

ABSTRACT**Modeling and Analysis of a Blade/Receptacle
Pair for the Prediction of Vibration-Induced
Fretting Degradation**

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Vibration-induced fretting can be a major problem for connector systems used in vehicle electronics. However, at present much of the evaluation of fretting propensity for particular connector designs and the influence of variations in those designs on fretting performance is conducted through exhaustive experimental testing. A simulation-based method would be of great value to those responsible for connector design and application.

Accordingly, the long-range objective of the reported work is to develop and validate a procedure for using modeling and simulation to predict the influence of various design factors on vibration-induced fretting propensity in electrical connectors. This procedure seeks to use detailed finite element models for the connector system to relate the observed relative motion at the contact interface to threshold vibration levels for the onset of fretting.

An earlier initial study was conducted in which a simplified finite element model was developed and experimentally validated for a blade/receptacle pair. The present study is the next step in this effort. A highly detailed 3-D model for this same connector system has been developed and analyzed to evaluate the threshold vibration levels as a function of excitation frequency, wire tie-off length, wire mass, interface friction coefficient, and normal force. A series of experiments were also conducted to validate and test the simulation. It was demonstrated that, for this limited system, finite element modeling and analysis have potential for the evaluation of the influence of design variation on the fretting behavior.