

Design of Solar Powered E-Cycle

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Abstract. The cost of fuel is getting increased day by day. Need of fuel also increasing day by day. Our project solar powered E- cycle that provides the alternative by harnessing solar energy to charge the battery and thus provide the required voltage to run the motor. The solar panels are mounted on the bicycle. The battery is coupled to a solar charge controller, which converts solar energy into electrical energy. The electrical power is stored in a battery, which is then supplied to a DC gear motor, which drives the motor. The bicycle has been changed from being an old-fashioned product to a less polluting means of transport and a compact mobility tool. In future, everyone will prefer electric vehicle than fuelled vehicles. Solar energy is one of the important sources of renewable energy which can be a best alternative to fossil fuels. However, most of the e-cycles are expensive. In this study, a cheaper solar e- cycle with more capability of utilizing the solar energy is designed.

Keywords: Electric bicycle, solar powered, ultra-light personal mobility tool.

1 Introduction

Electric vehicles are better for the future society. They release no greenhouse gases like petrol or diesel vehicles. Currently there is an increase in the interest on the electric vehicle field and its development. It is our duty to conserve the nature and their resources for the future generation. Electric vehicle will definitely improves the air quality and ensures the protection of nature.

Many researcher and scientist are focusing on studying and learning different ways to create environment friendly methods of transportation. As people are becoming more aware of the negative effect climate change has towards our planet, electrical cycles have been increasing in popularity. Specifically, in countries where one of their main sources of transport is cycles, China for the instance have been selling 9 out of every 10 electrical cycles are sold. Compared to other electrically dependent vehicles, the solar powered cycle is considered low in cost and

is very efficient as it relies on solar power.

Solar Powered Cycle is an alternative to many non-environment friendly form of transportation and its design is approached from the electrical cycle. We will be mainly focusing on how to efficiently create a solar powered cycle which allows you to travel the longest distance possible by properly utilizing energy generated from the sun. We will be also test which allows us to utilize the greatest amount of solar energy which will allow us to gain the maximum amount of sunlight wherever the sun is faced.

The main purpose of using this E-cycle is that it is user friendly, economical and relatively cheap. E-cycle comprises the features like high mobility efficiency, compact, comfortable riding experience, less weight vehicle. E- cycle is the most versatile future vehicle considering its advantages. The electricity is stored on board in a rechargeable battery, which drives the electric motors.

2 Problem Statement

Existing problems in powered e vehicles

- Low torque- Has very low torque, so that speed is very low.
- High maintenance- Existing models has lead acid batteries which has very high maintenance cost.
- Less distance- Full charged vehicle can cover only a small distance of 50 to 60 km.

Objective

- To reintroduce the bicycle with more user friendly and low cost features.
- To develop a cycle integrated with electric motor and the battery is charged using solar panel.

3 Components

Bicycle. A light weight bicycle made up of carbon fiber is be used to mount the components on it.

Solar panel. The solar panel produces the electricity from the solar irradiance. It converts the light energy into electrical energy and it got stored in the battery through solar charge controller. Usually, solar panel efficiency ranges from 15% to 20%, with some panels as high as 23%. Environmental conditions will not be same throughout the year. Hence the panel output will not be same all the time, as it differs with the environmental conditions.



Fig. 1. Solar panel.

Charge controller. A charge controller is basically a voltage and current regulator to keep batteries safe. It regulates the voltage and current from the solar panels to the battery. Controllers are also used to safe guard the solar panel from reversing current. These controllers will also make the circuit open and thus it separates the solar panel and battery, when the battery is not charging. Thus it prevent solar panel from reverse current flow condition. The regulated output voltage from the controller will be stable, thus fits for charging the battery. It prevents against overcharging and deep charging of a battery.

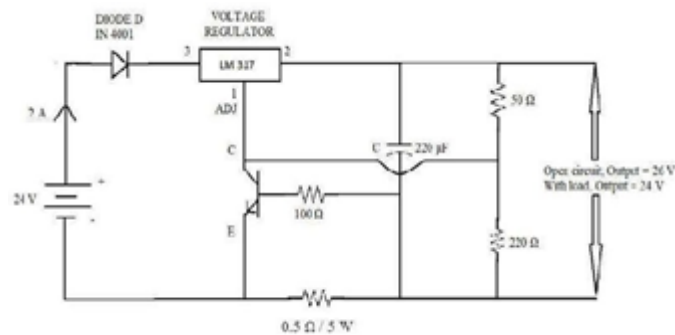


Fig. 2. Charge controller.

