

# Transformation Of An Ic-bike Into An E-bike

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## Abstract

The primary objective of the project is to design a feasible yet highly adaptable E-bike. As the number of motor vehicles on the roads throughout the world increases at a staggering rate each year, the dependence on oil-based fuel grows almost unchecked. The increased use of non-renewable fossil fuels brings with its environmental problems such as the “greenhouse effect”, health problems for city deliveries, and concern over the stability of fuel supply. To move away from this dependence on oil, a vast amount of money is being spent on the development of electrical vehicles (EVs) that may be produced.

**Keywords:** E-bike, greenhouse, fossil, Battery

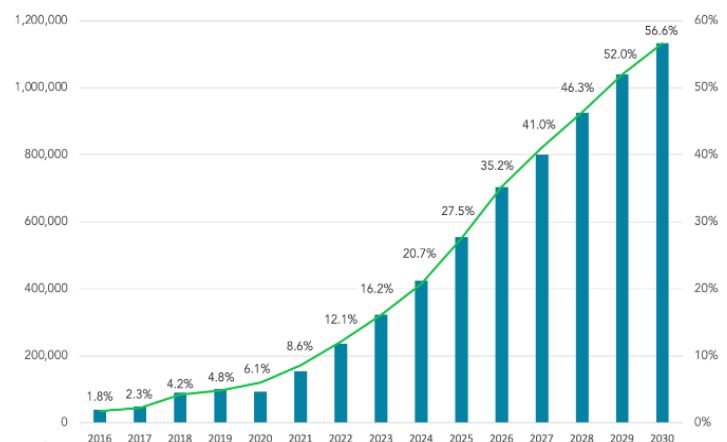
## 1. INTRODUCTION

Transportation is a vital part of any country, the need of which is increasing exponentially day by day across all the countries. Since transportation is developing, the way of commuting has been modified several times. The ancient mode of transport consists of sledges and logs which are powered by human force later animals were used to operate the vehicles. After the industrial development, self-powered vehicles are invented, therefore the engines were introduced and the various types of fossil fuel engines are being used across all types of transportation to date. In India, road transport has increased dramatically over the past decade and it is the dominant mode of transport in India than any other type. Since India is a

developing country, it mostly relies on the road as its major mode of transport



**Figure 1 GASOLINE PRICE HIKE FROM PAST YEARS.**



**Figure 2 ELECTRIC VEHICLE MARKET GROWTH**

## 2. ELECTRIC VEHICLE

An electric vehicle uses a battery to store electrical energy that is ready to use. A battery pack is made up of several cells that are grouped into modules.

Once the battery has sufficient energy stored, the vehicle is ready to use. Battery technology has improved hugely in recent years. Electric vehicles are more efficient, and that combined with the electricity cost means that charging an electric vehicle is cheaper than filling petrol or diesel for your travel requirements.

### 3. ELECTRIC VEHICLE COMPONENTS

Electric vehicles consist of an electric motor that is powered by a battery pack. The main advantage of electric vehicles is that they emit zero emissions and are eco-friendly. They also do not consume any fossil fuels and use a sustainable form of energy to power their car. The main components of electric vehicles are:

1. Battery pack
2. DC-DC Converter
3. Electric motor
4. Charging Port
5. Controller
6. Battery management system (BMS)

#### 3.1.BATTERY PACK

A traction battery pack is also known as an Electric vehicle battery (EVb). It powers the electric motors of an electric vehicle. The battery acts as an electrical storage system. It stores energy in the form of DC. The range will be higher with increasing kW of the battery. The life and operation of the battery depend on its design. The lifetime of a traction battery pack is estimated to be 200,000 miles.

We have chosen a Lithium Ferro Phosphate battery for our project because it is considered safe, and durable and it has more cycle time compared the regular Li-ion Batteries.

#### 3.2.DC-DC CONVERTER

The traction battery pack delivers a constant voltage. But different components of the vehicle have different requirements. The DC-DC converter distributes the output power that is coming from the battery to a required level. It also provides the voltage required to charge the auxiliary battery.

We have chosen 60V-12V DC-Converter as our Battery discharge is about 48V.

