Statement No. 22

Arkansas State Highway and Transportation Department
Transportation Research Committee

RESEARCH PROBLEM STATEMENT

DATE: 08/26/2010 | **PROJECT AREA:** Special Projects

TITLE: Batteryless Energy Harvester for Structural Health Monitoring (SHM)

PROBLEM STATEMENT:

Along with alternate energy, there has been a research focus in harvesting wasted energy like vibrations, ambient light, heat, and other forms of thermal/mechanical energy sources. Vibration energy harvesters are commercially available and need to be evaluated in applications relating to SHM of building, bridges, and road pavement. Vibration energy is significant in bridges because of its flexibility and 7/24 movement of traffic along highways. Sensor networks transmit current health condition to a central database and to the bridge authority. This proposal seeks to evaluate power requirement for such data transmission and examines if it is cost effective to use commercial energy harvester for the application. The other alternative is to develop low cost batteryless solar harvester that will supply or augment power for such SHM applications. For low power applications, super capacitors can be employed to store solar energy and eliminates the need for batteries, which have limited cell life. Powering the embedded sensor devices through harvested vibration energy and/or with batteryless solar harvester will provide a life cycle of more than 20 years.

OBJECTIVES:

The goal of our research is to evaluate commercial vibration energy harvesters for SHM application and to investigate batteryless solar harvester for such applications. The power available from energy harvesters is not sufficient in many applications or they are cost prohibitive. Batteryless solar harvester is a low cost solution since they employ a small solar panel of the size 10cm x 10cm to produce 1-2 Watts of power, which is sufficient for powering the sensor network. The energy harvesting can be maximized with ultra low power electronics and an efficient maximum power point tracker.

Form of Research Implementation:

The energy harvesters could be used to power a wide array of road monitoring and warning devices. Sensors and wireless data transmission equipment could monitor road conditions. Motorists could be warned of poor road conditions by roadside signals. It can also power flashing marker lights for lane dividers.

Total Estimated Cost and Project Duration: **$** 120,000 **and** 24 **months.**

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