



CONVERSION OF TRADITIONAL BICYCLE TO ELECTRIC BICYCLE

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Abstract: This project deals with design and fabrication of a low-cost portable electric bicycle kit, which can be mounted on an existing bicycle. It has two modes of drive, one is by pedaling and the other one is by using an electric motor.

However, all retain the ability to be pedaled by the rider. A major disadvantage of a conventional bicycle is that it increases rider fatigue on long distance travel. Thereby, implementing an external drive electric motor which can be switched between pedaling and electric drive and this will help to increase the range of travel, better riding experience and reduce rider fatigue 20-40km on a single charge. A bicycle can travel at a speed of km/hr. This basic principle of a solar-based electric vehicle is to use energy that is stored in a battery to drive the motor and it moves the vehicle in a forward or reverse direction. A PV panel is then boosted up to using a boost DC-DC converter and then an inverter. A system is used for improving the interactivity among electric-vehicle charging point and battery storage system. This idea helps in the future to protect our fuels from getting extinguished. All present electric vehicles drive on AC power.

Keywords: Solar energy, Bicycle.

• INTRODUCTION

An electric bicycle is a type of electric vehicle based on a traditional bicycle to which an electric motor has been added to help propel it. It is an ecological and urban means of transport and its source of energy is a battery. In the 20th century, electric bicycles began to play a more important role because they were an economic and simple option for urban transport problems and had environmental advantages especially in highly populated countries like China. To highlight this fact, it is enough to indicate that over 31 million e-bikes were sold in 2012. The main advantages of an electric bicycle are both economic and environmental. Among the economic advantages we can find the total cost per kilometer travelled by an electric bicycle

(including the energy, purchasing and maintenance), is less than 0.7 cents, compared to \$0.031/km for a gasoline scooter , or \$0.62/km travelled by car. The batteries of the electric bicycles can be recharged by connecting them to a plug or when pedaling in some gears. In addition, a typical electric bicycle needs 6–8 h to charge the battery and has a range of travel of 35 to 50 km at a speed of about 20 km/h (depending on rider weight) . This means that, with a single battery charge, it would be enough to go to work, visit friends, and return home on a normal day, since statistics show that about half of the trips and procedures of a normal urban person are carried out within a distance of 15 km from his/her house, therefore within the reach of these bicycles .

- **LITERATURE SURVEY**

A. JENNIFER DILL, GEOFFERY ROSE (2012) [3]

clarified that Electric bicycles are progressively regular in China however are moderately uncommon in the United States. The meetings uncovered a few conceivable statistic markets for e-bicycles that could extend the bicycling populace: ladies, more established grown-ups, and individuals with physical impediments.

B. ELLIOTFISHMAN, CHRISTOPHER CHERRY (2016)

Talked about that E-bicycles speak to one of the quickest developing sections of the vehicle showcase. More than 31 million e-bicycles were sold in 2012. Research has pursued this development and gives a combination of the most relevant subjects rising over the past on the expanding point of e-bicycles. The center is transport as opposed to recreational e-bicycle look into, just as the most basic research holes requiring consideration.

- **PROBLEM STATEMENT**

Use of external BLDC motor - affects the designing and makes the system complicated. BLDC motors can be brutal on the drive system. It also causes jerky or awkward motor timing during hill climbing and around obstacles.

Solar energy is not stable with weather changes- along with the weather changing, the electricity always varies with the light intensity. The clouds, seasons, day and night and extreme weather can affect the power from solar cells.

The maximum speed of bicycle when external BLDC motor used is only about 30-35km/hr. BLDC motor is connected externally through chain arrangements; losses occur due to friction. They cannot be used in regenerative situations and hence reduces the speed.

