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# DESIGN OF FREE POWERED ELECTRIC VEHICLE

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**Abstract-**In today's world the rapid growth in automobile industry requested most accurate and high performable vehicles, with pollution free and low cost in operation. The project free powered electric vehicle is an automobile which works on the principle of generating electricity with the help of synchronous electric motor and generator with attached fly wheel, boosting circuit which acts as a free powering machine by restoring waste mechanical energy into useful electric work. This device consists of one electric motor and generator with attached fly wheel in centre so that it connected with motor and generator with belt pulleys. When an mechanical input is given to the generator with help of stator its produces electricity later which is passed to motor as input so, motor rotates the attached flywheel then the stored kinetic energy in the flywheel is utilized to multiply the rotations of generator shaft to produce electricity with little effort on motor in this way cycle repeated and from produced electricity some amount of electricity taken as output which is used for charging batteries, accessories of the electric vehicle. Such that vehicle is propelled.

**Keywords-**Free powering electric generator, Electric motor, Batteries.

## I. INTRODUCTION

During last few decades, environmental impact of the petroleum based transportation infrastructure, along with the peak oil, has lead to renewed interest in an electric transportation infrastructure. Electric vehicles are mainly seen as the cars of the future as they are high efficient, produces no local pollution, are silent, and can be used for power regulation by the grid operator. However, electric vehicles still have some critical issues which need to be solved. The three main challenges are limited driving range, long charging time, and high cost. The three main challenges are all related to the battery package of the car. The battery package should both contain enough energy in order to have a certain driving range and it should also have a sufficient power capability for the accelerations and decelerations. In order to estimate the energy consumption of an electric vehicles it is very important to have a proper model of the vehicle. The model of an electric vehicle is very complex as it contains many different components, e.g., power transmission controller, electric motors, power electronics devices, and battery. Each component needs to be modeled properly in order prevent wrong conclusions. The design or rating of each component is a difficult task as the parameters of one component affect the power level of another one. There is a risk that one component is rated inappropriate which might make the vehicle unnecessary expensive or inefficient. In this project a method for designing the power system of an electric vehicle is presented. The method insures that the requirements due to driving distance and acceleration is fulfilled. we focused on the modeling and design of the power system(free powered generator) to charge and run electric vehicle. Less attention will therefore be put on the selection of each component (electric machines, power electronics, accessories etc.) of the power system as this is a very big task in itself. This project will therefore concentrate on the methodology of the modeling and design process of vehicle and power system.

## II. PROBLEM IDENTIFICATION

1. In electric vehicle there is an problem of battery discharge to an extent limited range.
2. Battery life less in electric vehicle.
3. Sudden power cut and trouble shooting of battery.
4. Required more time for charging batteries.

## III. SOLUTION TO THE PROBLEM

1. Free power generator continuously supply electricity so that vehicle limited distance is improved .
2. Battery life increases because of continuous level -2 charging.
3. Vehicle power load on batteries is reduced.
4. Charging problem is solved.

## IV. PROJECT EXPLANATION

**Description of Free Powered Electric Vehicle**

The free powered electric vehicle is an battery vehicle which runs on free powering generator which uses waste mechanical energy and converts into useful electric work so that it charges batteries, helpful in propelling vehicle.

**1. Electric Parts free powered electric vehicle**

**A. Free powered electric generator**

It is an machine which utilizes waste mechanical energy into useful electrical work as shown in Fig.1 this device consist of one electric motor and generator with attached fly wheel in centre so that it connected with motor and generator with belt pulleys. When an mechanical input is given to the generator with help of stator its produces electricity later which is passed to motor as input so, motor rotates the attached flywheel then the stored kinetic energy in the flywheel is utilized to multiply the rotations of generator shaft to produce electricity with little effort on motor in this way cycle repeated and some amount of power from generator is taken as output and transferred to boosting circuit such that it can charge and run the vehicle.

