Design & Installation of Solar System in electric Bike

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***Abstract*: The renewable energy is used in upcoming years as well as in future to full fill the energy requirements. The solar powered electric bike will be demand of near future. As by using solar powered bike, it will save non-renewable sources. The basic principle of this solar powered electric bike is to store energy in battery and used it after charging. Nearby all electric bikes uses AC powered to charge. First AC power is converted into DC power through inverter and it includes power losses. Although charging time of batteries also increases which make E-Bike not effective and common for everyone use. Thus solar bike can become a very vital alternative to the fueled automobile thus its manufacturing is essential.**

Keywords: Solar electric bike, energy conversion, IV-characteristics, circuit implementation.

1.INTRODUCTION

Today we are generating electricity from fossil fuels, they are nor environmental friendly. It is causing global warming, therefore we need Non-conventional sources of energy. To reduce use of energy from fossil fuels in transportation usage and make environment clean and green, we have designed electric bike that uses solar energy to run. The electric bike designed is a single seater and can be used for short distance. As these electric bikes are future of automobile industry. We need to concentrate on improving their design and making them cost effective. This vehicle is an initiative in this direction.

2.METHODOLOGY

Solar PanelSystem: -. A photovoltaic module or photovoltaic panel is a packaged interconnected assembly of photovoltaic cells, also known as solar cells. The photovoltaic module, known more commonly as the solar panel, is then used as a component in a larger photovoltaic system to offer electricity for commercial and residential applications .

The primary difficulty with solar power and indeed with its cousin wind power has been one of efficiency. There is more than enough energy hitting the earth in the form of solar radiation to meet power needs of our species. Estimates indicate that there is four times as much wind energy available for our use as the species uses every year. Solar power is even more dramatic, the sun showers the planet with more energy every day than we use in a year. So the difficulty has never been the availability of sun and wind, they are readily available.

Solar battery chargers are an inexpensive, environmentally friendly, and convenient way to make sure your batteries are always fully charged and ready to go all the time. The problem with charging a battery from a solar panel is the SUN. It does not shine all the time and clouds get in the way. Our eyes adjust to the variations in the strength of the sun but a solar panel behaves differently. As soon as the sun loses its intensity, the output from a solar panel drops enormously. Not only does the output current fall, but the output voltage also decreases. Many of the solar panels drop to below the 13.6v needed to charge a 12v battery and as soon as this occurs, the charging current drops to ZERO. This means they become useless as soon as the brightness of the sun goes away

Boost Converter:-A boost converter (step-up converter) is a DC-to-DC power converter that steps up voltage (while stepping down current) from its input (supply) to its output (load). It is a class of switched-mode power supply (SMPS) containing at least two semiconductors (a diode and a transistor) and at least one energy storage element: a capacitor, inductor, or the two in combination. To reduce voltage ripple, filters made of capacitors (sometimes in combination with inductors) are normally added to such a converter's output (load-side filter) and input (supply-side filter).

Charge Controler:-A motor controller is an important element of the solar hybrid bicycle or can be called as the brain of the vehicle. It controls the amount of power supplied to the hub motor and also to the lights and horn if required. The motor controller performs the function of conversion of the DC voltage from battery to an alternating voltage with variable amplitude and frequency that drive the hub motor at different speeds. It basically consists of MOSFET transistors and small microprocessor that vary from detecting any malfunctions with the motor hall sensors, the throttle, to protect functions against excessive current and under-voltage.

Energy Storage:-To make the system more effective when there is no sunlight availability; storage technologies have been introduced to used the stored energy from battery. Different system requires different types of storage technologies, for a standalone photovoltaic systems, lead acid battery is the first choice storage method. For a photovoltaic system, a deep discharge battery is required for photovoltaicapplication.

Global Issues:-Most of the power sources nowadays are emitting carbon dioxide. Whichcauses damage to the ozone sphere & therefore causing global warming. Global warming is the top highlighted issue,& this is one of the most effective method to sprade awareness about green technology & this will provide a platform which will reduce the green houseeffect on the earth introducing the solar educational kit as the basic step to expose about the concept of environment protection.

Educational Purpose:-

- Basic circuit measurement is the most important step to start as an engineering student.
- Most of the students wasinstill with dozens of theoretical knowledge& there is no basic practicalknowledge.
- Hence, this educational training kit to educate the student or it can be used as introductory subject to the students about measuring the current & voltage on the basic circuit using millimeter.
- This kit can also be used in the secondary school or even primary school,theschool level students can learn about the basic name of each component & the idea can be exposed to the student in the earlystage.

Then university level students can enhance learning process towards the characteristics of each components used in the educational training kit.

3. COMPONENTS

- Solarpanel
- Battery
- Boost converter
- Chargecontroller
- BLDC Motor
- Connecting cables

4.BLOCK DIAGRAM

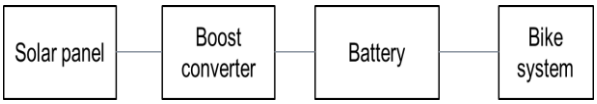

Fig.1: Block Diagram Of Solar E Bike

5. CIRCUITIMPLEMENTATION

Fig.2: Circuit implementation

6.WORKINGPRINCIPLE

The sunlight fall on solar panel it convert the sunlight rays into electricity energy. Then the electrical power will flow to the boost converter then this converted energy will be transfer tocharge controller to regulate the electrica energy generation before storing the electrical into battery as source. The charge controller function is toregulate&avoidtheovercharging whenthebatteryi

fullycharged.then the battery stores the energy .

