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CRACK INITIATION LIFE IN NOTCHED STEEL BARS UNDER TORSIONAL FATIGUE: SYNTHESIS BASED ON THE AVERAGED STRAIN ENERGY DENSITY APPROACH

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Abstract

In a recent contribution by Tanaka, the fatigue behaviour of notched bars made of austenitic stainless steel, SUS 316L, and carbon steel, SGV 410, characterized by different values of the notch tip radius was investigated under torsion loading. Tanaka monitored both fatigue crack initiation and propagation phases by means of the potential drop technique. The crack initiation life is correlated here to the depth of the initiated fatigue crack by means of calibration curves derived from electrical finite element (FE) analyses. In the present contribution, the approach based on the strain energy density (SED) averaged over a structural volume embracing the notch tip is employed to re-analyse the original experimental results of each material, by taking into account the crack initiation life, in order to exclude all extrinsic mechanisms acting during the crack propagation phase, i.e. sliding contact, friction and meshing between crack mating surfaces.

Keywords. Averaged SED; crack initiation; notch effect; potential drop method; torsional fatigue.

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