

## Accepted Manuscript

Title: Performance enhancement of a piezoelectric rain energy harvester

Author: Zhau-Zi Ong Voon-Kean Wong Jee-Hou Ho

PII: S0924-4247(16)30773-7

DOI: <http://dx.doi.org/doi:10.1016/j.sna.2016.10.035>

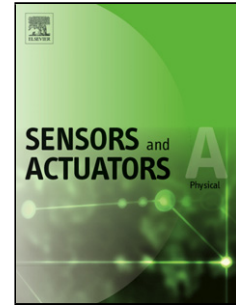
Reference: SNA 9891

To appear in: *Sensors and Actuators A*

Received date: 25-6-2016

Revised date: 6-10-2016

Accepted date: 25-10-2016



Please cite this article as: Zhau-Zi Ong, Voon-Kean Wong, Jee-Hou Ho, Performance enhancement of a piezoelectric rain energy harvester, *Sensors and Actuators: A Physical* <http://dx.doi.org/10.1016/j.sna.2016.10.035>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

<AT>Performance enhancement of a piezoelectric rain energy harvester

<AU>Zhau-Zi Ong, Voon-Kean Wong and Jee-Hou Ho\*  
##Email##JeeHou.Ho@nottingham.edu.my##/Email##  
<AU>

<AFF>Department of Mechanical, Materials and Manufacturing Engineering  
<AFF>Faculty of Engineering,

<AFF>The University of Nottingham Malaysia Campus,

Malaysia.

<ABS-HEAD>Highlights ► A design enhancement of a rain energy harvester is proposed ► Improvement in energy harvested for both simulated and actual rain conditions ► A theoretical model of the harvester is developed and validated

#### <ABS-HEAD>Abstract

<ABS-P>Using piezoelectric beam to harvest vibration energy from the impact of raindrop is a feasible approach in renewable energy conversion. There are some prototypes developed in recent years to demonstrate this concept. Following our previous works on mathematical modelling and experimental investigation of water droplets on a piezoelectric beam, we propose a design modification to enhance the performance of a piezoelectric rain energy harvester. The design incorporates a mechanism to direct water droplets to a syringe and hence able to convert raindrops into single water droplets. The enhancement strategy is to convert random raindrops to single water droplet impacts on an optimal position on the piezoelectric beam. The performance of the harvester was investigated under different rain conditions in a controlled environment via a raindrop simulator. The results show that the performance of the enhanced harvester has been improved by at least 208%. Besides that, a theoretical model is developed and good agreement is achieved in a comparison of simulation and experimental results. Finally the prototype is tested in actual rain conditions and an improvement of 6.84% is recorded.

<KWD>Keywords: Energy harvester; piezoelectric beam; rain.

#### <H1>1. Introduction

The advancement in technology development as well as the rising living standards increases the demand of energy usage. However, non-renewable energy sources such as petroleum, coal and natural gas are depleting. Therefore motivation is driven towards harvesting energy from renewable sources, such as wind and water droplets [1]. Furthermore, due to the climate change and energy security, decentralised energy systems which produce power near to the point of use are desirable. It is reported that the top priority of a sustainable energy system is energy conservation, followed by sustainable production (primarily renewables) and the last option is depletive energy generation [2]. Moreover, wireless electronic applications with low-power consumption such as micro electromechanical systems and sensors, are likely to be developed with a self-powered feature. This is to facilitate wireless and independent operations such as

Download English Version:

<https://daneshyari.com/en/article/5008499>

Download Persian Version:

<https://daneshyari.com/article/5008499>

[Daneshyari.com](https://daneshyari.com)