Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Piezoelectric energy harvesting from fluid-structure interaction ABINAYAA DHANAGOPAL, THOMAS WARD, Iowa State University — Piezoelectric energy harvesters have risen in popularity due to their ability to convert ambient vibrational energy into power. Small scale harvesters built on this principle can potentially charge batteries and power micro-scale devices. Experiments were conducted inside a low-speed wind tunnel (0 to 3.6 m/s) using commercial piezoelectric transducers subjected to uniform flow with the goal of maximizing the resultant voltage. Rectangular bluff bodies with varying aspect ratios (0.5-3.0) were loaded onto flexible piezoelectric transducers. The cantilevered-tip mass system was arranged in a parallel configuration to aid in vibration frequency control. Images at high speed were captured to observe the rise in voltage generated by coupled bluff-body and cantilever tip vibration as a function of incident wind speed. This allowed for the assessment of the flutter/vortex-induced vibration potential of the system. The operating limit for each bluff body of a given B/D ratio was established in terms of the wind speed, Reynolds number (Re), Strouhal number (St), and reduced velocity. Beyond the operating limit, no positive effect on the resultant voltage was observed. These results will aid the design and development of vibration-based energy harvesters.

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Date submitted: 09 Aug 2020 Electronic form version 1.4