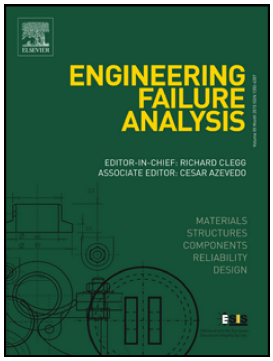

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Fatigue life analysis of crawler chain link of excavator

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ABSTRACT: In this study, the tension of crawler chain link of excavator is measured by experimenting in horizontal straight, pivot steering, and differential steering conditions. A virtual prototype model of excavator is established and its accuracy is verified on the basis of comparing the simulated and experimental tension of chain link in the abovementioned three conditions and adjusting the parameters of the model. The fracture surface morphology of chain link crack is analyzed by scanning electron microscopy. The fracture surface morphology conforms to the fatigue failure. Finite element analysis result indicates that the maximum stress of chain link is lower than the yield strength of material. The area of the maximum stress of chain link presents a crack, which indicates the fatigue failure of chain link. A rigid-flexible coupling virtual prototype model for simulation is established, which consists of a group of chain links of flexible body and other components of rigid bodies. The chain link operates in an entire cycle with the crawler in horizontal straight, climbing, and pivot steering conditions. The stress of key points in the cracked area and the fatigue life of chain link are obtained from the simulation. The comparison between the simulation and experimental data confirms the accuracy of the established virtual prototype model of excavator. Accordingly, the fatigue life of chain link is analyzed, which is usually difficult to achieve by experiment. The proposed analytical method for the fatigue life of components is easy and efficient and can serve as a reference for the fatigue life analysis of other key components of crawler.

Keywords: Excavator; Virtual prototype model; Experiment; Chain link; Fatigue life