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Development of wind turbine system for electric and hybrid cart

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Electric and hybrid vehicles are emerging as solutions to fossil fuel shortages. However, to travel a long distance, battery power may be insufficient, and electric car recharge durations may be lengthy. Previous research on wind turbine technologies had a direct impact on the appearance of the car. This research paper studied the development of a vehicle-mounted horizontal axis wind turbine for use in electric and hybrid vehicles. In the research horizontal axis, Archimedes wind turbine was used since it can effectively handle the urban wind conditions and it further has the property of drawing air stream into the turbine. Two air turbines will be mounted on the front bumper. These air turbines are expected to use wind energy to charge the battery of the electric or hybrid vehicle and increase the driving range. The objectives were to design the wind turbines, a sedan-type car that was modified and that could be simulated and tested in the field. Five-blade and three air foil wind turbines were developed using Qblade software. The Archimedes wind turbine models were then developed using Solidworks software. The drag force increased as the Archimedes wind turbine angle increased. The rotation speed decreased as the angle decreased. As a result, two separate average values were used. The size and number of wind turbines were determined by the type of the automobile and the size of the front bumper. The three-blade Archimedes wind turbine gave a better power coefficient and aerodynamics performance. The same turbine was tested in the field and showed positive results. As a limitation of this study, it was found that the wind turbine-mounted vehicle was not performing well under flat and ascending road conditions due to drag force on the vehicle. Therefore, vehicles with wind turbines can operate effectively when the car is descending. Further, the turbine system can also operate effectively while the vehicle is stopped since it can operate at low wind speeds and can operate while breaking the car.

Keywords: Archimedes wind turbine; Electrical cars; Horizontal wind turbine; Hybrid cars