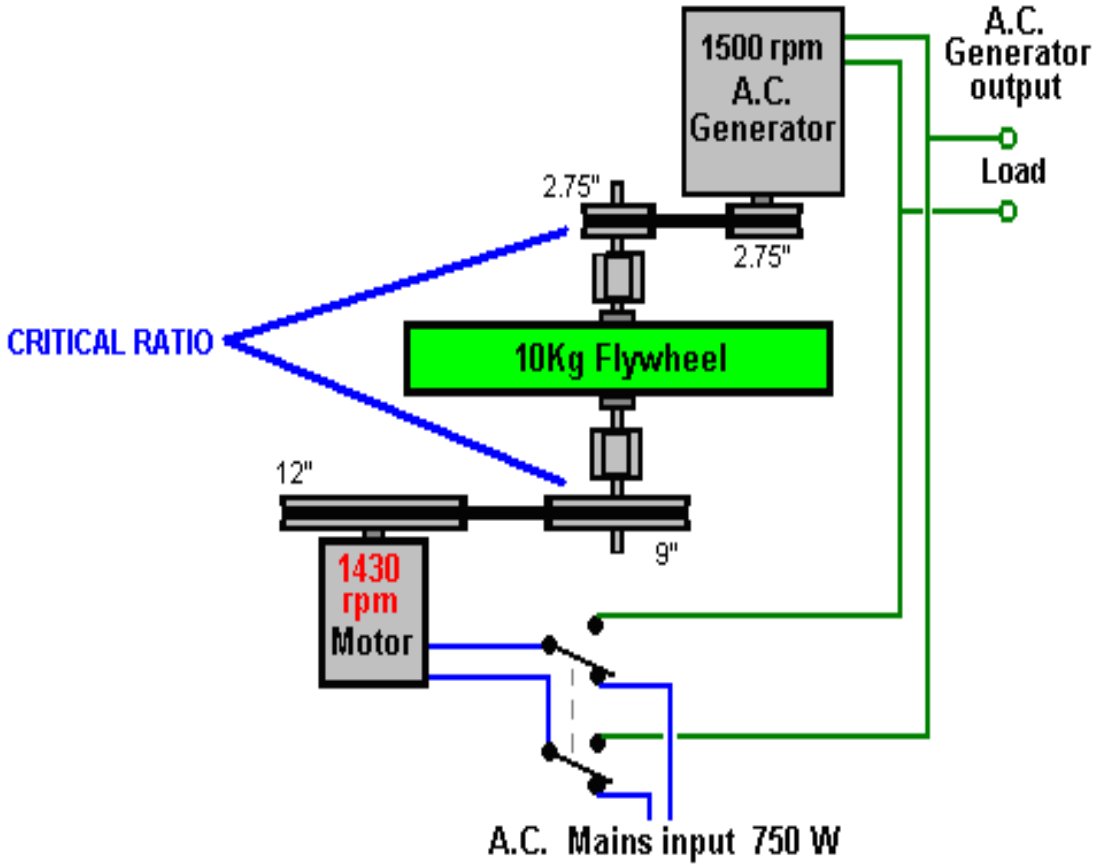


**Figure no.1 Free powered electric generator**

As shown in Fig.2 the mechanical energy is converted into electrical energy and again electrical energy is converted into mechanical energy by restoring kinetic energy with help of fly wheel such that cycle is repeated.

 

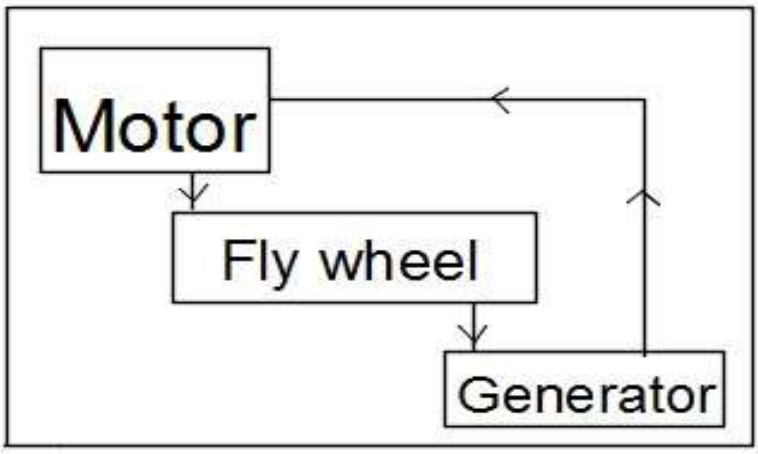


**Figure no.2 Block diagram of free powered electric generator**

**B. Brushless DC hub motor**

Brushless Direct Current (BLDC) motor is a type of synchronous motor, where magnetic fields generated by both stator and rotator have the same frequency. The BLDC motor has a longer life because no brushes are needed. Apart from that, it has a high starting torque, high no-load speed and small energy losses. The BLDC motor can be configured in 1-phase, 2-phase, and 3-phase. Three-phase motors are the most popular among all the configurations and are widely used in e-bikes. The structure of a BLDC motor is divided into two parts:

