NAME OF THE THEME: RENEWABLE ENERGY SOURCES

ENERGY HARVESTING FROM SERIES CONNECTED PIEZOELECTRIC DISCS

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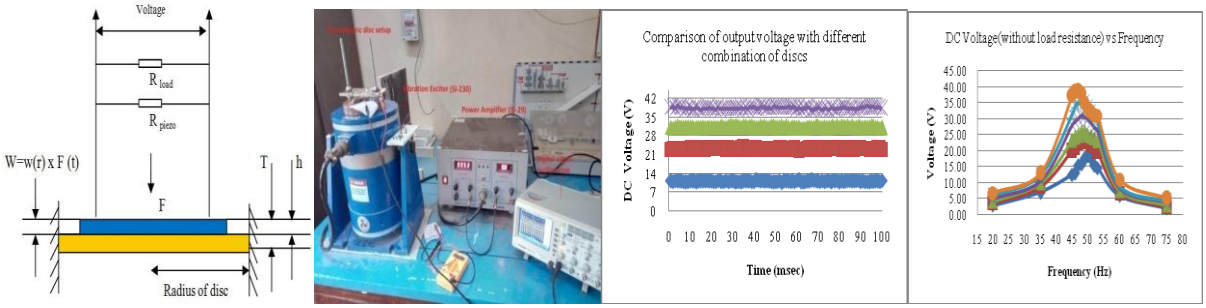
Abstract: This paper presents the power generation from piezoelectric transducer discs and there by investigates the capabilities of these transducers to generate electrical power at micro level applications. Piezoelectric Energy Harvester (PEH) will convert the vibration energy into electrical energy. In this work, investigative studies are conducted on serially connected circular type piezoelectric transducers for estimating the incremental power levels when multiple elements are used; the output values are estimated for no load and load conditions. During loaded conditions, the voltage increases with increasing load and the power is maximum at optimal resistance. The resonance frequency for generating the maximum voltage for the present study is also experimentally evaluated. An experimental setup is developed to study the voltage output of serially connected elements in different numbers, and the results are analyzed. The maximum voltage with four disc connected in series with resistive load of 500kΩ is around 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. The operating area is set as optimal load resistance and input frequency is selected near at resonance frequency band for harvesting the maximum energy.



Conclusions: Piezoelectric Energy harvesting studies are conducted on serially connected disc type transducers to investigate their ability to generate maximum output voltage. It is observed that there a loss factor in energy gain when the number 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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