

Design and Analysis of a Piezoelectric-Based AC Current Measuring Sensor

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Abstract : Electrical current measurement is a suitable method for the performance determination of electrical devices. There are two contact and noncontact methods in this measuring process. Contact method has some disadvantages like having direct connection with wire which may endamage the system. Thus, in this paper, a bimorph piezoelectric cantilever beam which has a permanent magnet on its free end is used to measure electrical current in a noncontact way. In mathematical modeling, based on Galerkin method, the governing equation of the cantilever beam is solved, and the equation presenting the relation between applied force and beam's output voltage is presented. Magnetic force resulting from current carrying wire is considered as the external excitation force of the system. The results are compared with other references in order to demonstrate the accuracy of the mathematical model. Finally, the effects of geometric parameters on the output voltage and natural frequency are presented.

Keywords : cantilever beam, electrical current measurement, forced excitation, piezoelectric

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