### 3.3. ELECTRIC MOTOR

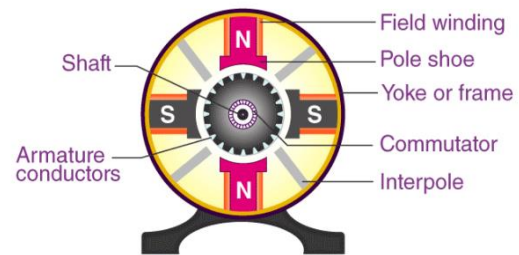
The electric traction motor is the main component of an electric vehicle. The motor converts electrical energy into kinetic energy. This energy rotates the wheels. An electric motor is the main component that differentiates an electric vehicle from a conventional vehicle. An important feature of an electric motor is the regenerative braking mechanism. This mechanism slows down the

vehicle by converting its kinetic energy into another form and storing it for future use. There are two types of motors DC and AC motors.

#### 3.3.1 DC MOTOR:

A DC motor is defined as a class of electrical motors that convert direct current electrical energy into mechanical energy.

From the above definition, we can conclude that any electric motor that is operated using direct current or DC is called a DC motor. We will understand the DC motor construction and how a DC motor converts the supplied DC electrical energy into mechanical energy in the next few sections.

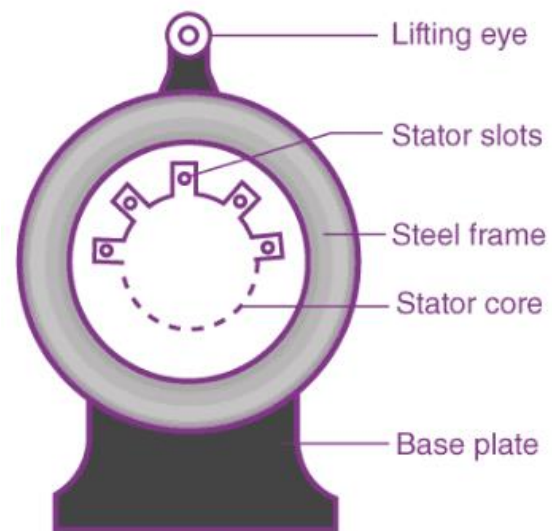


DC motor construction parts

#### 3.3.2 AC MOTOR:

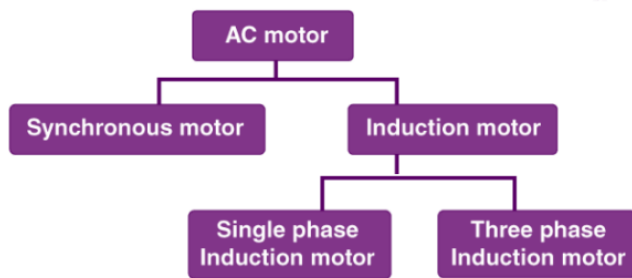
An AC motor is a motor that converts alternating current into mechanical power. The stator and the rotor are important parts of AC motors. The stator is the stationary part of the motor, and the rotor is the rotating part of the motor. The AC motor may be single-phase or three-phase. Nikola Tesla invented the first AC induction motor in 1887.

An alternating current drives an AC motor. The stationary stator and the rotating rotor are important parts of AC motors. In this section, let us study the different parts of an AC motor.



Stator

### CLASSIFICATION OF AC MOTOR



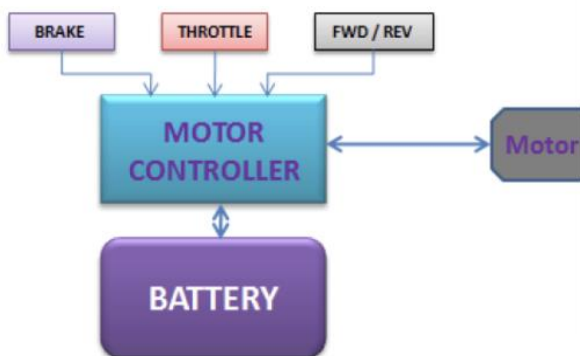
For our Project, we have chosen a 48V 1200WATTS BRUSHLESS DC motor as it is adequate for converting conventional Bikes to E-Bike.

