



# SELF RECHARGEABLE ELECTRIC BICYCLE

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## Abstract

Battery powered electric vehicles are gaining popularity worldwide. This trend is driven by several factors including the need to reduce air and noise pollution, and dependence on fossil fuels. The main drawback of today's electric vehicle is its limited range, and the long duration that is required to charge the electric batteries of the vehicles. In recent years, significant progress (through many R&D) has been made to decrease the charging time of the electric vehicle batteries through pulse charging rather than supplying continuous current and/or voltage. The part to be focused is that the estimation of electrical parameters of the battery in the electrical vehicle, which is the most important factor to get information about available driving range. If the amount of remaining battery capacity can be displayed for the driver then it is possible to make decision on the time of recharging the battery. To study battery behaviour under different conditions, it is necessary to know various battery performance parameters. Future trends in electric vehicle charging are mostly fast charging, contactless charging, and charging from renewable or sustainable energy sources. Furthermore, charging vehicles to grid or charging vehicles to home are the present field of scope for research. When the battery gets fast charging and are overcharged, it will lead to overheating, performance weakening and damage to battery. Likewise, deep discharge is root to permanent damage. The BMS lends a hand to battery life improvement, lessen damage rate, and make the most capacity, efficacy, durability and reliability in battery stacks. This study presents a comprehensive review and evaluation of an on-board charging system that will keep charging the battery as efficiently as possible while minimizing the losses.

**Key Words-** *Electric Bike, BLDC Motor, Charging System for Electric Bike, Alternative fuel*

## 1. INTRODUCTION

In the modern societies, the increasing needs of mobility means sometimes increasing the number of vehicles circulating. Ambient concerns, as for instance local Electric bikes are new and promising form of urban transportation. The electric bicycles can progress both cleaner development and moreover a lesser dependent on oil and gas.

There is no need of fuel or coolant to run the electric bike as compare to other automobiles. The electric bikes provide safe and comfortable transportation at free of cost. Electric bikes are ecofriendly with nature as they do not emit any pollutant gas in the atmosphere pollutant emissions for the atmosphere, influence also, in

nowadays, the technical decisions related with all kind of vehicles. Picking an engine was the initial phase in making a suitable framework for the electric bicycle. Electrical bicycle uses an electric motor, alternator and battery system, in which riders have to pedal the bicycle and the generated electricity in the generator, is stored in storage battery.

The stored energy can be used for riding the bicycle. Electrical bicycle can be used for a variety of purpose. At first, the task was to be driven by DC miniaturized scale engines that were arranged to turn a sprocket. The sprocket is utilized to transmit revolving movement between two shafts. In this context, new alternatives to the existing internal combustion engines are mandatory. So, vehicles with electric propulsion seem to be an interesting alternative. The electric bicycle is an errand that can progress both cleaner development and moreover a lesser dependence on oil. It will continue running on clean electric power with the ability to resuscitate the battery. This is our opportunity to contribute a greener and more profitable planet.

#### 1.1. Objective

- Our objective is to provide an electric bicycle with an onboard self-charging system which will keep charging the battery as the vehicle is operational.
- The second objective is to charge the battery by minimizing the losses that will be produced while the system will be operational.

#### 1.2 SCOPE

Electric bikes or bicycles are electric motor powered bikes used for propulsion purpose. E-bicycle technology has been developed to improve pedalpower of the rider E-bicycle are evolved from traditional bikes which are not much efficient for long distance travelling.

The india e-bicycle maeket was valued at USD 1.02 million in 2020, and it is expected to reach USD 2,08 million by 2026, projecting CAGR OF 12.69% during the forecast period.(2021-2026).

Now days all the vehicle work on fuel but storage of fuel is imitated that means when the storage of fuel is totally finish that time transportation is totally stop. There for today's need is self power generating electrical bike that bike generate owner power and work on self-power without effect on working of operation and this is not having any type of external energy it is free from pollution.

### **2. TECHNOLOGIES USED**

1. Cycle is driven by using 24V DC motor of 250W. 2. The battery is connected to the controller which maintains the current flow. 3. The speed of motor is controlled by the throttle which is connected to the controller. 4. The battery is charged using 24V DC dynamo. 5. Using flywheel for the continuous and fast rotation of dynamo while the bicycle is driven. 6. The shaft of the dynamo is connected to the rear wheel of the cycle using chain drive and freewheel

### **3. COMPONENT DETAIL**



**A.Motor :-**

It is an 24V Dc geared motor  
Which is used to drive the cycle  
Which is controlled by controller  
And its can be accelerated by throtal

**B.Cycle :-**

It is most economical means of transport, it uses muscle energy for it's working.  
Cycling enhances the stamina of cyclists and also helps in strengthening the muscles.  
It doesn't require much space for parking.

**C.Dynamo :-**

- It's use in our project to charge the battery while discharging.
- When cycle is running dynamo generate dc current and charge battery's.
- When Cycle is in running position we will connect dynamo with motor.

**D.Battery :-**

- It's a 24V lead-acid battery.
- It is used to supply electricity to motor to run
- It will be charge with the help of dynamo.

**E.Controller :-**

- It is used to drive and control the motor
- It is analogous to the human brain, processing information and feeding it back to end user.

