Optimizing Micro-Geometric Bladeless Wind Turbines, Year Five

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The purpose was to develop a system that can harness vibrational energy from a bladeless wind turbine that is small enough to implement in a residential area. The hypothesis was if a system consisting of a micro-geometric bladeless wind turbine is connected to magnets and vibrates past a coil, then by electromagnetic induction sufficient amounts of electricity will be converted from vibrational kinetic energy to make the system useful in a residential setting. Energy harvesting systems were tested using a wind tunnel and vortex induced vibrations were videoed, while the frequency, voltage and current were measured. Vibrating velocity (m/s) and power were calculated using measurements of voltage, current, frequency and amplitude. Five shapes were simulated in ANSYS fluent analysis. Three optimum shapes were 3D printed: Triangular Prism (TP), 5-degree-tapered TP (TP 5), and 4-inch 10-degree-tapered TP (TP 10-4). All test components were securely mounted to the wind tunnel frame to minimize outside variables. The changes in vibrating velocity, kinetic energy, power, and efficiency vs. wind velocity were plotted on graphs. Results show that one shape vibrated with the greatest velocity in almost every test condition, making it the optimum shape. The magnetic field altered the vibrations of the shapes therefore affecting the optimum system. The best system was then tested in an uncontrolled environment. These tests showed that the system is able to operate in a real world setting. The results also indicated future changes to the system which potentially could increase function.

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