### 3.4. CHARGING PORT

The charge port connects the electric vehicle to an external supply. It charges the battery pack. The charge port is sometimes located in the front or rear part of the vehicle.

### 3.5. CONTROLLER

The power electronics controller determines the working of an electric car. It performs the regulation of electrical energy from the batteries to the electric motors. The pedal set by the driver determines the speed of the vehicle and the frequency of variation of voltage that is input to the motor. It also controls the torque produced.

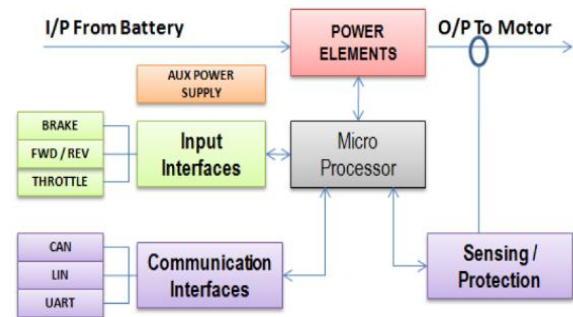


The motor controller acts as a major component that controls the energy flow to the motor. Interfaces like Throttle, Brake, OR FWD\REV control switches are connected to the Motor controller, which processes the commands from these inputs and very precisely controls the speed, torque, direction, and resulting horsepower a motor in the vehicle

Apart from transferring the energy from the battery to the motor for generating acceleration for the vehicle, Motor controllers also can reverse the

energy from the Motor back to batteries which helps electric vehicles to brake more effectively than a simple brake system. This capability commonly known as “REGENERATIVE BRAKING” also helps the electric vehicle to improve its range by storing energy in batteries at each instance of Braking

### Parts of a motor controller



### 3.6. BATTERY MANAGEMENT SYSTEM

Battery management systems do not have a fixed or unique set of criteria that must be adopted. The technology design scope and implemented features generally correlate with:

- The costs, complexity, and size of the battery pack
- Application of the battery and any safety, lifespan, and warranty concerns
- Certification requirements from various government regulations where costs and penalties are paramount if inadequate functional safety measures are in place

There are many BMS design features, with battery pack protection management and capacity management being two essential features. We'll discuss how these two features work here.

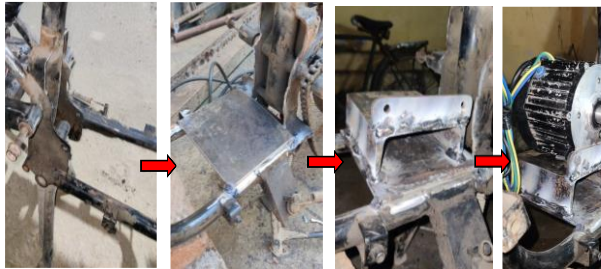
Battery pack protection management has two key areas: electrical protection, which implies not allowing the battery to be damaged via usage outside its SOA, and thermal protection, which involves passive and/or active temperature control to maintain or bring the pack into its SOA.

### 4. EV CONVERSION PROCESS

The conversion process is shown. The IC engine, muffler, catalytic converter, tailpipe Clutch, and gear assembly are removed.

A new electric motor is placed with an adapt plate and mount. The battery is used as fuel

and is placed using a specific mount in the chassis. The controller takes energy from the batteries and delivers it to the motor. The accelerator is swapped with an electric throttle Ride by wire Technology which provides the signal to the controller with the signal that indicates the amount of power to be delivered. A charger was added so that the Batteries could be charged after the consumption.



**Figure 4 REMOVING IC ENGINE AND REPLACING ELECTRIC MOTOR**



**Figure 5 MOUNTING OF CONTROLLER**

## 5. CONCLUSION

From these surveys, the required components and methods have been studied for the development of the E-bike. This review not only just explains their function but also precisely suited their need for the project such as motor, battery, etc.

Hence this Journal helps in filtering out the needed components and processes required, thus saving the cost and time needed to find the appropriate ones. Number of surveys has been taken into account for getting desired results. These studies also help in viewing the requirements and available features with up-to-date technologies. Thus, the journal helps in the completion of any project in an efficient and advanced manner than starting the work from scratch.

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