NAME OF THE THEME: RENEWABLE ENERGY SOURCES

ENERGY HARVESTING FROM SERIES CONNECTED PZT 5H PIEZOELECTRIC DISCS

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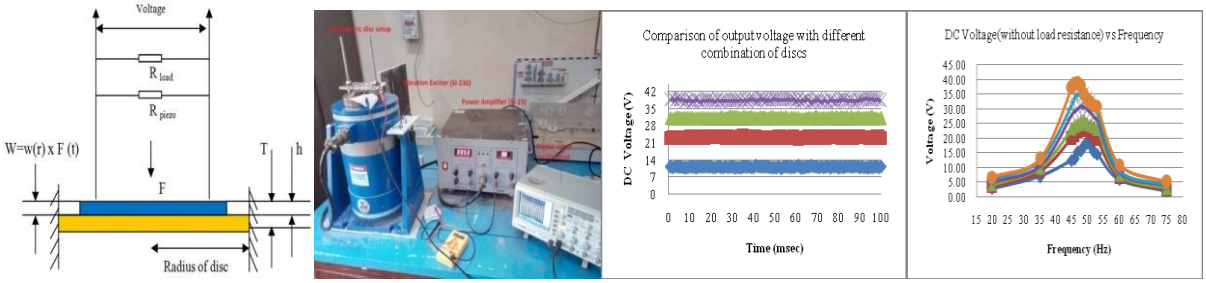
Abstract: Piezoelectric Energy Harvester (PEH) will convert the vibration energy into electrical energy. This paper presents the power generation from PZT 5H transducer discs and capabilities of these transducers to generate electrical power at micro level applications. Circular type PZT 5H transducer discs are serially connected for estimating the incremental power levels when multiple elements are used; the output values are estimated for no load and on load conditions. During on load conditions, the voltage increases with increasing electrical load and the power is maximum at optimal resistance of 500 KΩ. The resonance frequency for generating the maximum voltage for the present study is also experimentally evaluated as 50 Hz. An experimental setup is developed to study the voltage output of serially connected elements in different numbers, and the results are analyzed. The voltage with four disc connected in series with resistive load of 500KΩ is 21 V DC, and the maximum power is 0.882 m W. It is also observed that the incremental output voltage is reduced when the number of elements connected in series increases from single disc to two discs, three discs and four discs. The operating area is set as optimal load resistance of 500KΩ and input frequency band is selected near at resonance frequency 50 Hz for harvesting the maximum energy.



Conclusions: Piezoelectric Energy harvesting studies are conducted on serially connected PZT 5H disc type transducers to investigate their ability to generate output voltage of 42V at no load and 21 V at 500 KΩ load resistance. It is observed that there a loss factor in energy gain when the numbers of elements connected in series are increased. Therefore, Stacking of piezoelectric elements in series arrangements can extract more amount of power, but the loss in energy is to be compensated.

References:

[1] N. Wua, Q. Wanga, S.T. Quek "Free vibration analysis of piezoelectric coupled circular with open circuit" Journal of Sound and Vibration 329 (2010) 1126–1136.

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