Lead acid battery. Lead acid battery is a well-known battery which is a rechargeable. Inside the battery, cells are arranged in a series-parallel manner. Lead acid battery has proven its dependable performance over the last 160 years. It is now a mature technology and has overcome several issues any new technology faces in the initial years. It performs well in spite of its lower energy density compared to lithium ion. It does not have the safety issues associated with newer technologies like lithium ion. Lead batteries will continue to improve in terms of performance. For example bipolar batteries, Nano carbon additives in lead acid battery that give it better charge acceptance.



Fig. 3. Lead acid battery.

Throttle. An e-Cycle throttle functions similar to a motorcycle. The throttle controls are usually

found on the handlebar. To engage the throttle, you simply twist the handlebar, and the Cycle will accelerate. Let go of the throttle, and the Cycle will stop.

Some e-Cycles feature a thumb throttle, which requires pushing the throttle button to engage the motor. Most electric Cycle throttles can be adjusted to different power outputs, allowing riders to choose how much power exactly they need.

While some throttles offer a level-type mode to choose the power output, others work in a pressure-sensitive mode. This means, the further you press the button, the more power you will receive on your e-Cycle wheels. When you aren't using an e-Cycle – the motor stays in the “idle” mode until you are ready to take advantage of its features. This also helps save the battery and ensure that the motor doesn't run at all times – which would relatively lessen the range of each e-Cycle.



Fig. 4. Lead acid battery.

DC Gear motor. A DC gear motor has a gear setup coupled with the motor. In this project, we are focusing on increasing the torque of the motor. So the key parameters need to be considered here are speed, torque and efficiency. In this type of motor, the speed reduction is due to the gear mechanism which results in increased torque. Therefore the speed reduction or increase is determined by the gear ratio of the motor and efficiency of the gear box.



Fig. 5. DC gear motor.

4 Methodology

Conventionally we need to pedal bicycle for it to move. Later on it is driven by a motor which is powered by the petrol like fuels. The need of fuel and price of fuel is increasing day by day.

In order to conserve the non-renewable resources, we need to find an easy and cheap alternative way for transportation. In this project the motor coupled with the gear is powered by solar energy. The solar irradiance will be absorbed by the panel and charges the battery. Charging of battery is done through the charge controller for steady output power from the panel. Then the charged battery is used to drive the motor. Acceleration of motor is controlled by the throttle. Hope this project will contribute better to the society and also for the better future.

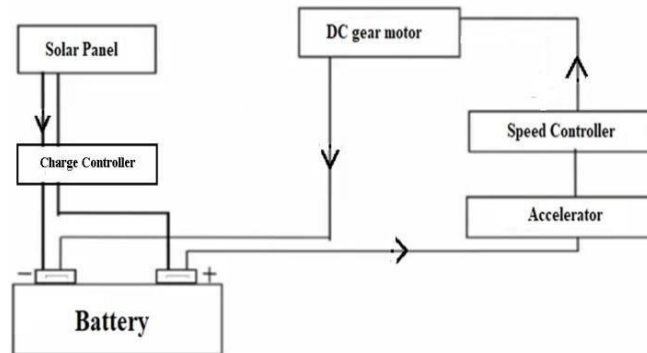


Fig. 6. Block diagram of Solar powered E-cycle.



Fig. 7. Prototype of solar powered e cycle.

5 Environmental impact

Global warming is one of the major problems the world has been facing due to pollution and other factors that lead to the increase of carbon dioxide in the atmosphere. Harvesting of solar energy will be one of the major solutions for this problem that we are facing today. Using solar energy will lead to the reduction of the green houses gases which is emitted by the use of fuel from vehicles. So the electric vehicles will be the eco-friendly transport solution for the future.

6 Conclusion

In this paper we designed and constructed a cheaper solar powered e-cycle. The given results and design for a solar- powered vehicle make its use in underdeveloped nations practical and practicable. For the Indian market, a solar- powered electric car with a DC gear motor is a

promising option. Hence electric vehicle have the potential to reduce the CO₂ emission and climatic changes in the environment. It'll lead us to the cleanest and pollution free future.

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