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Experimental Study of Double Inverted Flags Energy Harvesting System with Flow Induced Vibration

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Extended Abstract

This paper explores the vibration energy harvesting system (VEHS) composed of double inverted flags and PZTs in an experimental way. The structure of this research is to install two parallel elastic steel sheets on a base, the free ends of which face the upstream flow field. The roots of the steel sheets are fixed on the base and installed with PZTs to form a double inverted flags vibration energy harvesting system (DIF-VEHS). In order to obtain better power generation efficiency, in this study, a semi-circular receiving device is added to the free end of the elastic steel, and a cylinder is installed upstream of it to create a periodic oscillating flow field with the fluid in the pipe. During the experiment, the effect of different parameters on the energy harvester will be explored, such as the distance between the elastic steels, the diameter of the cylinder, the distance between the cylinder and the fixed base, etc. In this study, ANSYS software will be used to simulate the oscillating of the elastic steel after the DIFVEHS is installed in the pipeline flow field, in order to identify the feasibility of this design, and find the most efficient model from the experimental measurement results. The results of this study show that the power generation reaches a maximum when the distance between the cylinder and the elastic steel reaches 100 mm. In the experimental study, it can be observed that two pieces of elastic steel slap each other. Under the state of slapping each other, the elastic steel can rebound in a short time, thereby generating more electricity in a cycle. This model proves that it is possible to try to place the system in general rivers or sewers, and gradually change the experimental environment from a closed laboratory to a natural environment, so as to bring the system into the field of practical application.

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