Turbine Blade Specifications for More Profitable Wind Energy

Graham Sim, Ronald Dimmerling, Daniel Alatrash, Ryan Rudolph

Choose Ohio First

INTRODUCTION

Our project looked at how to optimize the output given by wind turbines. We innovated upon existing wind turbine designs to create a more efficient and profitable energy source. Our group focused on two specific wind turbine blade styles, the straight and flex design. The straight design only alters the angle of the blade while keeping it straight. The flex design curves the blade at an angle clockwise to the center.

Abstract

Transforming the prominent source of energy has been a goal for the United States since the late 1800s. Shortages of oil and fossil fuels have been detrimental to the economy and toxic to the environment. Over the last couple of decades, the push for "green energy" has been significant as the U.S. federal government looked to new sources of energy. The importance to innovate greater wind power is momentous towards the world as cleaner energy can prove beneficial against alternative energy sources. The following project has focused on the blade length, curvature, and quantity to find the most serviceable turbine model. Through a group study at Cleveland State University, the data can be used to produce sufficient data promoting increased wind power.

OBJECTIVES

- Innovate upon modern wind turbine blade designs to increase overall wind energy output
- Investigate the correlation between wind turbine blade designs and how variable wind speeds affect wind power generation

METHODS

- Use of Solidworks to alter given designs
- Powered wind generator to create air flow
- Measurements taken with a digital multimeter
- 3D printed wind turbine blades
- Premade wind turbine set for each blade model

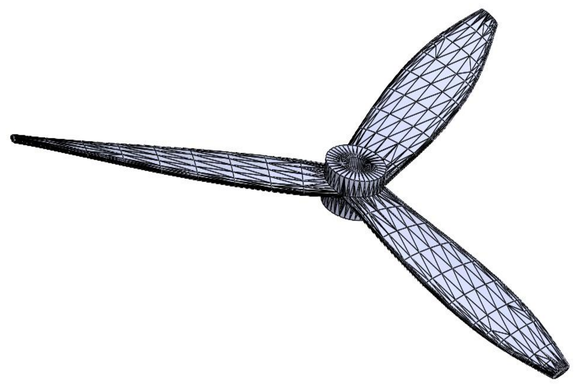

Figure 1. Three-Dimensional Flex Blade Design via Solidworks

RESULTS

- The straight blade designs output more voltage than the flex designs on average
- The straight-20 design was the most efficient
- The Flex-10 design proved efficient with higher wind speeds

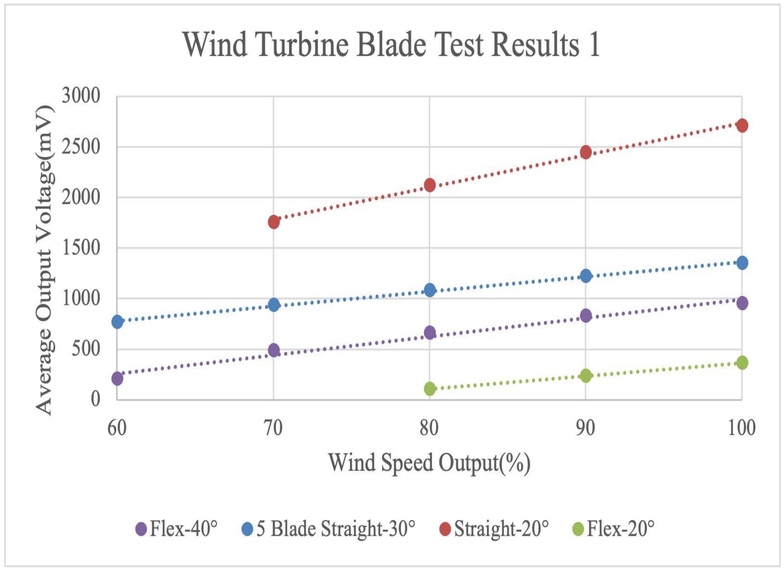

Figure 2. Graph of the first data set collected using different wind turbine blade designs

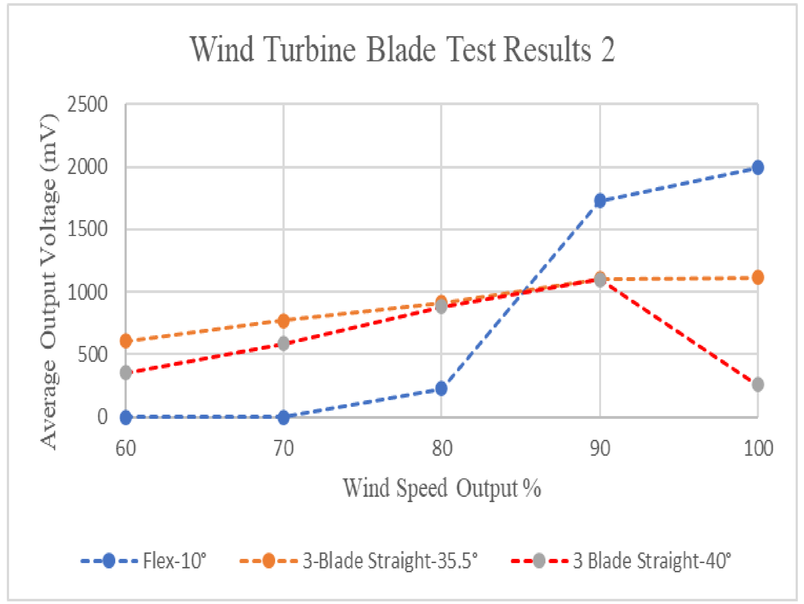

Figure 3. Graph of the second data set collected using different wind turbine blade designs

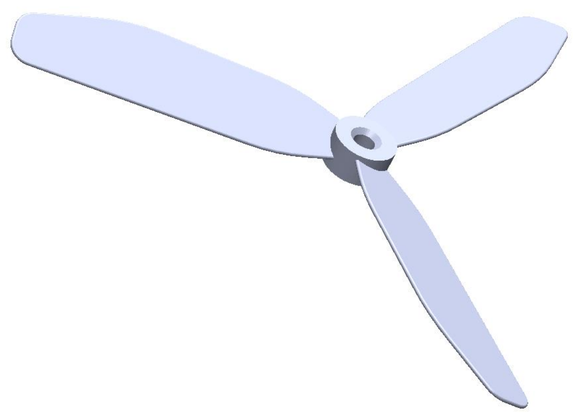

Figure 4. Three-Dimensional Straight Blade Design via Solidworks

CONCLUSIONS

The wind turbine blade design has a drastic effect in the amount of output voltage which in turn alters the profit gained. The wind speed also affects the output voltage and profit, with higher wind speeds being more efficient on average.

Acknowledgments

Dr. Wei Zhang for help with the project idea and use of materials for data collection.

Choose Ohio First Math Program