

Harvesting energy from low-frequency vibrations: electromagnetic vibration energy harvester analysis

ABSTRACT

The analysis of an Electromagnetic Vibration Energy Harvester (EVEH) has been undertaken with the aim of converting movements and vibrations of human body into usable electrical energy. The main objectives of current project are to estimate maximum acceleration for different scenarios, apply electromagnetic equations to study the behaviour of magnetic fields generated by the coil and magnet, and analyse the maximum output voltage and power generation of the EVEH system for low-frequency vibrations. In the observation of maximum acceleration, the EVEH demonstrated robustness and suitability for vibration environments, with higher acceleration magnitudes correlating with increased energy harvesting potential. By applying electromagnetic equations, the interaction between the magnetic field and the vibrating structure was investigated by providing insights for optimising field strength and uniformity. Analysis of the maximum output voltage and power generation highlighted the efficiency of the EVEH system in harvesting low frequency vibrations. The findings contribute to the advancement of energy harvesting technologies as well as paving the way for the access of small renewable energy sources. This project sets the stage for further research and development in the field of EVEH.