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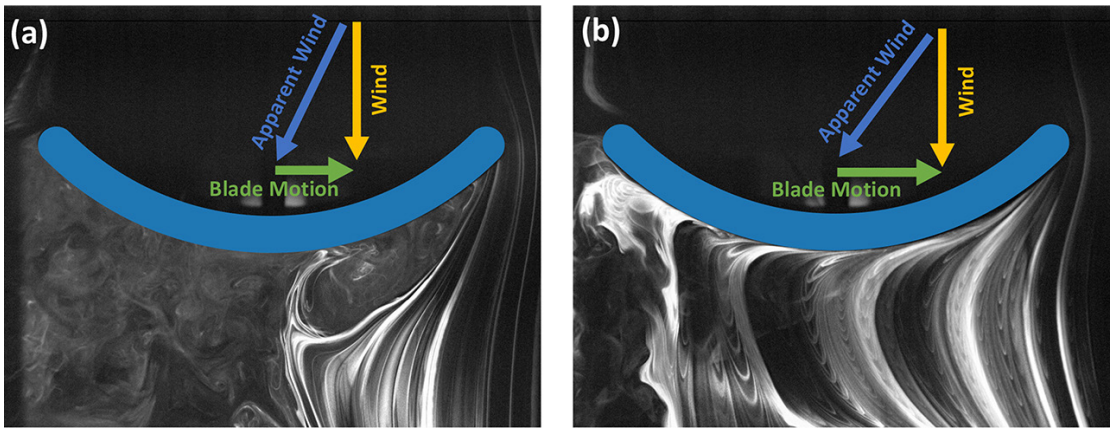
A new article reports on an aeroelastic energy harvester inspired by trembling aspen leaves, which are known to quiver in the presence of the slightest breeze.



Aeroelastic energy harvesters utilize fluid structure interaction to convert the energy in fluid motion into electrical energy. These systems have shown great promise for the powering of small autonomous electrical devices.

Harvey et al. introduce a new aeroelastic harvester design that looks more like an aerofoil than a bluff body and present results from experiments and calculations that demonstrate the efficiency of the new design.

The project started from mimicking the unique movement of trembling aspen leaves, which are known to quiver in the presence of the slightest breeze. The novel design consists of a cantilever beam and a curved blade tip geometry with a circular arc cross section. The curved blade is oriented perpendicular to the flow direction, which allows the harvester to produce self-sustained oscillations like the aspen leaf, even at uncharacteristically low wind speeds.

With the harvester mounted inside a wind tunnel, and the authors performed flow visualization with a hot wire smoke generator and a laser sheet curved along the blade trajectory. Images were captured by a high-speed camera and a 2D motion tracking system was used to analyze the blade motion. The results demonstrate that the flow becomes attached to the rear face of the blade when the blade's velocity becomes high enough.

Finally, a mathematical model was used to calculate the energy harvesting potential for the new design versus a square prism, a more conventional design. When operating in the higher amplitude branch in terms of blade velocity amplitude, the curved blade was predicted to produce significantly more power than the square prism.

Source: "A galloping energy harvester with flow attachment," by S. Tucker Harvey, I. A. Khovanov, and P. Denissenko, *Applied Physics Letters* (2019). The article can be accessed at https://doi.org/10.1063/1.5083103.