World Academy of Science, Engineering and Technology
International Journal of Mechanical and Mechatronics Engineering
Vol:9, No:08, 2015

# Piezoelectric Approach on Harvesting Acoustic Energy

**Authors :** Khin Fai Chen, Jee-Hou Ho, Eng Hwa Yap

**Abstract :** An acoustic micro-energy harvester (AMEH) is developed to convert wasted acoustical energy into useful electrical energy. AMEH is mathematically modeled using lumped element modelling (LEM) and Euler-Bernoulli beam (EBB) modelling. An experiment is designed to validate the mathematical model and assess the feasibility of AMEH. Comparison of theoretical and experimental data on critical parameter value such as Mm, Cms, dm and Ceb showed the variances are within 1% to 6%, which is reasonably acceptable. Hence, AMEH mathematical model is validated. Then, AMEH undergoes bandwidth tuning for performance optimization for further experimental work. The AMEH successfully produces 0.9 V/(m/s^2) and 1.79 μW/(m^2/s^4) at 60Hz and 400kΩ resistive load which only show variances about 7% compared to theoretical data. By integrating a capacitive load of 200μF, the discharge cycle time of AMEH is 1.8s and the usable energy bandwidth is available as low as 0.25g. At 1g and 60Hz resonance frequency, the averaged power output is about 2.2mW which fulfilled a range of wireless sensors and communication peripherals power requirements. Finally, the design for AMEH is assessed, validated and deemed as a feasible design.

**Keywords :** piezoelectric, acoustic, energy harvester
**Conference Title :** ICMARE 2015 : International Conference on Mechanical, Automobile and Robotics Engineering
**Conference Location :** Barcelona, Spain
**Conference Dates :** August 17-18, 2015

Open Science Index, Mechanical and Mechatronics Engineering Vol:9, No:08, 2015 publications.waset.org/abstracts/29247.pdf