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Abstract

This paper provides a new advanced probabilistic approach for reliable estimation of the fatigue characteristic S-N curves of welded joints both for constant amplitude (CA) and variable amplitude (VA) loading conditions. The presented approach, which is referred to as the ML-MCS approach, combines Maximum Likelihood method (ML) and Monte-Carlo Simulations (MCS) method to estimate true p-quantiles of CA and VA S-N curves by using complete experimental data-sets. The ML-MCS approach includes a linearization method for use of S-N curves in combination with linear damage accumulation rule as well as for direct comparison with current standards. Application of the ML-MCS approach on two study cases and comparison with current standards shows that the use of the ML-MCS approach may have a significant impact in re-definition of CA and VA S-N curves of current standards and in particular of the CAFL, of the S-N curve second slope and of the critical value of accumulated damage at failure. The last section of the paper provides accurate guidelines for future experimental tests needed for re-definition of current standards.

Keywords: Fatigue life, S-N curves, Maximum Likelihood, Monte-Carlo Simulations

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