

# Design and Implementation of Electric Bike

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**Abstract**— The primary objective of the project is to design a feasible yet highly adaptable E-bike. The aim of this project is to implement an electric bike as a cheaper alternative to a conventional combustion engine bike. The Electric bike is a bike which is driven with the help of battery which is coupled to electric motor.

**Index Terms**—Electric Vehicle, Battery driven, controller.

## I. INTRODUCTION

In the modern world of today where the population of people in the earth is in constant growth the demand for energy is drastically increasing. To meet these demands the need for a sustainable & reliable energy source arises, where the current sources are finite, limited & very harmful to the environment.

Taking considerations of recent events of meager resources and facilities at their disposal, over increasing traffic, snags problem of parking and the need to make automobile a more environmental friendly, designers of vehicles are back with a view to hit upon a novel concept that completely alter the conventional design. The Electric bike is a bike which is driven with the help of battery which is coupled to electric motor.

It works on the principle that the electromotive force of an A.C. motor which receives electrical energy stored in D.C. battery is converted with the help of D.C. to A.C. converter. The aim of this project is to implement an electric bike as a cheaper alternative to a conventional combustion engine bike.

## II. LITERATURE REVIEW

- [1] This was first developed in 1890's in US and those were documented within various US patents.
- [2] On 31st Dec, 1895 Ogden Bolton designed a battery powered cycle
- [3] .Couple of years later, Hosea W. Libbey invented electric bike which was propelled by double electric motor.
- [4] Later in 1990's torque sensors and power controls were developed including some modified versions of bike with NiMH, NiCd and/or Li-ion batteries

## III. COMPONENTS

### A. BLDC Motor

A brushless DC motor is an electronically commuted DC motor which does not have brushes. The controller provides pulses of current to the motor windings which control the speed and torque of the synchronous motor. These types of motors are highly efficient in producing a large amount of torque over a vast speed range

### B. 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. We have used 12 V 7 Ah lead acid

Battery for this project we can give our whole system about 30 min of run time.

*C. Controller*

The electric bike controller is one of the main parts of an electric bike, it is the brain of the e-bike, controlling the motor speed, start and stop. It is connected to all the other electronic parts such as the battery, motor, and the throttle(accelerator), display(speedometer).



Fig.1 BLDC motor      Fig.3 Controller



Fig.2 Battery



Fig.4 speedometer

*D. Speedometer*

A speedometer or speed meter is a gauge that measures and displays the instantaneous speed of a vehicle. Now universally fitted to motor vehicles, they started to be available as options in the early 20th century, and as standard equipment from about 1910 onwards

*E. Throttle*

Throttle, Valve for regulating the supply of a fluid (as steam) to an engine, especially the valve controlling the volume of vaporized fuel delivered to the cylinders of an internal-combustion engine. In an automobile engine, gasoline is held in a chamber above the carburetor.

*F. Led lights*

As we have made the prototype the LED are used for the indication purpose for indicating the directions for the bike.

*G. Bike frame*

We selected hero splendor because it's the lightest bike available, which benefits us as the motor will work more easily as the bike is lighter.



Fig.5 Throttle



Fig.6 LED



Fig.7 Frame

III. DESIGN AND DEVELOPMENT

A. Hardware design

We have installed all the components on the bike and the connections are made through the controller, which is the main component of the bike. All the signals are received by the controller and all the signals are given by the controller. The connections are labelled and were easy enough to join to every component.



Fig.12 Hardware Design

B. Application design

We had to weld a plate for battery placement and the battery is placed over the motor and the motor is connected to the wheel through chain & sprocket.

C. Battery connection

The batteries are connected in such a way that we are getting 48v 14a through 8 batteries. We have connected 2 sets of 4 batteries in series and connected those 2 sets in parallel. We had problem in acquiring battery of 48v and 15a, but we came up with the idea and made these connections which gave us results

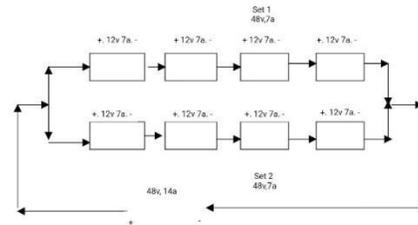


Fig.12 Battery Circuit

IV. CALCULATION

Battery requirement for a motor (48v, 750w)

Step 1:- Find out the current consumed by the motor to run

$$P = V * C$$

$$750 = 48 * \text{Current}$$

$$\text{Current} = 750 / 48 = 15.625 \text{ Amps}$$

Step 2:- Find the watt hour of battery  
To run the 750w motor for 1 hour

Simply multiply (750\*1) = 750 watt hour  
Take efficiency of 80%  
i.e. (750/0.8) = 937.5 watt hour

Step 3:- Convert watt hour of battery into ampere hour of battery

$$\text{Power} = \text{voltage} * \text{current}$$

$$\text{Also, Watt hour} = \text{voltage} * \text{ampere/hour}$$

$$937.5 = 48 * \text{Ampere hour}$$

$$\text{Ampere hour} = (937.5 / 48) = 19.53125 \text{ or } 20 \text{ Ah}$$

Therefore, to run the 750W motor for 1 hour, 48V 20Ah lithium ion battery is needed

If the electric bike is running at an average speed of 35Km/hr, 48v 20Ah provides a mileage of 35. i.e If you want 35Km mileage or range, 48v 20Ah is needed.

Similarly,

For 70 km range you would need a 48v 40Ah battery

For 105 km range you would need a 48v 80Ah battery

#### V. CONCLUSION

There has never been a more exciting time than now to become an electric bike owner. Having established itself as a hugely popular, effective, and important mode of transportation in countries around the world—most notably China and several nations throughout Europe—the electric bike is beginning to take off in the United States as well.

One of the key reasons for the rapid growth in e-bike use is improved technology—as batteries and motors have become more efficient, durable, and lightweight, electric bikes have become increasingly viable vehicles for everyday travel.

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