Correlations between crack initiation and crack propagation lives of notched specimens under constant and variable amplitude loading

Melanie Fiedler[1] and Michael Vormwald[2]

[1]Dresden University of Technology
[2]Technische Universität Darmstadt

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Abstract

This paper starts with an overview of the application of the three guidelines (GL) of the German Research Association of Mechanical Engineers (FKM). Each of these provides algorithms for calculating fatigue lives of components under constant or variable amplitude loading, however, with underlying different failure criteria, i.e. technical crack initiation life (GL-nonlinear), fatigue crack growth life (GL-fracture mechanics), and total fracture life (GL-linear). This paper introduces the U-Concept which has been evaluated from a large structural durability database. The U-Concept is a small add-on to the Local Strain Approach (LSA) which is the backbone of the GL-nonlinear. It enables 1) to directly calculate the fatigue life to total fracture based on elastic-plastic material behaviour according to the LSA, or 2) to estimate the remaining fatigue life from crack initiation to fracture without a crack growth simulation.

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