Numerical analysis of piezoelectric energy harvesting system

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ABSTRACT

A piezoelectric harvester can harvest energy from around a few micro-Watt (μ W) to a few milliwatts (mW); in fact, it ' s really small. But why does it still attract many well-known research teams to set it as the key research area? That's because its mechanism is simple and its area is tiny (can less than 1cm 2), and in the process of micro-, it can be used with standard semiconductor manufacturing process and the integration of integrated circuits, which are suitable for the demand of many other fields, such as: wireless, telemetry, wireless multipoint distribution monitoring networks and MEMS, and so on. Because the energy that piezoelectric harvester can harvest is really very small, it is difficult to directly supply all kinds of electronic facilities with it. Therefore, power must be consolidated and stored, and then be exported to supply an external facilities. This objective is twofold: 1. The selection of the best adhesive location of piezoelectric patches in order to get the most out of converting energy. 2. Energy harvesting circuit analysis, to achieve the best conversion efficiency. This Matlab simulation tries to find how the beams under various boundary conditions vibrate, so that we can identify piezoelectric film adhesive law---adhesive in vibration response at the maximum, you can get the best conversion energy. And the interface circuit input impedance is the key to maximize energy conversion, that is, the circuit input impedance must match with the impedance of piezoelectric equivalent output in order to get the highest conversion efficiency.

Keywords : MFC piezoelectric actuator, piezoelectric harvester, impedance matching, the vibration mode.

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