# Shaping the Future of Wind Energy: An Investigation of the Most Productive Blade Design for Horizontal Axis Wind Turbines

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As environmental change has become a more prominent issue in the world, the need for alternative energy sources is ever growing. However, it is apparent that wind turbines are not nearly efficient enough to replace the nonrenewable sources of today. Seeking to understand what factors go into creating more efficient wind turbines, this research project changes various factors to see which produces the greatest energy outcome. Four key variables were chosen for this research: blade type, blade number, angle of pitch, and wind speed. Testing was done by constructing a small-scale wind turbine which included a system allowing for the blade type, blade number, and angle of pitch to be adjusted. The efficiency is determined by looking at the volts produced by each wind turbine type. The design which produces the most energy is deemed the most efficient. The investigation has a total of four trials, so the results of each trial could be compared to ensure accuracy. The design most similar to commercial wind turbines currently used was deemed the most efficient form. In all trials, an angle of pitch of 15 degrees allowed the most efficiency, and the best number of blades was consistently three. The environmental and humanitarian implications of studies concerning the creation of better renewable energy sources is important in the world now more than ever. From powering third-world countries to cutting carbon emissions, making wind energy more efficient is one of the best steps in creating a better world tomorrow.

**Awards Won:**