- Moving part called the rotor, represented by permanent magnet
- Fixed part called the stator, represented by phase windings of magnetic circuit

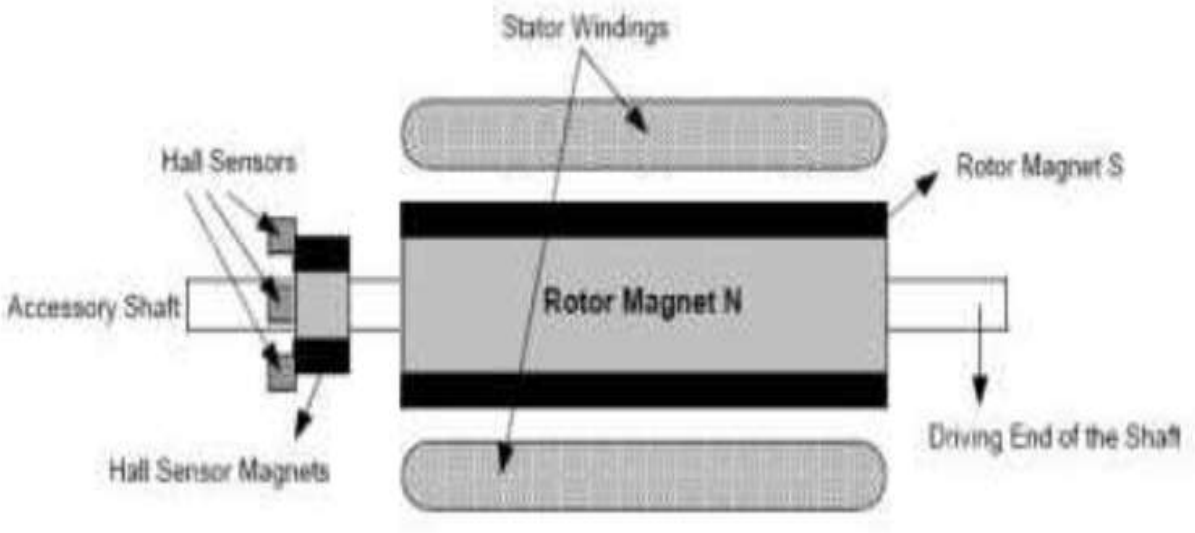


**Figure.3 Motor Mechanical Structure**

Unlike a brushed DC motor, BLDC motor can be controlled electronically. To rotate the BLDC motor, the stator windings must energized in a special sequence. The rotor position must be known in order to understand which winding will be energized next. The rotor position is sensed using Hall Effect sensors that are embedded in the stator. Most BLDC motors have three Hall sensors embedded in the stator on the non driving End of the motor. Whenever the rotor magnetic poles pass near the Hall sensors, they generate a high or low signal, which indicates that N or S pole is passing near the Sensors. Based on the combination of these Hall Sensor signals, the exact sequence of Commutation can be determined. Because of the increasing popularity of e bikes, motors designed specifically for e bike application are now commercially available. These motors vary a great deal in how they are mounted to a bicycle and in how the power is applied to them.

 

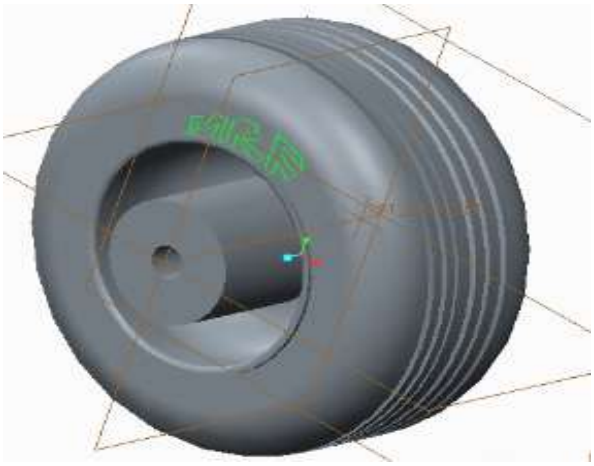

**Figure.4 Hub Motor Wheel**

## C. Batteries

In this vehicle sealed lead acid batteries are used. The batteries in an electric vehicle are the energy storage device for the electric motor. Unlike the gasoline in the fuel tank, which can only power the gasoline engine, the electric motor can put energy into the batteries as well as draw energy from them.