- METHODOLOGY

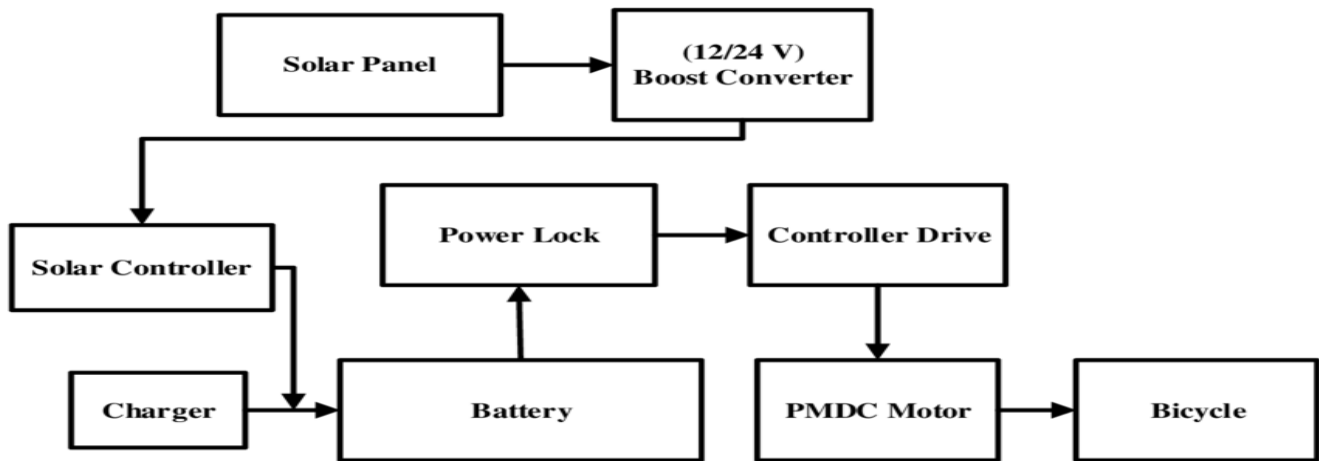


Fig 1: Block Diagram

A solar charge controller is provided in the cycle because the voltage acquired from the sun is not constant and varies drastically. When this constant voltage is applied to the battery which causes harm and leads to overheating the battery. So, in order to control this voltage from the solar panel we place a voltage regulator in the circuit between the battery input port and solar panel output port. This circuit protects the battery not to operate under overheating means it works within the safe value required for its charging. The solar panel captures the solar energy from the sun.

This solar panel is connected to a boost converter circuit. This converter boost-up the voltage to 24V which is necessary to operate the motor circuit. From this circuit, it is further connected to a Lithium-ion battery. This Li-ion battery is the finest and safest battery due to the absence of the acid which eliminates the sparks when the cycle may undergo jerks. Li-ion batteries are rechargeable batteries. Two Li-ion batteries of 12V are connected in series. So the sum of these voltages is 24V. This voltage has to maintain a the motor voltage to operate. These two Li-ion batteries are charged with the help of this solar energy which is DC supply.

- Components:**

1.solar panel:A solar cell (also known as a photovoltaic cell or PV cell) is defined as an electrical device that converts light energy electrical energy through the photovoltaic effect.



Fig 2: solar panel

2.battery

, we used two batteries with the voltage of 12V and current of 7.5A each, producing a fully charged output voltage of 24volts, 15Amps. A battery cell consists of two lead plates a positiveplate covered with a paste of lead dioxide and a negative made of sponge lead, with an insulating material(separator) in between.

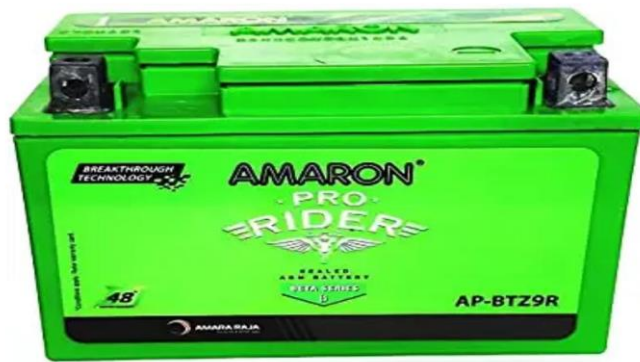


Fig 4: battery

3. permanent magnet DC motor (PMDC): PMDC motor, stator field is generated by permanent magnet and hence the field remains constant. Due to constant stator field, linear torque/speed characteristics can be obtained. PMDC motor provides high torques; it is widely used in the application where accurate position control is required. In this project the motor need starting torque as to be high that's why this project use permanent magnet DC motor of following rating



Fig 5: PMDC

- **Result and discussion**



- We can conclude that the most critical load cases are the first. In the first, the component that is subjected to bigger stress and most probable to fail is the rear part of the frame and mostly the connection between the bottom bracket and the chain stay. Concerning the third load case, the component subjected to higher stresses is the handlebar assembly, presenting high stress concentrations around the hinge that folds the handlebar and its connections. Taking in consideration the obtained results it's possible to conclude that the model prototype is suitable to be used with safety.

Advantages

- Its less hard on knees and joints than riding a traditional bicycle.
- It won't get hot riding up hills, won't struggle riding in the wind.
- We can ride on sidewalks, through parks and in bike lanes.
- doesn't require a driver's license to ride in most cases.
- Its more upright seating position than traditional bikes can reduce back and neck pain and also

Disadvantages

- 1.It is heavier than the traditional bicycles.
- 2.It is more expensive than most mid-grade traditional bicycles.

Applications

- 1.Electrical bicycle can be use to travel within certain limit with low cost and maintenance.
- 2.Which can be use as gym and exercise equipment.

CONCLUSION

Electrical bicycle is a modification of the existing cycle by using electric energy and also solar energy if solar panels are provided, that sum up to increase in energy production.

The range of the bicycle ride was successfully increased with the help of the E-bike kit by using a brushed DC motor to drive the bicycle when needed and powered by a lead acid battery. The whole unit was controlled by a control unit. The estimated range of an E-bike is 18Km, with the speed of 25-30 km ph and the torque obtained on the wheels is 14 N-m. As it is having two modes of drive electric and manual pedaling it will significantly improve rider's health than motorbikes and reduces rider fatigue than traditional bicycle. E-bikes are claimed to have a significantly lower environmental impact than conventional automobiles and generally seen as eco-friendly.

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