

Fatigue & Fracture of Engineering Materials & Structures

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Abstract

A Parametric Lifetime Model for the Prediction of High-Cycle Fatigue Based on Stress Level and Amplitude

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ABSTRACT

The goal of this paper is to present a general parametric lifetime model for predicting fatigue behaviour at any stress level and amplitude (for example, at any combination of σ_{\max} and σ_{\min} pair) in the high-cycle fatigue regime. The problem of the design of the experimental laboratory test required for such a prediction is dealt with. The surprising and relevant result is that running two groups of tests for two different constant stress levels of σ_{\max} or σ_{\min} is sufficient to predict the whole collection of Wöhler fields for any possible stress level. However, some combinations of tests, such as one for a fixed value of σ_{\max} and one for a fixed value of σ_{\min} , are shown to be insufficient. Closed formulas for obtaining any Wöhler field from the results of the

experiments corresponding to the two different fixed values of σ_{\max} or σ_{\min} are given. Together the proposed model and lab tests allow any fatigue analysis to be performed in the current investigation. One example of application illustrates the proposed method.

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