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Innovative Integration of Solar & Wind Energy for Future Automotive Propulsion Systems

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Extended Abstract

Abstract:

As the automotive industry development to achieve a sustainable future, the incorporation of renewable energy sources such as solar and wind power into automotive propulsion systems emerges as a promising solution. This scientific article delves into the efficient utilization of solar and wind energy in automotive applications, presenting a sustainable approach to future mobility. Extensive discussions follow on the individual integration of solar and wind energy in automotive systems, exploring existing technologies, their advantages, and limitations.

The article places a significant focus on the combined integration of solar and wind energy in automotive propulsion systems. It explores innovative architectures and technologies designed to maximize energy generation, enhance system efficiency, and extend the driving range of vehicles. Furthermore, the article evaluates the performance of integrated solar and wind energy systems in automotive applications, comparing their effectiveness to traditional propulsion systems through empirical data and analysis[1-13].

Results:
The experimental results conducted with wind turbines mounted on the car reveal promising insights:

1.50W Commercial Wind Turbine
Maximum recorded power: 50W at 120 km/h.
- indicates normal operation under standard wind conditions.
- potential for improved performance at higher speeds.

2.Special 100W Turbine
Achieved power: 110W at 120 km/h, exceeding estimated turbine power.
- specifications and 3D technology enhance efficiency.

3.Impact on Fuel Consumption
Without turbine: 6.2 liters at 100 km/h.
With turbine: slight increase to 6.3 liters at the same speed.
- small impact on fuel consumption, suggesting improved efficiency with renewable energy and fuel combination.

4.Turbine Positioning
Positive impact on performance when turbines are installed on the roof and in front of the vehicle.
- direct exposure to air speed and pressure enhances turbine performance.

5.Solar Panel Results
Sun in the clouds, solar panel connected for 10 minutes:
- current: 4.86A, Voltage: 13.7V, Power: 66.582W.
- reduced power due to inconsistent solar illumination.

Full sun for 30 minutes, air temperature 30 °C:
- current: 6.16A, Voltage: 17.14V, Power: 105.58W.

- significant power increase with prolonged direct solar lighting.

Full sun for 45 minutes, air temperature 30 °C:
- current: 6.12A, Voltage: 17.40V, Power: 106.488W.
- constant and effective performance throughout extended sun exposure.

Sun in full condition for 1 hour, air temperature of 30 °C:
- current: 6.17A, Voltage: 17.56V, Power: 108.34W.
- efficient and constant electricity production during one hour of direct solar lighting.

Full sun for 1 hour, air temperature 34 °C:
- current: 6.65A, Voltage: 18.32V, Power: 121.828W.
- higher temperature conditions result in increased electric current and total power.

Partial sun in the clouds, air temperature of 30 °C:
- current: 6.02A, Voltage: 17.13V, Power: 103.122W.
- slightly decreased performance in partially overcast conditions.

Sun in the clouds for 20 minutes, temperature 25 °C:
- current: 5.3A, Voltage: 16.85V, Power: 89.3W.
- significant decrease in power generation in cloud conditions compared to full sun exposure.

In conclusion, this article underscores the significance of efficiently integrating solar and wind energy into automotive propulsion systems for achieving sustainable mobility. By presenting real-world examples, performance evaluations, and experimental results, the study demonstrates the viability and relevance of this approach in shaping a greener future for the automotive industry.

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