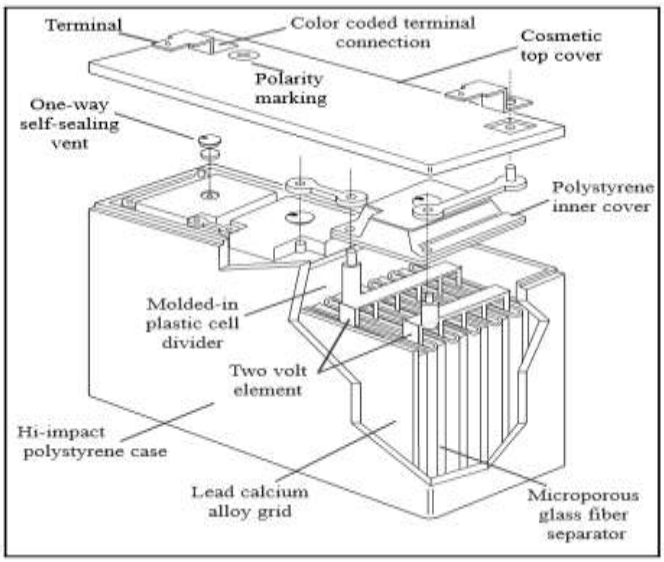


**Figure.5 Construction of battery**

**Table 1 Specification of battery**

| | |
|---|---|
| Type | Lead acid batteries ( sealed) |
| Voltage | 48V |
| Total capacity | 24 kWh (16 kWh available, 67% Dod , 21 kWh declared ) |
| Power output | Over 90 Kw |
| Dimensions | 61.8 x 46.8 x 10.4 in. (1570.5 x 1188 x 264.9 mm) |
| Weight | 648 lbs |
| Battery pack contents: | 1. Positive electrodes: lithium manganese<br>2. Negative electrodes: carbon<br>3. Cells<br>4. Modules<br>5. Assembly parts |

| | |
|---|---|
| Charging times: | 1. Quick charger DC50kW (0 to 80%): approx. 30 min (Level 3 charging)<br>2. Home-use AC240V charging dock (0-100%): 8 hrs (Level 2 charging)<br>3. Regular 110/120V 15-amp outlet: 22 hours (Level 1 charging) |
| Battery layout | Under seat & floor |

**D. Accelerator**

Accelerator is device which is used to change the speed of motor by regulating the current. It is operated by foot pedal system. This accelerator system connected to DC controller through potentiometer.

**E. DC controller**

The controller takes power from the batteries and delivers it to the motor. The controller can deliver zero power (when the car is stopped), full power (when the driver floors the accelerator pedal), or any power level in between. If the battery pack contains twelve 12volt batteries, wired in series to create 48 volts, the controller takes in 48 volts direct current, and delivers it to the motor in a controlled way**.** The controller reads the setting of the accelerator pedal from the two potentiometers and regulates the power accordingly. If the accelerator pedal is 25 percent of the way down, the controller pulses the power so it is on 25 percent of the time and off 75 percent of the time. If the signals of both potentiometers are not equal, the controller will not operate

