METAL FATIGUE AND ELASTOPLASTICITY: MODELING AND APPLICATIONS

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ABSTRACT

Fatigue is a complex phenomenon resulting from the interaction of various factors, including microstructural effects, thermal influences, irreversible deformation, geometry, and loading conditions. Developing a methodology or model to predict material behavior remains a critical challenge, as fatigue is responsible for approximately 80% of component and structural failures caused by fracture.

The significance of plastic deformations has been demonstrated not only in low-cycle fatigue conditions but also in high-cycle and very high-cycle fatigue scenarios [1, 2]. Despite advances in computational capabilities, accurately modeling fatigue remains challenging due to the high number of loading cycles, the multitude of influencing factors, and the heterogeneity of material properties, particularly in cases such as welded joints.

Therefore, the aim of this section is to present ongoing research on modeling the fatigue phenomenon through numerical simulations, highlighting improvements in predictive accuracy, innovative approaches for service life estimation, crack growth modeling, and techniques for reducing computational time.

Keywords: fatigue; elastoplasticity; loading cycles; numerical modeling

References

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