

# Analysis of a bluff body geometry through vibrations induced by low-speed air vortices while harvesting energy using a piezoelectric cantilever

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This article discusses experiments on energy harvesting from wind-induced vibrations (WIVEH), using systems consisting of a flexible beam with piezoelectric transducers (PZTs) coupled to an irregular solid geometry. The study examined streamlined solid structures mounted singly and in pairs on the beam. Characteristics of vibration, frequency, and output voltage were obtained at air speeds ranging from 3.5 to 15 m/s. The importance of nonlinear aerodynamic excitation mechanisms of vortex-induced vibrations (VIV), including galloping and flutter effects, was discussed. The obtained results demonstrate the influence of irregularly shaped solids on the beam's vibration amplitude, vibration frequency, and energy harvesting efficiency. Among the paired solid configurations, the two-cylinder configuration achieved the highest vibration amplitudes and an 89% increase. However, the single-cylinder configuration provided a moderate and predictable voltage increase ( $\sim 75mW/cm^3$ ). Experimental observations have proven that two-cylinder configurations can be effective in low, constant airspeed conditions, and a cylinder-cuboid hybrid can be dedicated to broadband, variable-speed environments.

## References

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