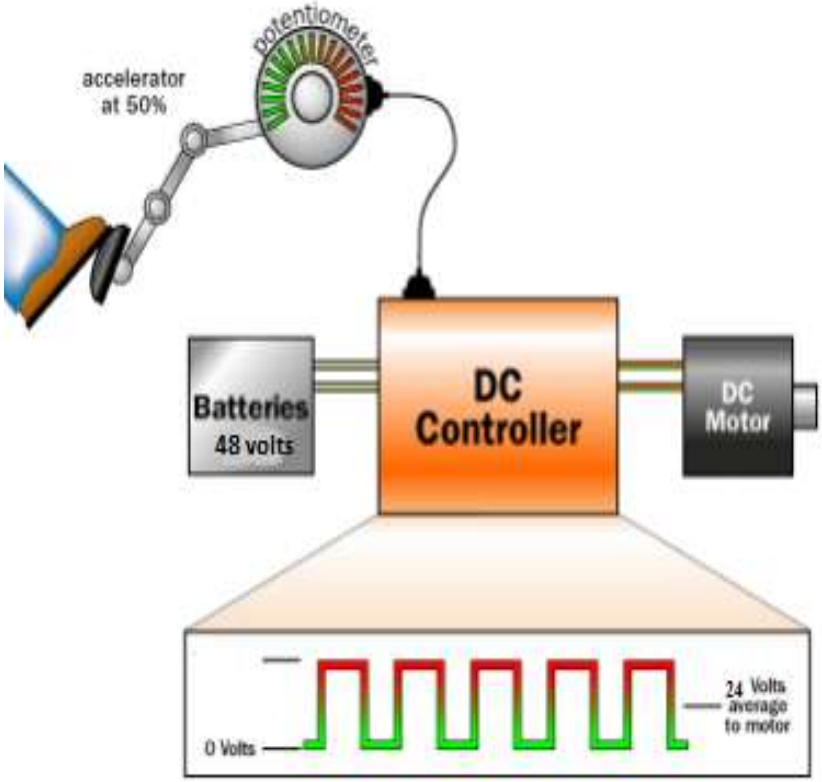


**Figure.6 DC motor controller**

The accelerator pedal hooks to a pair of potentiometers (variable resistors), and these potentiometers provide the signal that tells the controller how much power it is supposed to deliver. The controller can deliver zero power (when the car is stopped), full power (when the driver floors the accelerator pedal), or any power level in between In this EV (electric vehicle) the controller works under 0 to 48 volts only

**4.1 Electric wiring connection of free powered electric vehicle**

In Fig.7 the wiring connections of vehicle is briefly described basing on vehicle design.

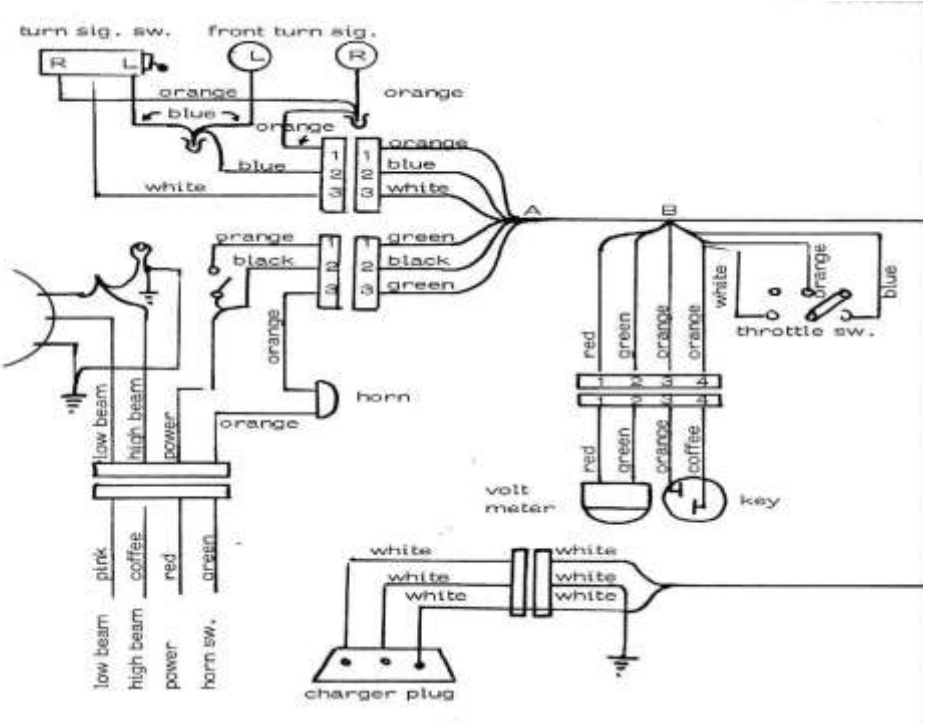


**Figure .7 Electrical Wiring of an Electrical Vehicle**

## 2. Assembling Parts of Free powered Electric Vehicle

The Following components are assembled to get a Complete Free powered Electric Vehicle:

### A. Wheels

Automotive wheels are the devices that are circular in shape, surrounded by a rubber-based tire used for moving a vehicle. These wheels respond very quickly to all types of road conditions and provide uniform and frictionless riding. Automobile wheel manufacturers have used different materials for making wheels. Amongst the diverse range of automotive wheels used in automobiles, alloy wheels and wire wheels are the most common.

