

Energy Harvesting and Conversion from a Piezoelectric Plate

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ABSTRACT

The process of acquiring the energy surrounding a system and converting it into usable electrical energy is termed power harvesting. Piezoelectric materials have a crystalline structure that provides them with the ability to transform mechanical strain energy into electrical charge, vice versa, to convert an applied electrical potential into mechanical strain. The use of piezoelectric materials to capitalize on ambient vibrations surrounding a system is one method that calls the piezoelectric power harvesting. The purpose of this thesis is to establish a mathematical model of piezoelectric plate, and expect this model can calculate the export of electric energy generated by piezoelectric material by the method of numerical simulation. Points of this thesis are: establish a mathematical model of piezoelectric plate, analyse the characteristic of electric energy of the piezoelectric material, design the structure of piezoelectric power harvesting and observe the influence of the parameters: (1). Apply force range, (2). The site of the structure that piezoelectric element plaster, (3). The position of input force, (4). Apply force model (harmonic oscillations and random noise) on the characteristic of piezoelectric energy harvesting system (transformable voltage, current and power) by experimental measurement.

Keywords : power harvesting, piezoelectric material, piezoelectric plate.

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