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ABSTRACTS
of the contribution not included in this issue

Fatigue crack growth under stationary stochastic loading(*)

K. DOLIŃSKI (WARSZAWA)

THE GAUSSIAN stationary stochastic process is considered to cause fatigue crack growth in randomly nonhomogeneous materials. The Paris–Erdogan model is applied and the time when the crack length reaches a critical value (lifetime) is determined as a random variable. Statistical parameters of random stress amplitudes are derived from the model of conditioned stochastic process given a maximum occures at a time instant t. It is shown that random variations of the lifetime are not significantly affected by stochastic fluctuations of loading and material nonhomogeneity. This fluctuations, however, affect significantly the mean value of the lifetime.

Futhermore, the crack propagation under Gaussian stationary stochastic loading in presence of crack growth retardation effects is considered. The Wheeler retardation model is used in calculation of the crack length increments after random overloadings. The crack growth process is modelled by Markovian diffusion process. The retardation effect, some properties of envelope and clustering effect of the load process are taken into account in calculation of parameters of the Kolmogorov diffusion equation.

The analysis of the mean lifetime equation and results of an example show again that the stochastic fluctuations of the stationary load process alone do not affect significantly random variations of the lifetime.

There appears, moreover, that the fatigue lifetime mainly depends on the band-width of the stress process and does not depend on the shape of correlation function alone. The retardation effects are more significant for wide-band stress processes than for narrow-banded.

The relative simple, quasi-deterministic relation between the features of the fatigue fracture and some material and load parameters allows us to consider effectively the fatigue crack propagation even with retardation effects as an additional failure mode in reliability analysis, where the probability of failure of a component or a system is looked for.

POLISH ACADEMY OF SCIENCES
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