Accepted Manuscript

A simplified method for weakest-link fatigue assessment based on finite element analysis

Paul Qvale, Gunnar Härkega˚rd

PII: S0142-1123(17)30097-X
DOI: http://dx.doi.org/10.1016/j.ijfatigue.2017.03.010
Reference: JIJF 4273

To appear in: *International Journal of Fatigue*

Received Date: 30 November 2016
Revised Date: 7 March 2017
Accepted Date: 8 March 2017

Please cite this article as: Qvale, P., Härkega˚rd, G., A simplified method for weakest-link fatigue assessment based on finite element analysis, *International Journal of Fatigue* (2017), doi: http://dx.doi.org/10.1016/j.ijfatigue.2017.03.010

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

A simplified method for weakest-link fatigue assessment based on finite element analysis

Paul Qvale[a,*], Gunnar Härkegård[a]

[a] *Norwegian University of Science and Technology (NTNU), Department of Engineering Design and Materials, Richard Birkelandsvei 2B, NO-7491 Trondheim, Norway*

Abstract

Widespread use of weakest-link theory for high-cycle fatigue assessment based on finite-element (FE) results is limited by the lack of suitable post-processors. By assuming the stress within each element to be a linear function of the volume, weakest-link calculations can be performed by simple operation on typical FE output. This simplified method was evaluated on FE results from five elementary components with brick element meshes of different resolution. Deviations in effective stress amplitudes were $< 2.5\%$ compared with analytical solutions. In cases where analytical solutions were unavailable, solutions were compared with those of the in-house post-processor P-FAT. Deviations were around 5% for 'fine' meshes and increased with decreasing mesh resolutions. Deviations were always conservative and largest for materials with high fatigue strength scatter.

Keywords: Probabilistic analysis, Weakest-link, Finite elements, High-cycle fatigue

Nomenclature

b_σ	Weibull stress exponent
d	maximum relative deviation in nodal stress amplitudes
E	Young's modulus

*Corresponding author.
Email address: paulq@online.no (Paul Qvale)

Download English Version:

https://daneshyari.com/en/article/5015119

Download Persian Version:

https://daneshyari.com/article/5015119

Daneshyari.com