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Investigation on Potential in Regenerative Passive Suspension System for Automotive Technology

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Abstract

Modern vehicles dissipate vibration energy from road irregularities as heat through conventional suspension systems, resulting in energy loss. Recent research works in engineering explores energy harvesting with various method including the application of piezoelectric to generate electricity. The research in this paper addresses the engineering challenge by exploring the potential of a piezoelectric-based regenerative suspension system capability to harvest wasted energy. A quarter-car model was implemented using MATLAB Simulink and Simscape to simulate the electromechanical response under different road profiles and vehicle speeds. Key simulations used harmonic excitations and speed-dependent road inputs to evaluate both energies harvesting potential and application. The system achieved a maximum output of 30V, 120 μ A, and 2.1mW on rough roads, with peak power of 0.75W recorded at a low speed of 40km / h. These results indicate the potential of exploring the integration of piezoelectric regenerative suspension systems to support advanced subsystem in modern vehicle. This is an open access article under the CC BY-NC-SA 4.0 license.

Author keywords

automotive suspension; energy harvesting; green technology; Regenerative suspension

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Abstract

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