عنوان مقاله:

Fluid-solid interaction analysis of cantilever plate behind a fixed cylinder in parallel flow: Application to energy harvesters

محل انتشار:

دو فصلنامه تجهیزات و سیستم های انرژی, دوره 11, شماره 1 (سال: 1402)

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خلاصه مقاله:

In the present study, the transient vibration of a fixed cylinder attached to an elastic piezoelectric splitter plate is examined. The vibration frequency of these systems is a combination of vortex shedding frequency and splitter plate natural frequency. Therefore, Geometric plate and fluid flow parameters that affect the structure’s frequency and dynamic behavior are investigated. The fluid-solid interaction model is developed for the described problem to determine the splitter motion patterns and their effect on the vortex shedding frequency and the estimated piezoelectric output power. The effect of involving parameters such as inlet fluid velocity, density ratio, splitter plate length and stiffness on the dynamic response of the device and the produced power is inspected. A comparison between the data of the present study and those reported in the literature is conducted and great agreement is achieved. Results show that the decreasing of dimensionless Young modulus of plate or increasing dimensionless plate length and density ratio decreases the natural frequency of the system. By increasing the fluid velocity from ۱ to ۴, ۸ and ۱۶, respectively the excitation modes of ۱st, ۱st and ۲nd, first three and first four are activated and higher plate deflections are obtained.

کلمات کلیدی:

Vortex-Induced Vibration, Piezoelectric Flexible Splitter Plate, Fluid-solid interaction, CFD