

DESIGN AND FABRICATION OF SOLAR ASSISTED BICYCLE

Prajwal D. Dhore, Anmol K. Mule , Amol A. Shrawankar
Pratik S. Vaitage, Pranay S. Sahare , Ankush R. Anjekar
Department of Electrical Engineering
Priyadarshani J. L. College of Engineering
Nagpur, Maharashtra, India – 440009

Abstract -

There are many types of bicycle in the world such as normal bicycle that people need to paddle for it to move, motorized bicycle that uses fuel as its prime power and electric bicycle that can only be sufficient for an hour. Because of some weaknesses in the existence system, the idea of a solar bicycle came in mind. As we all know the fuel prices especially the petrol is rising steadily day by day. Again the pollution due to vehicles in metro cities & urban areas is increasing continuously. The idea is to make the bicycle last longer and can be automatically recharge when the bicycle is not in use by the renewable solar energy. The concept of the solar energy is that high torque motor will be put on the bicycle which will be generated by the solar energy. Keeping this in mind, a search for some way to cater these economically poor people as well as to provide a solution for environmental pollution was in progress. The solar assisted bicycle developed is driven by DC motor fitted in front or rear axle housing & operated by solar energy. When the bicycle is idle, the solar panel will charge the battery.

Keywords : Solar Assisted Bicycle, DC Geared Motor, Solar Panel, Microcontroller, Throttle, Lead Acid Battery

I. INTRODUCTION

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. People have been looking for many solutions to help decrease this problem and to avoid causing more damage to the earth. A huge factor that has been playing a large role in causing pollution and therefore increasing the effect of global warming is car exhaust as recorded in 2004 (IPCC 2007, p 29). People have been looking for alternatives to this problem which lead them to 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 bikes have been increasing in popularity. Many people are using it as their main form of transport as it is very convenient and does not contribute to global warming. Specifically, in countries where one of their main source of transport is bikes, China for instance have been selling 9 out of every 10 electrical bikes are sold (Navigant Research, 2014). Compared to other electrically dependent vehicles, the solar powered bike is considered low in cost and is very efficient as it relies on solar power. Solar energy is a very reliable energy source as it is available in every location in the world and is very dependent unlike other natural resources. Solar energy charges the bicycles motor which allows you to transport to your desired location without having to pedal, people always have the option to pedal the bike as well which makes it very reliable incase the battery is not charged. Solar Powered Bike is an

alternative to many non-environment friendly form of transportation and its design is

approached from the electrical bike. We will be mainly focusing on how to efficiently create a solar powered bike which allows you to travel the longest distance possible by properly utilizing energy generated from the sun. As well as improving and creating new technology designs for our bike. We will be also testing and implementing sun trackers on our bike to allow 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.

II. METHODOLOGY

The solar assisted bicycle consist of following components - DC geared motor, solar panel, throttle, lead acid battery, microcontroller, ordinary bicycle.

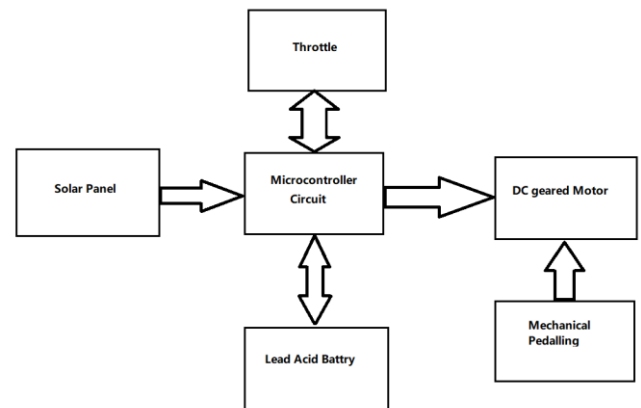


Fig1. Block Diagram of Solar Assisted Bicycle

1. DC Geared Motor

A gear motor is a combinational of motor and gearbox. The additional of gearhead to a motor reduces the speed while increasing the torque output. Using the correct combination of gear motor. its speed can be reduces to any desirable speed. This concept where gears reduce the speed of vechile but increases its torque is known as gear reduction. In our project we installed 350 watt, 24v DC geared motor. Following shows the front and side and view of dc motor.



Fig1. DC geared Motor

Table 1 : Specification of Geared Motor

Type of Motor	DC Geared Motor
Power Rating	350W
Torque Constant	62 kgcm
Speed (rpm)	300
Rated Voltage (V)	24
Noise (dB)	noiseless
Weight(kg)	2.97

2.Solar Panel

Solar Panels is of 25 watt/12 volt.As the name say's solar energy begins with the sun.It is also known as photovoltaic (PV) panels which convert the light particles (i.e. photons) in the Electrical Energy which can be used to operate Electrical equipments / loads. Solar panels are comprised of several individual solar cells which are themselves made by using layers of silicon, boron (provides +ve charge), phosphorous (negative charge). These PV panels absorbs the energy packets the light and in doing so initiate an electric current. The resultant energy generated from photons striking the surface of solar panels allows electrons to be knocked out of their atomic orbits and released into electric field generated by solar cells which will attract these free electrons into a Directional current. An e This phenomenon is called Photovoltaic effect, and is used in Solar Panels.



Fig2. Solar Panel

3.Microcontroller

The microcontroller is an important component of the system. It is essential to control the amount of power supplied and to drive the DC geared motor. The controller converts the DC voltage from battery to a PWM (pulse width modulation) signals with variable amplitude and frequency that drive the motor at different speeds. It basically consists of MOSFET transistors and small microprocessor that vary from detecting any malfunctions with the throttle, to protect functions against

excessive current and under-voltage, which are ideal for protecting the system.

