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

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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.

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