### B. Chassis frame

Chassis frame is the basic frame work of the automobile. It supports all the parts of the automobile attached to it. It is made of drop forged steel. All the parts related to automobiles are attached to it only. All the systems related to automobile like power plant, steering, suspension, braking systematic are attached to and supported by it only.

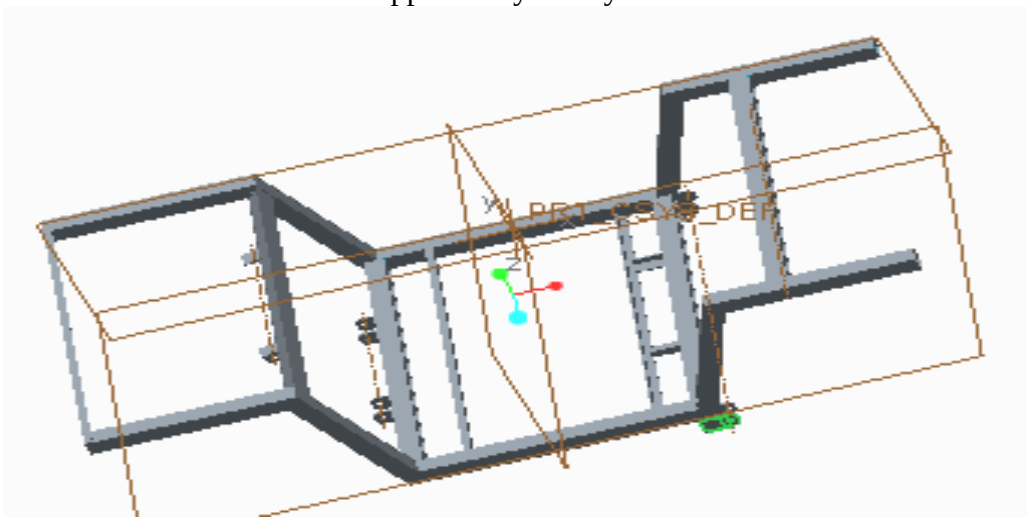

**Figure.8 Chassis of electrical vehicle**

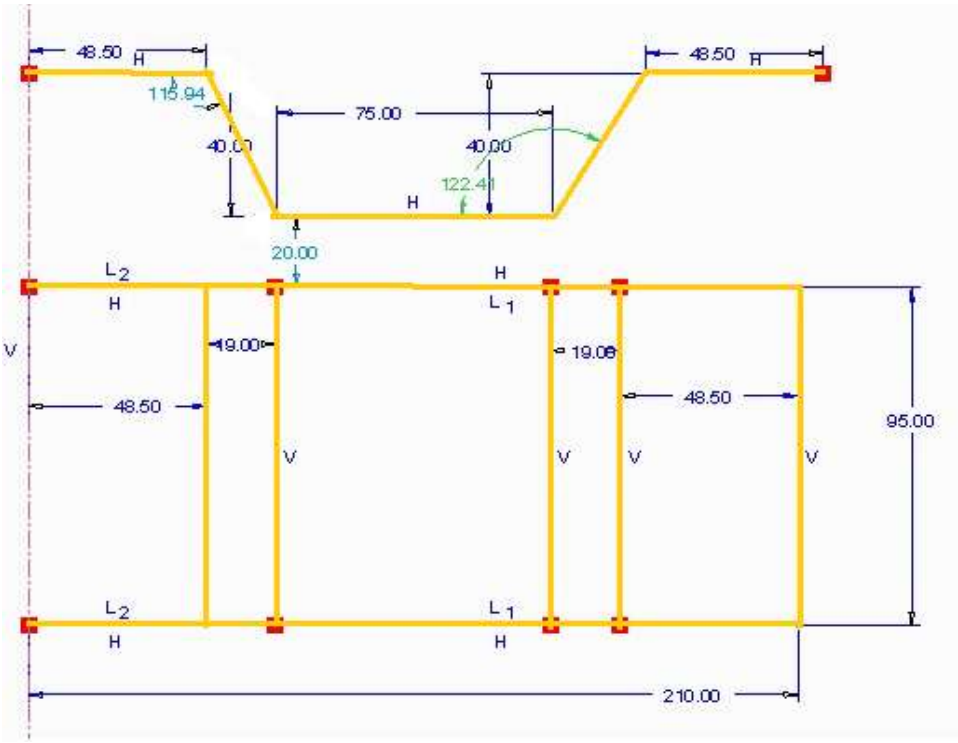


**Figure.9 Line Diagram Chassis Dimensions**

## C. Steering System

The basic aim of steering is to ensure that the wheels are pointing in the desired directions. This is typically achieved by a series of linkages, rods, pivots and gears. In this vehicle rock and pinion steering mechanism is used

