

Vibration based energy harvesting using piezoelectric material

Abstract

Energy harvesting has been around for centuries in the form of windmills, watermills and passive solar power systems. It is not only restricted to the natural resources but it has widened the tapping source to utilise the vibration which happens all around us. In the last decade, beams with piezoceramic patches have been used as a method to harvest energy. An energy harvester system modelled in this paper consists of a unimorph piezoelectric cantilever beam with a tip mass. It generates electric current or voltage from the piezoelectric strain effect due to base excitation. This paper is aimed at developing a mathematical model of a unimorph cantilever beam with a piezoelectric harvester by using Euler–Bernoulli beam theory. The step-by-step analytical solution and the simulation results are shown in the form of voltage around the natural frequencies.

Keywords — Piezoelectric, unimorph, energy harvester, Euler–Bernoulli