

Fatigue Crack Growth Analysis of Semielliptical Surface Crack

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ABSTRACT

The aim of this paper is to present the simulation technique and experimental work for surface crack in a structure. For the sake of test apparatus's feasibility, a semielliptical surface crack in a structure was converted into small specimen size. The specimens represented semielliptical surface crack problem in real application of engineering structure. The specimens with semielliptical surface crack were tested by experiment and simulation. The S-version Finite Element Model (S-FEM) was implemented in simulation, and verification was performed through experimental works. The S-FEM consists of virtual crack closure method and Paris' law as a crack growth criterion for 3-dimensional problem with hexahedron elements was used. Auto-mesh generation technique with a fully automatic crack growth simulation system was employed in SFEM simulation. Specimens with 0° of crack surface angle were prepared and analysed for the mode I loading. A four-point bending fatigue test was conducted and simulated in order to gain crack path, fatigue crack growth and stress intensity factor's value. Results from simulation and experiment showed good agreement with a certain condition. The implications from the results were discussed through the analysis of fatigue crack growth.

KEYWORDS: S-version finite element model; Stress intensity factor; Surface crack and fatigue crack

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