**Specifications of the controller module:**

Voltage (Rated): 24 Volts  
Rated power for motors : 250Watts  
Maximum current: 13.5 Amps  
Rated current for chargers Up To: 3 Amps  
Efficiency (Conversion) : 95%  
Rated under voltage protection: 20.5 Volts  $\pm$  1.0 Volt Fuse size (recommended) : 40 Amp

**F.Chain:**

A bicycle chain is a roller chain that transfers power from the pedals to the drive-wheel of a bicycle, thus propelling it.

It is the more common type of chain drive which is used for transmission of mechanical power to long lasting & better way of rotatory motion from one gear to another it is derived by a tooth head wheel called a sprocket it is simple, reliable and efficient.



#### 4. MATHEMATICAL EQUATIONS

##### 4.1 Current required for motor

We know that,

$$\text{Power} = \text{Current} * \text{Voltage}$$

$$\text{Current} = \text{power/voltage}$$

##### 4.2 Torque of the motor

We know that,

$$\text{Power} = 2\pi NT / 60$$

$$\text{torque} = (\text{power} * 60) / (2\pi N)$$

##### 4.3 Speed ratio of sprockets

$$\therefore \text{Speed ratio} = \text{Number of teeth on driver} / \text{Number of teeth on driven}$$

##### 4.4 Time required to charge the battery

###### 4.4.1 At zero load condition

$$\text{Charging time of battery} = \text{Total battery ampere hour rating} / \text{Total charging current}$$

###### 4.4.2 At loading conditions

When the battery is connected to the load (running motor) while in charging then the required charging current is the addition of load and the charging current required for the battery.

$$\therefore \text{Total charging current} = \text{load} + \text{charging current} \quad \text{required for battery}$$

$$\therefore \text{Charging time of battery} = \text{Total battery ampere hour rating} / \text{Total charging current.}$$

##### 4.5 Battery discharging time

$$\therefore \text{Discharged time} = \text{Battery ampere hour rating} / \text{Load amp}$$

##### 4.6 Cost of battery charging

$$\therefore \text{Cost of electricity} = \text{capacity} \times \text{price per kwh} / 1000$$

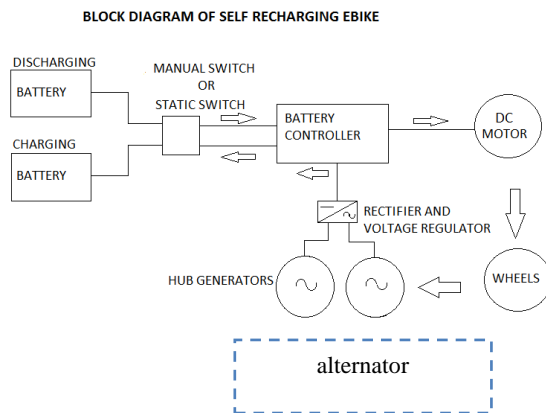
##### 4.7 Power required for motor at various weight

$$\therefore \text{Power} = 2 \times \pi \times N \times T / 6 \text{BILL OF MATERIALS}$$

- Cycle = 1300
- 24v DC Motor = 3000
- Controller 250 watt = 1000
- Throttle = 350
- Reverse threaded freewheel = 300
- 24v DC dynamo = 2000
- Batteries = 6000

**Total = 13,950**

## CONSTRUCTION



The figure shows that block diagram of self-rechargeable bicycle, the main components of bicycle are motor, batteries, battery controller, and voltage regulator. The working of self-rechargeable bicycle is similar to conventional E-Bike. Two or more batteries can be included in the battery bank. One can supply the motor for propulsion, one will be charged while bicycle is running. The generator generates electric power while bicycle is running. The battery controller is used to charge and discharge the battery safely, and regulate the speed of motor.

## ADVANTAGES

The advantage of our proposed system over the current system that is being used for charging of Pure Electric automobiles are

1. The Regenerative Braking is the only thing that is being used for charging the system while the automobile is operational. As the name suggests, the system is operational only when the automobile is slowing down or braking. Our system will be operating as long as the motor shaft is rotating regardless the vehicle is moving forward or in reverse.
2. Since, the Regenerative Braking is going to be operational only for a small duration the charge produced will be less. On the other hand, our system will be operational till 70% - 80% Throttle which means the duration of operating of our system will be more and hence, the charge produced will be more.
3. Since, the regenerative braking has low initial investment and low maintenance cost. It gives better short term benefit, but our system can provide a better long term benefit as the charge produced is much higher than the regenerative

## DISADVANTAGES

1. The motor gets heated after so it cannot run for too long hours.
2. The motor cannot carry more than 2 people as there is load limit.
3. Electric bikes do not have too much speed like petrol engines

## CONCLUSION

1. Electric bikes are vital part of our future as it makes transportation affordable, quick, easy and convenient.



2. One of the key reason for the increase in electric bike is that batteries and motors have become high efficient, durable and light weight.
3. No need to charge the battery externally as there is dynamo inbuilt through which battery is charged.
4. If you want to charge battery externally you can charge using an adopter or eliminator and you can also add solar panel if you are able to bare the expenses.
5. With an electric bike you don't need to worry about paying for any sort of special license or registration.
6. Electric bikes are one of the cheapest way of traveling.
7. Electric bike riders can tailor the difficulty level of their rides to meet their unique health and fitness needs.
8. You can go peddling incase the battery is totally discharged.
9. The discharged battery gets recharged as you keep peddling or riding the bike.

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