



SENIOR DESIGN ORGANIZATION SYNOPSIS – SPRING 2013

HIGHWAY WIND TURBINES

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The objective of our project was to design a wind turbine to recycle wind energy from passing vehicles on the highway. Wind is considered the fastest growing clean energy source, however; it is limited by variable natural wind. Highways can provide a considerable amount of wind power to drive a turbine due to the high volume of fast moving vehicles. The energy generated from the wind turbines may be used to power streetlights and other such public amenities. The major components of the turbine considered were the blades, scoops, collars, shaft, bearings, gearbox and motor.

In order to design the most efficient turbine, data is collected on the wind draft created by vehicles on both sides of the highway. A vertical wind turbine design was selected because vertical turbines are capable of capturing wind in any direction, whereas, horizontal turbines need to be pointed in the direction of maximum wind velocity. The turbines will be placed on the medians to capture wind from vehicles on both sides of the highway. Additionally, it is capable of utilizing any natural wind that may be available in the placement area. To achieve this we used Darrieus blades with airfoil cross-sections and Savonius rotors to get the turbine started. They are attached to the turbine shaft with custom designed collars. The power produced from the rotating blades and shaft is amplified using a gear set connected to a low rpm motor. Analysis was performed on each of the components and the system as a whole.

There were several important design considerations including stability, energy output and storage, safety and environmental impact. In this project the turbine blades were designed specifically for their intended use and analyzed for efficiency. Using an energy storage system was vital to the design because the energy produced by the turbines will be intermittent due to fluctuating traffic patterns. In order for the design to be useful, a constant output of energy is necessary. A battery was utilized to store the energy created by the turbines. Since placement is necessarily in high traffic locations, the turbines must be placed carefully to avoid safety concerns. Warning labels are also used.

The turbines can be installed on any highway, in any part of the world. The wind energy produced can help offset some of the damage caused globally by the burning of fossil fuels for energy. Wind turbines are traditionally installed in rural areas; highway wind turbines are an effective way of bringing the technology into major cities. The design of the wind turbine will continue to be useful in the future as it is sustainable and environmentally friendly.