ABSTRACT

The increasing demand for electrical energy drives the development of alternative energy harvesting systems. One applied solution is the utilization of mechanical energy from vehicles passing over speed bumps to be converted into electrical energy. This research aims to design and build a prototype energy harvesting system on speed bumps using a DC generator. This prototype is designed to utilize the pressure and movement generated by vehicles as a source of mechanical energy, which is then converted into electrical energy by a DC generator. The design process involves the creation of a mechanical system integrated with the DC generator and an energy storage system. Experimental results show that the designed system is capable of producing a significant. Prototype testing yielded an average energy conversion efficiency of 10.46%. Vehicle speed when passing over the speed bump significantly influences the amount of electrical energy generated, where an increase in speed will result in a larger generator output. Similarly, variations in vehicle mass also have a significant impact; as mass increases, the generator output will be greater. The average energy produced and storable in the battery is 0.0039 Joule per 1 second of pressure. With this average power, a full charge of a 2000 mAh 18650 battery is estimated to take approximately 1818 hours or 75 days. Based on the conducted tests, it can be concluded that this system demonstrates potential as an alternative energy source for very low-power applications or as part of a larger system.

Keywords: *Energy Harvesting, DC Generator, Speed Bumps, Alternative Energy, Energy Conversion.*