests.

Specific requirements (experiences, skills)

Preferably Basics of: Linear Elastic Fracture Mechanics, Finite Element Models, Vibration theory, Very-High-Cycle Fatigue

Website of the research group (if any)

http://www.dimeas.polito.it/en/research/research_groups/mechanics_of_materials_and_joints

Keywords (min 3, max 6)

SIF, VHCF, FEM

Research Area (max 1)

Mechanics and Aerospace