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# Diffuser Augmented Wind Turbine to Create Electrical Power Generation and Charging In the Vehicle Motion

**Narmada Kari**

Associate Professor, Department of Electronics and Communication Engineering, Malla Reddy College of Engineering for Women, Hyderabad -500100, Telangana, India

***Abstract* - This article focuses on the design of a Diffuser Augmented wind turbine that will be installed on the vehicle to create electrical power that may be utilised to operate accessories or even charge the battery while the vehicle is in motion. The DAWT (Diffuser Augmented Wind Turbine) is designed to be mounted on the roof of the automobile, closer to the windscreen, where the air velocity travelling around the car is at its maximum due to its aerodynamic nature. The horizontal axis diffuser augmented wind turbine is used for this type of design, which may provide a larger power output than conventional turbines. The torque necessary to rotate the rotor is created by the air velocity when the automobile starts moving. The support for the turbine is termed a shroud or diffuser. The car's speed is estimated to be 80kmph (22.2m/s) for the purpose of design.**

***Key Words:*** Diffuser Augmented Wind Turbine, Electric Vehicles, Power Generation.

## 1. INTRODUCTION

In the present world fossil fuels are considered as dominant energy sources for both the transportation sector and power generation industries. The reduction of fossil fuel gives a wake-up call for finding alternative energy sources for these sectors. Although, burning fossil fuels produces greenhouse gases (GHGs) which highly influence world climate change. The promising solution for the transportation sector is electric vehicles (EVs) and they are taking a remarkable pace in the vehicle market. It is predicted by the economic studies that EVs will completely take over IC engines in the future. Though the EVs produce less range and should be charged hours for the next run, the electrification of the transportation sector is one of the feasible solutions to the problems such as energy security, global climate change, and geopolitical concerns on the availability of fossil fuels [1].

In a complete life cycle of a car, electric vehicles emit two times less carbon dioxide (CO2) in comparison to diesel engines considering the European electricity mix. The Belgian electricity mix could even make this four times less. The emissions of Carbon dioxide could be further reduced by more than 10 times. if cars were driving on sustainable electricity. Taking about availability and demand of electricity there will be only 1.4% additional demand for power If 10% of our fleet becomes electric. But considering the gearing up of renewable energies and their implementation, the production and supply will only increase [2].

Among renewable energy, solar energy is the predominant one. After solar power, wind turbines are popular and widely used in the locations where the wind resource is highly available. Harvesting Wind energy is those generating electricity from the wind's kinetic energy using wind turbines consisting of rotor blades and hub [3]. This paper will concentrate on the combination of both the EVs and Wind turbine technologies to improve the range of the electric vehicles by placing the turbine on top of the car near the windshield. By using working principle of turbine, the electricity when the car is in motion. Here the electricity produced is stored in the alternator that is used to run the car for extra range or can be connected directly to power the accessories. The materials required and design for the model is discussed in the further chapter.

## 2. LITERATURE REVIEW

*I Electric Vehicles*: A vehicle that is propelled by one or more electric motors or traction motors is known as an electric vehicle (EV). An electric vehicle can be self-contained using a battery, solar panels, fuel cells, or an electric generator to convert gasoline to energy, or it can be fueled by electricity from off-vehicle sources via a collector [1].

*II History of EVs:* The electric car has been around for over a century and has a fascinating development history that continues to this day. In the late 1860s, France and England were the first countries to create the electric automobile [2]. The first commercial application, a fleet of New York City taxis, was founded in 1897. Early electric vehicles, such as the Wood's Phaeton from 1902,

 

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were essentially electrified horseless carriages and surreys. It has been developed since the invention of the electric cardriving range persists [2].

Traction Battery: The battery in an electric automobile serves as a storage mechanism for electrical energy in the form of direct-current power (DC).

Power Invertor: The inverter converts direct current (DC) from the battery to alternating current (AC), which is then used by an electric motor.

Electric Motor: The electric traction motors will turn the gearbox and wheels because the controller receives electrical power from the traction battery.

Charger: Charger is a device that charges batteries. External sources of electricity, such as the utility grid or solar power plants, are used to power chargers. AC power is converted to DC power, which is then stored in the battery.

*IV Turbine and its types*

Wind turbines, which convert the kinetic energy of the wind into electric energy for consumption, are one solution to the developing world's present power shortage. To recover the kinetic energy of moving air, wind turbines use propeller-like blades that are rotated by the wind. The power is transmitted to a generator via a shaft, which transforms it to electrical energy.

*Horizontal-Axis Wind Turbines (HAWT):*

HAWTs are the most widely used wind turbine designs today. HAWTs use aerodynamic blades (also known as airfoils) mounted on a rotor that may be positioned upwind or downwind. The largely dominant technology today is the three-bladed HAWT the reduced number of blades theoretically reduces the cost but leads to irregular torque [3].

*Vertical-Axis Wind Turbines:*

Vertical-axis wind turbines (VAWTs) feature a vertical rotation axis, so they can capture wind from any direction, unlike horizontal wind turbines. The main rotor shaft of vertical axis wind turbines (or VAWTs) is positioned vertically. The turbine does not need to be aimed into the wind to be functional, which is one of the main benefits of this setup [3].

***Wind Turbines***

 

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*Diffuser-augmented wind turbine:*

A diffuser-augmented wind turbine (DAWT) is a wind turbine that has been modified to include a cone-shaped wind diffuser to improve the efficiency of converting wind energy to electricity. The enhanced efficiency is made possible by the diffuser's ability to deliver higher wind speeds. The rotor blades of a DAWT are positioned within the diffuser, which is subsequently put on the support tower's top. To achieve the higher air velocity, the diffuser's exit hole must be bigger than the entry hole in order to effectively distribute the air. When wind passes through the diffuser, it travels along the walls, causing the wind to generate low pressure zone as it exits [5].

## 3. OBJECTIVES

- The aim of the project is to develop a Power source from moving vehicles using wind turbines.
- To make the device simple and to implement on the electric vehicles to increase the range.
- The objective of this project is to design a prototype that can generate and store energy for later usage.
- To make it eco-friendly and to attain requirements for market availability.

***Advantage of Proposed model***

- Range of the vehicle is increased.
- Since the DAWT is used the aerodynamics of the vehicle is not affected.
- More efficiency compared to other traditional models.

## 4. RESULT & OBSERVATIONS

Renewable energy, particularly wind energy, should be dramatically developed in the next decades to reduce fossil fuel reliance. This may be accomplished by placing turbines in locations where they can efficiently generate maximum energy, such as this project. This project is meant to produce the most energy while taking into account all required design aspects in order to keep costs low. The use of materials that are very robust, fatigue resistant, and damage tolerant are the essential criteria for completing this project. In the previous chapter, it is discussed that the power produced at end of the shaft is 0.6744KW at the speed of 80KMPH (22.22m/s). This can be further increased by the additional research on the materials and using the efficient materials that can serve the purpose.

## 5. CONCLUSION AND FUTURE SCOPE

With sophisticated communication, control, and metering technology, the study found that the deployment of Moving Vehicles into Power Generation would be viable. The interoperability of EVs for power generation will be aided by wind turbines in this scenario. Although more research is required on the incorporate the design of turbines into the body of the car. Further execution of the project may be done by enhancing the project's aerodynamics by finding a more efficient location for the turbine. In order to create more energy, more turbines can be installed, with one possibility being to place the turbine under the bonnet, where air can reach the turbine through the radiator gap. EVs and rear-engine automobiles are both capable of this. With advancements in

 

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technology, it will be feasible to expand the size of the blades in the future, allowing for increased power generation and vehicle range.

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