The stored energy will use by throttle throw BLDC motor.

7. IV-CHARACTERISTICS

Important parameters:

There are two curves of PV modules, that is IV curves &pvcurve.In this graph red colouris IV curve & blue colouris PVcurve.

To check the solar panel efficiency the following parameters must be introduced

- **Voc:** This is the open circuit voltage which is the voltage provided by the solar panel when it is not connected to any load (open circuit condition). This value depends on the number of PV panels connected inseries.
- **Isc:** This is the maximum current produced when the output ends are shorted together (short circuit condition).
- **Imp:** This is the maximum current provided by the panel under operating conditions (when a load isconnected).
- **Vmp:** The maximum voltage under operating conditions.
- **Maximum power point (MPP):** This is the point where the power supplied to the connected load is at maximum (MPP =Imp*Vmp)
- **Percent efficiency:** The ratio between the maximum power the panel generates and the amount of solar irradiance incident onit.

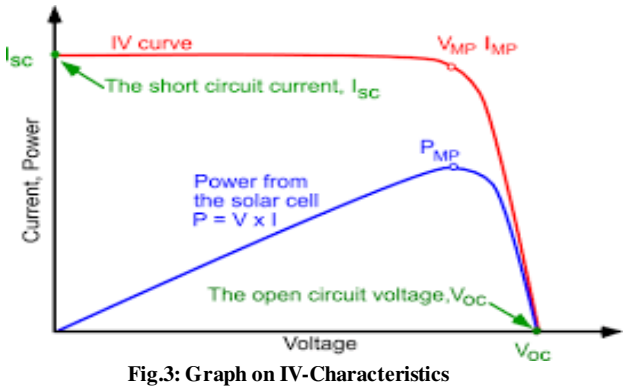

Fig.3: Graph on IV-Characteristics

8. CALCULATION

Size of the solar panel: - We know that to calculate the size of solar panel, we consider 30% more than the Load demand i.e multiply Load with 1.3

Total PV energy required = (750×1.3) = **975 Wh/day.**

Consider peak sun hours = 4 hours per day

Therefor PV panel capacity = (975/4) = 243.75 = **250 W**

so the number of PV panel required = 250/50 = 5 panels.

As we cannot place 5 panels of 50 w or single panel of 250 w because of the weightage And looks of the system, we are using a Singlepanel of 50 watt power.

We will convert its voltage from 12V to 48V by using boost converter (1500W)

Battery requirement for a motor (48V, 750 W):-

Step 01:- Calculate the current (in amps) Consumed by the motor to run.

P = V × I

750 = 48 × I

I = (750 / 48) = 15.625 amps.

Step 02:- Find out the watt hour of the battery.

To run 750 W motor for 1 hour,

Simply multiply (750 W × 1 Hour) = 750 Watt hour.

Consider efficiency Of 80%

So, (750 / 0.8) = 937.5 Watt hour

Step 03:- Convert Watt hour of battery into Ampere hour of the battery. We know that,

Power = Voltage × current

Also, Watt hour = Voltage × ampere per hour

So,

937.5 = 48 V × ampere hour

Ampere hour = (937.5 / 48) = 19.532 = **20 Ah.**

Therefore to run the 750 W motor for 1 hour, **48V 20 Ah** Lithium ion battery is required.

If the electric bike is running at an average speed of 35Km/hr., 48V 20Ah Battery provides the mileage of 35 kms.So if you want **35 kms** mileage, 48V 20Ah battery is needed.

For **70 kms** mileage, 48V 40Ah battery is needed.

And **105 kms** mileage, 48 V 80Ah battery is needed.

9. CONCLUSION

People are always looking for new and better ways to ride bike, with the increased popularity of e-bikes we can find an even better vehicle which is the solar powered bike. 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 bike that depends on solar power energy to run without having the need for people any fuel 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 bike continuously, to be able to control the movement of the bike 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 expected outcome and to run the bike in the most efficient

10.RESULT

Readers may recall the launch of my solar vehicle experiments in the last issue. At the time – having made a number of purely theoretical calculations – I concluded that a 50 watt solar panel might just be viable on an electric bike. In the event, for reasons of panel size and cost, it was necessary to settle on a single panel, reducing the potential gains, but keeping the apparatus down to a manageable size. Why one panel? It's simply that most solar panels provide a 12 volt output, but the we are using 24 v is, like many other electric bike.
Fitting solar panels to the bike brings a number of advantages: greater range, a less traumatic life for the battery, plus greater efficiency, because of the direct motor supply. Batteries are around 90% efficient when charging and much the same when discharging. That's pretty good as these things go, but a direct supply will still give a bonus.
Static panels are remote from the vehicle, so range is unimproved. On the positive side, the panels can be positioned to capture most of the available solar radiation from dawn to dusk and they'll charge all day, every day, and even in the rain, when the bicycle might be under cover. A spare battery is not obligatory with this system, but it does mean charging can be undertaken continuously – more effective if the bike is away for most of the day

11. FUTURESCOPE

The global solar vehicle market is projected to grow at a CAGR of 36.4% during the forecast period to reach 107,380 units by 2030 from projected 8,955 units by 2022. Solar vehicle is an electric vehicle integrated with solar panels. Generally, solar panels consist of photovoltaic cells which help to convert solar energy into electric energy. The propulsion of these vehicles is usually offered through solar energy, and the efficiency of solar modules defines the propulsive force of the vehicle

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