Sampling Method In Probabilistic S-Version Finite Element Analysis For Initial Flaw Size

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ABSTRACT

The aim of this paper is to demonstrate the accuracy of the sampling method in probabilistic fatigue surface crack growth analysis. A finite thickness plate with surface crack subjected to a fatigue load is considered for fracture analysis using the newly developed Probabilistic S-version Finite Element Model (ProbS-FEM). Two sampling methods, Monte Carlo and Latin Hypercube are employed in the ProbS-FEM. Two different sampling methods are used to generate the random variables in the analysis. The results from the strategies are compared to highlight the advantages of each sampling strategy. The distribution of the initial surface crack length and depth are extracted from the fatigue tests. The accuracy and consistency between the two sampling methods are evaluated. The Latin Hypercube sampling (LHS) shows advantages compared to the Monte Carlo. Then, the developed ProbS-FEM is demonstrated on a four-point bending model. The developed ProbS-FEM shows that the code is capable of modelling the uncertainty in the fatigue surface crack analysis with better accuracy and consistency of sampling process.

KEYWORDS

Crack growth; Finite element model; Probabilistic; Stress intensity factor; Surface crack

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