

Review Paper on Electrical Vehicle

Prof. Sandip Godhade¹ Mr. Sourabh Shete² Mr. Avinash Teli³ Mr. Soumitra Kumbhar⁴

Mr. Digvijay Pawar⁵

¹Professor ^{2,3,4,5}Student

^{1,2,3,4,5}Department of Electrical Engineering

^{1,2,3,4,5}SGI, Atigre, India

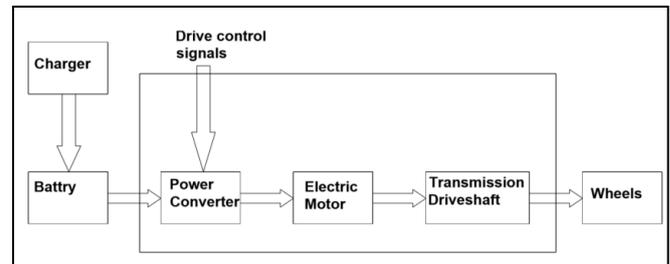
Abstract— An electric rickshaw consists of a battery, an electric motor and a controller. The motor is powered by batteries by mistreatment the batteries voltage and changing it to mechanical energy. The controller regulates the energy flow to the electrical motor. An electric automotive stores its energy on board in batteries. These batteries can be plugged into an electrical outlet or charged by another source such as a gasoline engine, fuel cells or solar power. The two main kinds of electrical cars square measure all electrical and hybrid. All electrical cars run solely on batteries that square measure charged up by associate degree wall socket and square measure solely powered by the electrical motor. This project involves designing and construction “Electrical Vehicle” for garbage collection that would be economical, reliable and environment friendly.

Key words: Electrical Vehicle

I. INTRODUCTION

In day to day life we are using diesel, petrol, coal, such type of non-renewable fuels those are vanish in few year. And conventional sources are producing pollution to affecting human and wild life. In the environment we all are know that emission produce from CO₂ gas are harmful human being then we designed such a electrical vehicle do not produce emission from Carbon Dioxide (CO₂). Hence we are deciding to make a three wheeler rickshaw in the rickshaw manly study of the core aspects of electro mobility, we have chosen the areas of environment, politics, economy, society, infrastructure and technology. in the Electrical three wheel rickshaw we are using lead acid battery to operated vehicles, which are considered as an upgrade to conventional rickshaws, and economically better than auto rickshaws and other fuel variants, these rickshaws, since are battery hopped-up have zero emission, and is often argued to be much better than other rickshaws as they are considered almost pollution free E rickshaws are now fairly popular amongst Indian rickshaw drivers and have created new opportunities for people, as they require a minimum investment to earn a living. They offer large returns in less time and area unit straightforward to control and have low maintenance and running value. A lot of variants area unit on the market currently, most of them started as less-quality products and imported from other nations. E-rickshaws can provide a decent income since the battery charging cost is far lower than any other fuel, new material such as fiberglass has been introduced in them since the fabric provides high strength, sturdiness lighter than metals like milled steel and garbage cantener is mead up of iron sheet, square pipes. Environment, impact of the petroleum based transportation together with the oil, has led revived interest to an electrical transportation infrastructure through the previous couples of dacades.

II. BLOCK DIAGRAM



Following are the component used for the designing of Electrical Vehicle

- A. Electrical Motor
- B. Differential
- C. Battery
- D. Motor Controller
- E. Chassis
- F. Breaking System and suspension

A. Electrical Motor

In the construction and designing of electrical vehicle we are used BLDC motor. Reason to be chosen behind of BLDC motor these motor having a high starting torque. BLDC motor having high power to weight ratio speed. These motor provided smooth speed control over a convectional electrical motor. BLDC motor also known as electronically Commutated motor as well as synchronous DC motors. Rating of BLDC motor for the using designing of electrical vehicle is 48V, 850Watt.

B. Differential

A differential is nothing but gear with three shafts that has the property that the rotational speed of one shaft is the average of the speeds of the others, or a fixed multiple of that average. The differential allows the outer drive in automobiles and other wheeled vehicles, the input rotational speed of the drive shaft is the average of the rotational speed of the two driving wheels. If increase in the speed of one wheel then the speed of this wheel is balanced by a decrease in the speed of the other.

C. Battery

An electric battery is a consisting of one or more electrochemical cells with external connections they can used as a source to run the motors, smart phones, flashlights. We are using led-acid battery and rating of battery for the use of construction and designing of electrical vehicle is 12V, 26Ah. We connecting four batteries' in series to make required motor voltage 48V According to battery ratings they can charge for the 1-2Hrs then 1.2kwh energy is consumed.

