

# DESIGN OF ELECTRIC BIKE

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**Abstract:** In today's time where the whole world is struggling with global warming and to get rid of it, it is talking about carbon neutrality. Electric bike can prove to be a milestone in this endeavor. An electric bike is also necessary because as we know that fossil fuel sources are limited and they are depleting continuously.

Keeping all these things into consideration there is a need to find a solution for conventional fuel-powered vehicles also the people's vigorous awareness of environmental problems also leads to research towards the alternate solution for the automotive vehicle. The uses of renewable energy in the place of conventional fuel are the best solution to overcome this problem. An electric bike can be considered a good alternative for traveling within small and medium distances.

It is very important that time taking for travelling should be less, also it should be economical and easily available. With the fast depleting resources of petrol and diesel, there is need to find intermittent choice. Taking all this into account, a shift away from conventional based fuels to using a renewable sources of energy is a must. Electric bike which will be driven with the help of battery and thus provide required voltage to the motor.

## INTRODUCTION

An electric bike is normally powered by a rechargeable battery and their practical performance is influenced by motor power, battery capacity, road type, operation weight, control, etc. In A vehicle propelled by an electric motor, rather than a traditional petrol or diesel engine is called as electric vehicle. The electric motor is powered by rechargeable batteries that can be charged using household mains electricity via an electric vehicle charge point at home or at a more powerful electric vehicle charge station at work or in the street. Global warming is a major concern all around and to save Mother Earth, there are several policies, promises and pledges. With the ever increasing emission of greenhouse gases, there is an increased fear of environment pollution at every step. With modern technology and innovation, transportation and communication have undergone a paradigm shift. Along with this, we are also experiencing the negative effects of industrialization in the form of global warming. Under these circumstances, when there are traffic jams, when you need to run an errand at an odd hour of the day, when you need to go to workplace quickly, you stumble and fumble as there are so many vehicles emitting soot and CO<sub>2</sub> polluting the air incessantly. With increased number of fossil-fuel dependent vehicles, they not only add to greater level of pollution but are also leading to depletion of fuel resource. It is here that automobile companies felt the need to innovate motorized vehicle that will get charged through electricity and will not be depending on fossil fuels.

This led to expansion of eco-friendly initiatives and many automobile manufacturing companies invested in research and development to bring for the Electric bikes that will help people save a few bucks by reducing consumption of already spiraling fuel price, besides fighting global warming.

## BLDC MOTOR

A brushless DC electric motor (BLDC motor or BL motor), also known as an electronically commutated motor (ECM or EC motor) or synchronous DC motor, is a synchronous motor using a direct current (DC) electric power supply. It uses an electronic closed loop controller to switch DC currents to the motor windings producing magnetic fields which effectively rotate in space and which the permanent magnet rotor follows. The controller adjusts the phase and amplitude of the DC current pulses to control the speed and torque of the motor. This control system is an alternative to the mechanical commutator (brushes) used in many conventional electric motors.

The construction of a brushless motor system is typically similar to a permanent magnet synchronous motor (PMSM), but can also be a switched reluctance motor, or an induction (asynchronous) motor. They may also use neodymium magnets and be out runners (the stator is surrounded by the rotor), in runners (the rotor is surrounded by the stator), or axial (the rotor and stator are flat and parallel plate. The advantages of a brushless motor over brushed motors are high power-to-weight ratio, high speed, nearly instantaneous control of speed (rpm) and torque, high efficiency, and low maintenance.

### **LITHIUM ION BATTERY**

Lithium-ion battery or Li-ion battery is a type of rechargeable battery in which lithium ions move from the negative electrode through an electrolyte to the positive electrode during discharge and back when charging. Li-ion batteries use an intercalated lithium compound as the material at the positive electrode and typically graphite at the negative electrode.

Li-ion batteries have a high energy density, no memory effect (other than LFP cells) and low self-discharge. Cells can be manufactured to either prioritize energy or power density. They can however be a safety hazard since they contain flammable electrolytes and if damaged or incorrectly charged can lead to explosions and fires.

