World Academy of Science, Engineering and Technology
International Journal of Transport and Vehicle Engineering
Vol:9, No:07, 2015

Stress Recovery and Durability Prediction of a Vehicular Structure with Random Road Dynamic Simulation

Authors : Jia-Shiun Chen, Quoc-Viet Huynh

Abstract : This work develops a flexible-body dynamic model of an all-terrain vehicle (ATV), capable of recovering dynamic stresses while the ATV travels on random bumpy roads. The fatigue life of components is forecasted as well. While considering the interaction between dynamic forces and structure deformation, the proposed model achieves a highly accurate structure stress prediction and fatigue life prediction. During the simulation, stress time history of the ATV structure is retrieved for life prediction. Finally, the hot sports of the ATV frame are located, and the frame life for combined road conditions is forecasted, i.e. 25833.6 hr. If the usage of vehicle is eight hours daily, the total vehicle frame life is 8.847 years. Moreover, the reaction force and deformation due to the dynamic motion can be described more accurately by using flexible body dynamics than by using rigid-body dynamics. Based on recommendations made in the product design stage before mass production, the proposed model can significantly lower development and testing costs.

Keywords : flexible-body dynamics, veicle, dynamics, fatigue, durability
Conference Title : ICAE 2015 : International Conference on Automotive Engineering
Conference Location : Prague, Czechia
Conference Dates : July 09-10, 2015