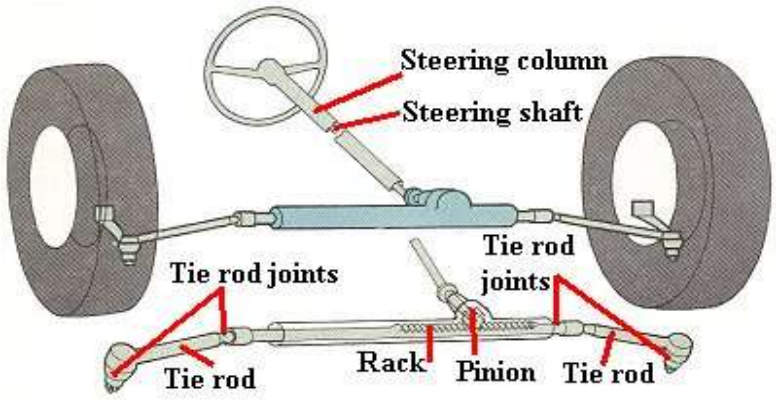


**Figure.10 Front Wheels, Basic components of steering system**

**Supporting channel for steering mechanism and front wheel connection**

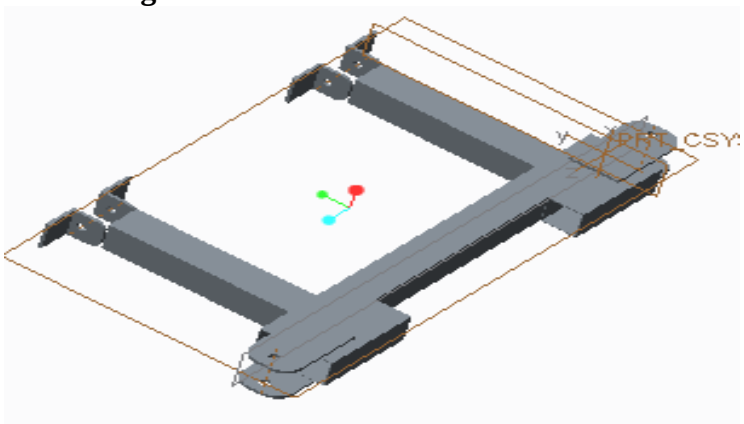

**Figure.11 supporting channel of electrical vehicle**

**D. Suspension system (Shock absorbers)**

A shock absorber or damper is a mechanical device designed to smooth out or damp shock impulse, and dissipate kinetic energy.

**Figure.12 Front & Rear Shock Absorber**

**E. Brakes**

In this vehicle drum brakes are used, a brake drum is attached concentric to the axle hub whereas on the axle casing is mounted a back plate. The back plate is made of pressed steel and is ribbed to increase rigidity and to provide support for the expanding brake shoes. These brakes are also known as internal expanding brakes.

