

“Performance Analysis of a Kinetic Energy Recovery System (KERS) for Mechanical Energy Harvesting in Electric Motorcycles Using MATLAB R2024a”

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ABSTRACT

This study investigates the performance of a Kinetic Energy Recovery System (KERS) as a mechanical energy harvesting system in electric motorcycles through modeling and simulation using MATLAB R2024a. The main issue addressed is the low efficiency of energy utilization in electric vehicles due to kinetic energy losses during braking. KERS is implemented to convert kinetic energy into electrical energy, which is then stored in an ultracapacitor as a high-power energy storage medium. The research method employs a simulation-based approach using Simulink with parameters representing a 5 kW class electric motorcycle under typical operating conditions. The simulation is conducted for 60 seconds, with a braking duration of 10.75 seconds from an initial speed of 19.7387 m/s. The results show that the available kinetic energy is 40,294.12 Joules, while the recovered and stored energy reaches 7,270.128 Joules. The resulting system efficiency of 18.043% indicates that KERS is capable of recovering energy, although it is still affected by conversion losses and storage characteristics. These findings indicate that ultracapacitor-based KERS has potential to improve energy efficiency in electric motorcycles.

Keywords: *KERS, Electric Motorcycle, Regenerative Braking, Ultracapacitor, Energy Efficiency*