1) For battery calculation

$$\text{Current} = (\text{motor required Power} / \text{Voltage})$$

$$\begin{aligned}
 &= (850/48) \\
 &= 17.70 \text{ Amp} \\
 \text{Amp hr capacity} &= \text{For 15 hrs} * \text{current} \\
 &= 15 * 17.70 \\
 &= 460 \text{ Ahr (for 1 hr, 17.70 Ahr)} \\
 \text{Watt hr capacity} &= \text{Battery Voltage} * \text{Amphr} \\
 &= 48 * 17.70 \\
 &= 849.6 \text{ watt hr}
 \end{aligned}$$

D. Motor Controller

A motor controller is a device to control motor, on/off the motor as per requirement in some predetermined manner. A motor controller would possibly embrace a manual or automatic suggests that for beginning and stopping the motor, choosing forward or reverse rotation, choosing and control the speed, control or limiting the force, and protective against overloads and faults. In motor controller mainly consist of MOSFET. It has three terminal gate, drain and source. It's use because of less energy losses, uninterruptible power supply, more efficiency, high speed power switching, high frequency circuits and hard switched. And all MOSFETS are controlled by using PWM modulator. In PWM consist of reference speed and actual speed sensing the hall sensors. In MOSFET there are two types P-channel and N-channel MOSFET. In BLDC motor use buck converter to give supply off inner elements such as IC and other sensors. Buck converter is nothing but the DC-DC converter to step down the voltage up to required voltage e.g. 5V and step up the current.

E. CHASSIS

Chassis is med up of mild steel to get stronger seaport of the mechanism. We are dividing chassis in three parts 1. Handle controller, 2. main bass and 3. garbej cantener mainly focusing weight, and safety of vehicle. The chassis of rickshaw made up of square pipes and other materials of various cross sections. The rickshaw chassis should be consisting of stability, torsion rigidity. It cans also adequate strength to sustain load of other accessories and operator. The chassis is design by safety and convenience for vehicle handler. The load is applied on it without compromising the structural strength and also the chassis was designed for a secure ride. Be aware that need a strong but light frame. I have used in design thick section so that bending operation of the material use should be easier. A ladder frame is a type of vehicle chassis which is designed following are versus types of chassis and we are chugs ladder type chassis.

- 1) Back bone chassis
- 2) Monocoque Chassis
- 3) Space frame chassis
- 4) Ladder Chassis.

F. Breaking System and Suspension

We are designing mechanical breaking system back two wheel's to controlling the speed purpose. The road is consist of iron, brake shoes are made of synthetic substances bonded into a composite, principally in the form of cellulose, PAN, aramid and brake plants consist of steel to less wear Suspension purpose front wheel using shock absorber. It's mead up of silicon steel, mixed alloy.

And back wheels consist of leaf spring due to weight on back side its med up of plain carbon steel having 0.90 to 1.0% carbon. It have joint to chassis with help of nut-bolts. It consist a road to join the brake pedal and break plats of wheels.

III. ELECTRICAL CALCULATION

For motor selection,

$$P = T * \omega$$

(Let us consider vehicle weight is 500 Kilogram and Radius of wheel is 0.15 m)

$$\begin{aligned}
 T &= \text{Vehicle weight} * 9.81 * \text{Radius of wheel} \\
 &= 500 * 9.81 * 0.15 \\
 &= 735.75 \text{ Newton per meter}
 \end{aligned}$$

Required speed of electrical vehicle is 25 Km per hr,

$$\begin{aligned}
 \omega &= 6.94 * 0.15 \\
 &= 1.041 \text{ rad/sec}
 \end{aligned}$$

$$\begin{aligned}
 P &= T * \omega \\
 &= 735.5 * 1.041 \\
 &= 765.65 \text{ watt}
 \end{aligned}$$

For battery selection,

For measuring amp hr capacity battery is discharged for continuously 20 hrs and its current output supplied to its standard load is measured.

Suppose that battery delivers,

$$\text{Current} = (\text{Power required for motor} / \text{Voltage of battery})$$

$$\begin{aligned}
 \text{Current} &= (765.65 / 48) \\
 &= 15.95 \text{ ampere}
 \end{aligned}$$

Hence for 1 hour 15.95 ampere required.

For 20 hrs,

$$\begin{aligned}
 \text{Amp-hr capacity} &= 20 * 15.95 \\
 &= 319 \text{ ampere-hour}
 \end{aligned}$$

$$\begin{aligned}
 \text{Watt-hr capacity} &= \text{Voltage required} * \text{ampere hour} \\
 &= 48 * 15.95 \\
 &= 765.6 \text{ watt hr}
 \end{aligned}$$

Power requirement:

Power required to drive a vehicle at the speed can be calculated from the formula,

$$P = (2 * \pi * N * T) / 60$$

For this calculation we have to calculate rpm of motor first,

Therefore,

Desired top speed,

Let us consider,

$$\text{Speed} = 25 \text{ kilometer per hour}$$

$$\begin{aligned}
 V_{\text{max}} &= 25 * (5/18) \\
 &= 6.95 \text{ meter/second}
 \end{aligned}$$

$$V_{\text{max}} = R_w * N * 0.10472$$

$$6.95 = 0.15 * N * 0.10472$$

$$N = 442.44 \text{ rpm}$$

(Let us consider Torque of vehicle is 19.87 N-m)

$$\begin{aligned}
 P &= (2 * \pi * 442.44 * 19.87) / 60 \\
 &= 920.62 \text{ watt}
 \end{aligned}$$

So conclusion is that selection of motor is about 1.5H

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