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Design and Analysis of Flexible Slider Crank Mechanism

Authors : Thanh-Phong Dao, Shyh-Chour Huang

Abstract : This study presents the optimal design and formulation of a kinematic model of a flexible slider crank mechanism. The objective of the proposed innovative design is to take extra advantage of the compliant mechanism and maximize the fatigue life by applying the Taguchi method. A formulated kinematic model is developed using a Pseudo-Rigid-Body Model (PRBM). By means of mathematic models, the kinematic behaviors of the flexible slider crank mechanism are captured using MATLAB software. Finite Element Analysis (FEA) is used to show the stress distribution. The results show that the optimal shape of the flexible hinge includes a force of 8.5N, a width of 9mm and a thickness of 1.1mm. Analysis of variance shows that the thickness of the proposed hinge is the most significant parameter, with an F test of 15.5. Finally, a prototype is manufactured to prepare for testing the kinematic and dynamic behaviors.

Keywords : kinematic behavior, fatigue life, pseudo-rigid-body model, flexible slider crank mechanism
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