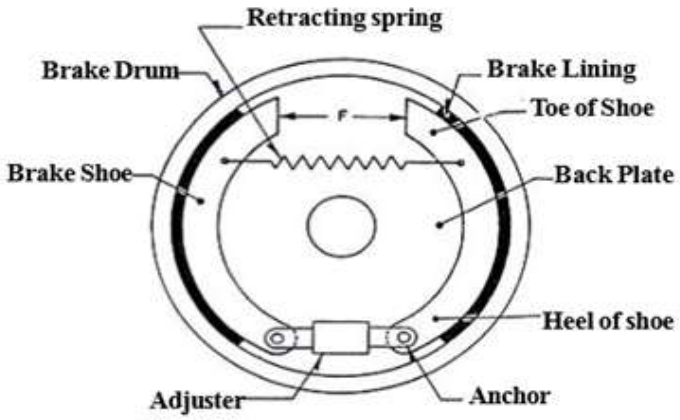


**Figure.13 Drum brake**

**4.2 Final assembly of free powered electric vehicle**

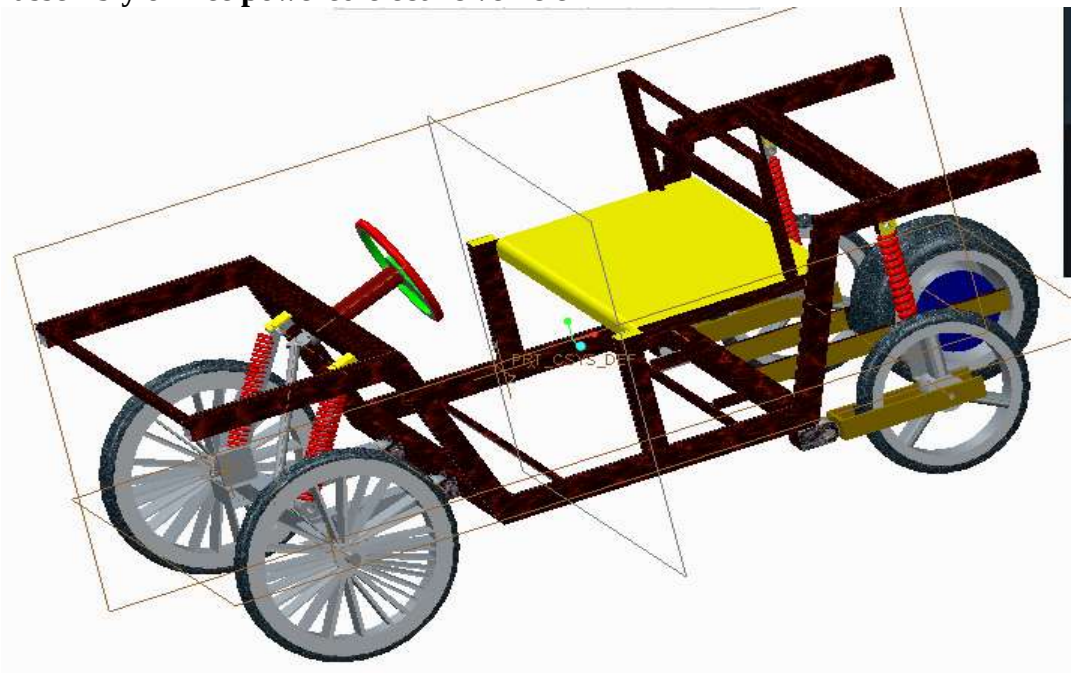

**Figure.14 Assembly of Free Powered Electrical Vehicle**

 

**Figure.15 Free powered electric vehicle working model**

## V. RESULT

1) Designed Free powered Electrical Vehicle for carrying capacity 170 kg.
2) Maximum speed of vehicle 40 kmph
3) Steering efficiency 98.7%

## VI. CONCLUSION

Currently electrical vehicles are manufacturing for different applications. This Project is designed for the self charging EV, which is modified with New Version of Five Wheels and a self-charging battery circuit by using free powering electric generator it utilizes the waste mechanical energy and converts into useful electric work to charge the batteries and run the vehicle, thereby introducing a system which makes the vehicle pollution free and less in cost. Design of Chassis is made as per Standards which is available in the market. After testing the vehicle, it is successfully running with self recharging. Due to this extra feature the vehicle is running long distances, and due to five wheels the maximum load cannot be distributed on motor, So that motor durability is more, need of fossil fuel is ignored so that harmful gases is reduced and impact environment is decreased.

## VII. ACKNOWLEDGEMENTS

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