

Piezoelectric Array Configuration Technique into Enhance Power Catchment for Sound Energy Harvester System

Abstract

The objective of this study is to explore the harvest maximum output changes occurs in piezoelectric transducer when connected in different configuration to produce highest electricity consumption and generate sound energy harvesting system. Acoustic energy is a type of environmental energy source that can be extracted and converted into electrical energy for small-scale energy applications. In this study, the corresponding load resistance for single piezoelectric transducer is $4.5 \text{ k}\Omega$, together with a constant vibration source at a frequency of 68 Hz and a 1-g acceleration. The performance of output voltage and power of piezoelectric are evaluated and the optimum output is measured by depending on the connection of the piezoelectric transducer arrangement into series, parallel and series, and parallel which stimulated using Proteus software. The experiment result presented that, when have single piezo, 5 piezo connected in series, and 5 piezo connected in parallel, the output powers are 1.664 mW, 1.671mW and 7.676 mW, respectively. During the combination series and parallel connections, the output power of 3S1P piezo increases to 5.05mW. In a parallel configuration, the output voltage that produced is much higher than a piezoelectric transducer arrangement connected in series connection. The piezoelectric transducer that connected in parallel configurations increases its voltage output from 2.83 V to 13.05 V with the same polarity. The arrangement of piezoelectric transducer in parallel configuration is affordable, with its higher production of a higher power output compared to the arrangement of piezoelectric transducer in series connection. Whereas in terms of power output, the maximum power remains constant in the range of 1.665 to 1.671 mW when three transducers are in series configuration connection with the same polarity. In conclusion, the proper implementation of the piezoelectric array configuration is needed in order to operate the minimum energy for low load devices and promise to accomplish generated optimum power output in harvester system.

Keywords

Acoustics wave; Array configuration; Energy harvesting system; Parallel and series; Piezoelectric material