Accepted Manuscript

Assessment of tensile fatigue limit of notches using sharp and coarse linear elastic finite element models

Giovanni Meneghetti, Alberto Campagnolo, Filippo Berto

PII: S0167-8442(16)30054-4
DOI: http://dx.doi.org/10.1016/j.tafmec.2016.06.001
Reference: TAFMEC 1712

To appear in: *Theoretical and Applied Fracture Mechanics*

Received Date: 7 March 2016
Revised Date: 9 May 2016
Accepted Date: 1 June 2016

Please cite this article as: G. Meneghetti, A. Campagnolo, F. Berto, Assessment of tensile fatigue limit of notches using sharp and coarse linear elastic finite element models, *Theoretical and Applied Fracture Mechanics* (2016), doi: http://dx.doi.org/10.1016/j.tafmec.2016.06.001

ASSESSMENT OF TENSILE FATIGUE LIMIT OF NOTCHES USING SHARP AND COARSE LINEAR ELASTIC FINITE ELEMENT MODELS

Giovanni Meneghetti[1]*, Alberto Campagnolo[1], Filippo Berto[2,3]

[1] Department of Industrial Engineering, University of Padova, Via Venezia, 1 – 35131 Padova (Italy)

[2] Department of Management and Engineering, University of Padova, Stradella San Nicola, 3 – 36100 Vicenza (Italy)

[3] Department of Engineering Design and Materials, NTNU, Richard Birkelands vei 2b, 7491, Trondheim, (Norway)

* Corresponding author: giovanni.meneghetti@unipd.it, tel. 0039 049 8276751, fax 0039 049 8276785

Abstract

The aim of the present paper is to provide an efficient numerical technique to evaluate the linear elastic stress parameters to use in an existing fatigue model. The model allows to assess the tensile fatigue limit of components weakened by defects, cracks, sharp as well as blunt notches with arbitrary notch opening angles. To apply the fatigue model, both the elastic stress concentration factor of the notch and the notch stress intensity factor of the corresponding sharp notch must be evaluated. Therefore, in principle two different linear elastic stress analyses should be performed. The novel technique proposed in the present paper involves only a single linear elastic stress analysis, consisting of a sharp and coarse finite element model: *sharp* because the notch tip radius is set to zero, and therefore a sharp V-shaped notch is modelled; *coarse* because coarse patterns of finite elements can be employed. Approximate values of the elastic stress concentration factor and of the notch stress intensity factor calculated from the sharp and coarse finite element model are compared with very accurate estimations obtained from dedicated analyses. To illustrate the fatigue assessment procedure, experimental notch fatigue limits taken from the literature and characterized by a variety of geometrical configurations are compared with theoretical estimations.