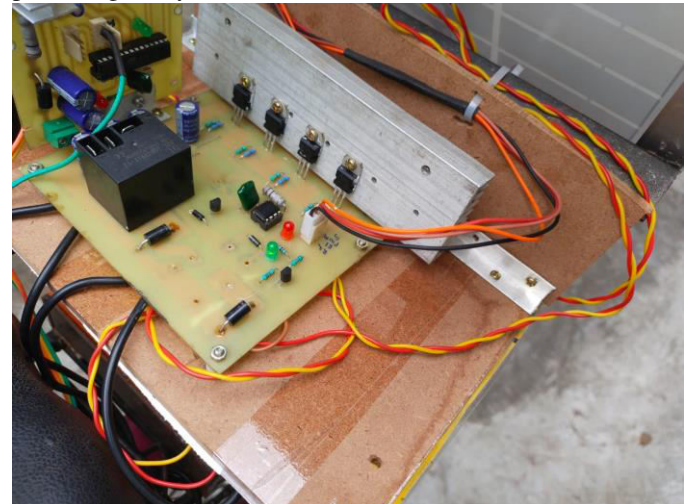


Fig3. Microcontroller Circuit

4.Throttle

The throttle mode is similar to how a motorcycle or scooter operates. When the throttle is engaged the motor provides power and propels you and the bike forward.A throttle allows you to pedal or just kick back and enjoy a “free” ride! Most throttles can be fine tuned like a volume dial between low and full power. The throttle has three wires contains a black, red, and green. The supply voltage is via red and black wires and is usually around 4 volts. Green wire voltage increases as the throttle is turned.



Fig4. Throttle

5.Lead Acid Battery

The battery which uses sponge lead and lead peroxide for the conversion of the chemical energy into electrical power, such type of battery is called a lead acid battery. The lead acid battery is most commonly used in the power stations and substations because it has higher cell voltage and lower cost.

This project revolves around supplying and utilizing energy within a high voltage battery. It demands for a battery with longer running hours, lighter weight with respect to its high output voltage and higher energy density. Among all the existing rechargeable battery systems, the lead acid cell technology is the most efficient and practical choice for the desired application,as it is readily available in market with cheaper cost. The battery chosen for this project was a high capacity lead acid battery pack designed specifically for vehicles. Plastic casing is provided to house the internal components of the battery.

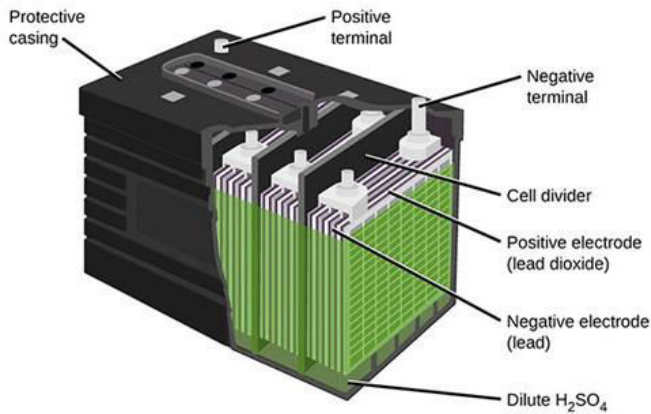


Fig5. Battery

expected outcome and to run the bicycle in the most efficient way.



Fig6. Solar Assisted Bicycle

III. RESULT AND DISCUSSION

Parameter	Solar Assisted Bicycle	Ordinary Bicycle
Max. Speed Limit (km/h)	17-22	10 – 15
Drivers pedalling required	No	Yes
Weight	38 Kg	15 Kg
Charging Time	5-6 hrs for 80W solar panel And 12-13 hrs for 25W panel	Not applicable
Type of energy used	Solar	Muscle Power
Driving noise (dB)	Noiseless	Noiseless

IV. CONCLUSION

People are always looking for new and better ways to transport, with the increased popularity of e-bikes we can find an even better vehicle which is the solar powered bicycle. People are becoming more aware of the negative impact the exhaust of vehicles are having on our environment and are looking for better ways of transportation while avoiding that. Our main goal is to create an electric bicycle that depends on solar power energy to run without having the need for people to pedal and to allow it to run for the longest distance possible. The system main features we will be focusing on are, the ability to charge the battery used to run the bicycle continuously, to be able to control the movement of the bicycle and to utilize the maximum amount of solar energy during the day by sun tracking device. Our system will be using the proper hardware components needed to achieve the

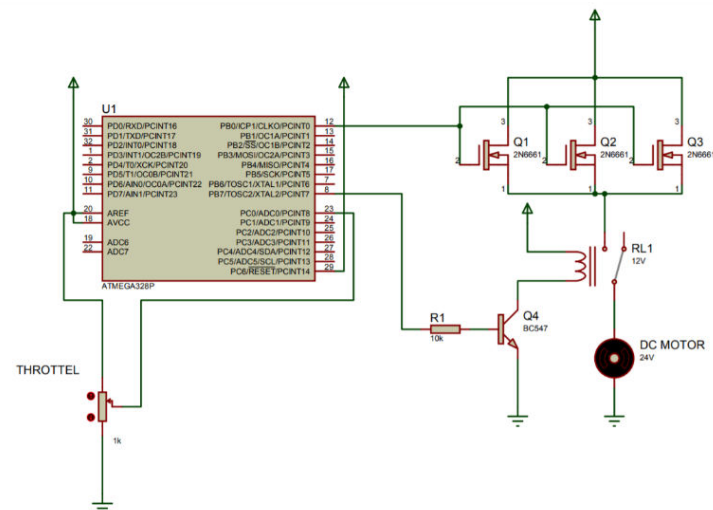


Fig7. Simulation Circuit of Solar Assisted Bicycle

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