MULTI-PURPOSE AND ECO-FRIENDLY VEHICLE FOR INSTITUTE CAMPUS VISITS FOR DIVYANG PERSONS AND SENIOR CITIZENS

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Battery, Motor, Solar Panel and Chassis

Introduction:

According to recent surveys, the fossil fuels are depleting at a fast rate; and the whole fossil fuel in the world must be completely depleted in and around 50 years. Therefore, it is the need of the time to make a new exploration of natural resources of energy and power among the natural resources available sunlight is the most promising one. Sunlight is considered to be a source of energy which is implemented in various day-to-day applications. The Solar/Electric Powered Hybrid Vehicle (SEPHV) contains the solar panel, brushless DC (BLDC) motor, charge controller, batteries, step-down transformer, additional brushes and diode rectifier unit. Diode rectifier can be used to charge the batteries in normal AC supply during sunless conditions. A zero emission solar/electric vehicle is powered by photovoltaic (PV)/electric supply energy by means of solar panels and AC supply with storage of electric energy in batteries. The PV array has a particular operating point that can supply the maximum power to the load which is generally called maximum power point (MPP), which is used to boost the efficiency of the PV system. Solar energy is being used to produce electricity with the help of these technologies. We aim to make solar energy powered vehicle in our paper Main disadvantages of solar energy is such that it is not a constant source of power and the amount of solar energy

available keeps on varying throughout the day, and is completely unavailable at night time. So to power our vehicle during the absence of solar energy, we designed an alternative method of obtaining power to run the vehicle from the electric supply.

The reasons for studying and developing a Hybrid Solar Vehicle can be summarized as follows:

- Fossil fuels, largely used for car propulsion, are doomed to depletion; their price tends to increase, and is subject to large and unpredictable fluctuations.
- The CO_2 generated by the combustion processes occurring in conventional thermal engines contributes to the greenhouse effects, with dangerous and maybe dramatic effects on global warming and climatic changes.
- The worldwide demand for personal mobility is rapidly growing, especially in China and India; as a consequence, energy consumption and CO_2 emissions related to cars and transportation are increasing.

Objectives:

1. We are using the vehicle for short-distance travel, reducing reliance on external energy sources.

2. The primary focus is on making the vehicle economical and environmentally friendly, helping to reduce pollution by using solar energy instead of fossil fuels.

3. The motor is connected to the wheels of the vehicle through a timing belt pulley system. This system ensures that power is efficiently transferred from the motor to the wheels.

4. The vehicle is designed for campus visit to divyang persons and senior citizens.

5. The vehicle is intended for campus visit, medical assistance emergency situations, towing and goods transportation.

Methodology:

Our solar-powered vehicle is a four-wheeled, two-seater design that incorporates a belt pulley mechanism. Solar energy is captured by solar panels, which are used to charge the vehicle's batteries. These batteries then power the motor, which drives the wheels. In this project, the motor's shaft is connected to the drive system through a belt pulley setup. The solar panels generate energy, which is stored in the lead-acid batteries and used to power the motor. The vehicle uses a timing belt system, featuring teeth that mesh with corresponding toothed Pulleys. When properly tensioned, the timing belt ensures smooth and consistent motion without slippage. This type of belt is efficient for transferring direct motion, often used for precise timing and indexing applications. Unlike chains or gears, the timing belt operates quietly and does not require lubrication. It also operates under minimal tension, making it one of the most efficient types of belts available.

Figure 1: Final model

SPECIFICATIONS

- Power Sources: Solar panels + Electric battery (Hybrid)
- Solar Panels: 24volts, integrated into roof
- Battery: 48volts, lithium-ion battery
- Electric Motor: 48volts, Brush less DC Motor
- Range: 10 - 15 km
- Top Speed: 30 km/hr

- Charging: Solar panels (daytime) + Electric charging
- Design: Lightweight materials, mini van shape
- Environmental Impact: Zero emissions driving
- Length: Typically between 4.5 to 5.5 feet
- Width: Around 2.5 to 3feet
- Height: Typically 4 to 4.5feet
- Wheelbase: Around 5 to 5.5 feet
- Weight: 140 to 150 kg

Result and Conclusion:

Testing and Performance Results of Solar & Electric Hybrid Vehicles

- A single solar cell typically produces about 0.5 to 0.6 volts.
- A 36-cell solar panel typically produces around 18 to 21.6 volts.
- Battery capacity is about 48 volts.
- Solar panel charges the battery within 6 to 7 hrs of time.
- By electric plug it takes 4 to 5 hrs of time.

Test 1:

Weight = 100kg, Distance = 10km

Table 1: Tabulated Test 1 Results

Trail	Speed (km/hr)	Time(hr)	Mileage (km per hr)	Average
1	8 km/hr	1.25 hr	9 km/hr	8.5 km/hr
2	10 km/hr	1 hr	8.5 km/hr	
3	12 km/hr	0.83 hr	8 km/hr	

Test 2:

Weight = 150kg, Distance = 10km

Table 2: Tabulated Test 2 Results

Trail	Speed (km/hr)	Time(hr)	Mileage (km per hr)	Average
1	8 km/hr	1.25 hr	8.5 km/hr	8 km/hr
2	10 km/hr	1 hr	8 km/hr	
3	12 km/hr	0.83 hr	7.5 km/hr	

Test 3:

Weight = 200kg, Distance = 10km

Table 3: Tabulated Test 3 Results

Trail	Speed (km/hr)	Time(hr)	Mileage (km per hr)	Average
1	8 km/hr	1.25 hr	8 km/hr	7.5 km/hr
2	10 km/hr	1 hr	7.5 km/hr	
3	12 km/hr	0.83 hr	7 km/hr	

Conclusion:

The solar vehicle addresses several environmental issues and represents an ideal pollution-free solution. It is crucial to adopt solar vehicles to reduce our reliance on fossil fuels. While they do have some drawbacks, such as limited speed range, high initial costs and an unsatisfactory energy conversion rate. For instance, the efficiency of solar cells could be improved by utilizing ultra- efficient cells. As the field of solar automobiles advances, these problems will be resolved. Solar vehicles hold significant potential in the market, and it is important to begin incorporating them into our daily lives. The timing belt system, unlike gears or chains, requires less tension and doesn't need lubrication, making the vehicle easier to maintain. The vehicle is used within the organization for various applications, as outlined in the objectives.

Future Scope:

Future iterations could incorporate advanced battery technologies or hybrid solar panels, minimizing dependence on charging infrastructure. Additionally, designing systems for quick battery swaps could eliminate the need for lengthy charging times. Promoting adoption by educational institutions would align with their efforts to support diversity and inclusion.