### **ELECTRONIC SPEED CONTROLLER**

An electronic speed control (ESC) is an electronic circuit that controls and regulates the speed of an electric motor. It may also provide reversing of the motor and dynamic braking. Miniature electronic speed controls are used in electrically powered radio controlled models. Full-size electric vehicles also have systems to control the speed of their drive motors. An electronic speed control follows a speed reference signal (derived from a throttle lever, joystick, or other manual input) and varies the switching rate of a network of field effect transistors (FETs). By adjusting the duty cycle or switching frequency of the transistors, the speed of the motor is changed. The rapid switching of the current flowing through the motor is what causes the motor itself to emit its characteristic high-pitched whine, especially noticeable at lower speeds.

### **ELECTRONIC THROTTLE CONTROLLER**

Electronic throttle control (ETC) is an automobile technology which electronically "connects" the accelerator pedal to the throttle, replacing a mechanical linkage. A typical ETC system consists of three major components: (i) an accelerator pedal module (ideally with two or more independent sensors), (ii) a throttle valve that can be opened and closed by an electric motor (sometimes referred to as an electric or electronic throttle body (ETB)), and (iii) a powertrain or engine control module (PCM or ECM). The ECM is a type of electronic control unit (ECU), which is an embedded system that employs software to determine the required throttle position by calculations from data measured by other sensors, including the accelerator pedal position sensors, engine speed sensor, vehicle speed sensor, and cruise control switches. The electric motor is then used to open the throttle valve to the desired angle via a closed-loop control algorithm within the ECM.

### **BATTERY CHARGER**

A battery charger, or recharger, is a device that stores energy in a battery by running an electric current through it. The charging protocol (how much voltage or current for how long, and what to do when charging is complete) depends on the size and type of the battery being charged. Some battery types have high tolerance for overcharging (i.e., continued charging after the battery has been fully charged) and can be recharged by connection to a constant voltage source or a constant current source, depending on battery type. Simple chargers of this type must be manually disconnected at the end of the charge cycle. Other battery types use a timer to cut off when charging should be complete. Other battery types cannot withstand over-charging, becoming damaged (reduced capacity, reduced lifetime), over heating or even exploding. The charger may have temperature or voltage sensing circuits and a microprocessor controller to safely adjust the charging current and voltage, determine the state of charge, and cut off at the end of charger.

### **BIKE BRAKE**

A bike brake reduces the speed of a bicycle or prevents it from moving. The three main types are: rim brakes, disc brakes, and drum brakes. Most bicycle brake systems consist of three main components: a mechanism for the rider to apply the brakes, such as brake levers or pedals; a mechanism for transmitting that signal, such as Bowden cables, hydraulic hoses, rods, or the bicycle chain; and the brake mechanism itself, a caliper or drum, to press two or more surfaces together in order to convert, via friction, kinetic energy of the bike and rider into thermal energy to be dissipated.

### **ADVANTAGES**

1. Good efficiency: BLDC motors in e-bikes are above 90% efficient than IC engines which are nearby 40% efficient.
2. Eco-friendly: Electric bikes are eco-friendly if required— power to charge the batteries is derived from nonconventional sources Cheaper:
3. Running cost of e-bike is less as compared to— conventional bikes.
4. Some people may think because the bike is electric and takes less effort to ride that it's not really exercise.
5. Quiet journey: E-bikes are quietest of all— transportation.

**CONCLUSION**

Electric vehicles are the future of our world with the increasing consumption of non renewable resources such as petroleum, diesel which leads us to step our way towards the renewable sources such as solar hydro electric power and battery. There are alternative ways by which we can save energy. One of such way is electric bike; it is also the new way of transport which provides us easy way of transport to provide of any age. It is cheap source of transport and affordable to anyone. The motor used in this bike has high efficiency and the battery bank has less weight with high speed. These bikes are environmental friendly, needs less maintenance and can be also assembled to small component.

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