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Multiaxial fatigue analysis of stranded-wire helical springs

(2015) *International Journal of Damage Mechanics*, 24 (7), pp. 1013-1025. Cited 1 time.

Abstract

In this paper, finite element method is implemented to model stranded-wire helical springs under different loading conditions. Finite element results are coupled with multiaxial fatigue criteria such as Fatemi-Socie and Kandil-Brown-Miller together with a uniaxial fatigue criterion, Coffin-Manson, to predict fatigue life of the stranded-wire helical springs. It is shown that due to damping effects between wires, stranded-wire helical springs have longer fatigue life compared to their equivalent single-wire helical springs at a similar condition. It is also demonstrated that fatigue life is longer for loadings with higher initial displacement of spring head. As practical examples, fatigue life of stranded-wire helical springs with 9 and 15 wires are estimated and compared. It is shown that the spring with 15 wires gives longer fatigue life. It is also observed that Kandil-Brown-Miller and Fatemi-Socie criteria give the least and the highest fatigue life prediction, respectively. © SAGE Publications.

2-s2.0-84946712244

Document Type: Article

Publication Stage: Final

Source: Scopus