Economic Conversion of Gasoline Cars into Electric Cars with BMS

M.Haritha[1], Dr.P.Sridhar[2]

[1]M-Tech student scholar Department of Power Electronics and Electrical drives, Institute of Aeronautical Engineering (IARE), Dundigal. Hyderabad, Telangana,India
[2]Professor and Head of the Department of Power Electronics & Electrical drives Institute of Aeronautical Engineering (IARE), Dundigal. Hyderabad, Telangana, India.

Abstract - *An electric car with newly introduced pulse width modulation based controller is proposed in this project. The proposed system involves mechanical and electrical design of electric car. This can be archived by using batteries. The batteries are used to store the required amount of power. An AC/DC motor with PWM controller is used to regulate the speed. Regenerative braking is the major concept discussed in this proposed electric car. During braking, the mechanical energy is converted to electrical energy and the same is stored in batteries. A boost converter is also used in control circuit to amplify the power. As an alternative to the energy, a solar panel is placed to make hybrid energy system. This combination makes the system ecofriendly. Thus the proposed electric car utilizes the solar energy which plays vital role for upcoming energy crisis.*

Key Words: *Regenerative braking, batteries, PWM controller, boost converter, solar energy.*

1. INTRODUCTION

Now a days we observed a requirement substitute for fuelled vehicles to take edge off the issue of out let release from internal combustion engines and to decrease the protectorate on bring from foreign crude oil. Throughout the years from 1960 to the now, multitudinous attempts to generated experimental electric vehicles happen and pursue to occur. The motive of this project is to particular purpose the technology used to manufacture an electric vehicle and describe why the electric engine is superior to the internal combustion engine. It incorporate because why the electric vehicle developing quick and reason is a compulsory to better the world today. The detail describes the greatest point in an electric and hybrid vehicle. It differentiate the electric to the hybrid and internal combustion vehicle. It also incorporate the time to come of electric automobiles. The general impact of the electric vehicle eventually benefits the individuals. Dissimilarity between to gasoline powered vehicles, electric vehicles are believe to be ninety-seven percent free from pollution, emits no tailpipe discharge that can place specific matter into air. Particulate matter, cancer causing agents released into the envelope of gas surrounding the earth by gas powered vehicles, "can grow asthma conditions, as well as annoy respiratory systems".

The electric vehicle (EV) is drive by an motor, supply by restored battery packs, preferably than gasoline engine. From covering, the vehicle does not come into sight to be electric. In most occurrence, electric cars are designed by transform a gasoline-powered car. Frequently, the only object that indication the vehicle is electric is the reality that it is almost silent. Throughout the rear not any decades, environmental action of the petroleum related transport facilities, down with top oil, has led to recommence attentiveness in an electric transport infrastructure. Electric vehicles change from gasoline that is fossil fuel powered vehicles in that the electricity they utilize can be cause from a broad limits of origin, as part of the whole being considered fossil, nuclear, green energy sources such as tidal, solar, and wind power some combined of them. An electric vehicle represented to as electric driven vehicle, uses one, two depends on designee electric or traction for momentum of motor.

1.1 Types of Electric Vehicle:

Battery electric vehicles (BEVs) don't have gasoline engine and propulsion exclusively on the batteries that stores energy. This type of vehicles can go from 100 km or more before energising these vehicles can run for 100 miles or more before recharging. Examples are the, all TESLA models.

Plug-in hybrid electric vehicles (PHEVs) are having ICE that can propel conventional/alternative source and an electric motor which is run by the batteries. The car is plugged in to electric power source to batteries by the connection we gave. This type of vehicles can travel by 70 km on electric power only. And all can run singly on gasoline that is similar to ford fusions energy or Chevy volt types.

Extended range Electric Vehicle These are essentially powered by an IC engine that works on regular or traditional fuel and an electric motor that used energy keeps in a battery. These batteries are charged by the regenerative braking of the vehicle which is designed by extended range. Examples which is the Toyota Prius.

The Low Speed Vehicle, which runs slowly and it is also the neighbourhood vehicle which dependent on electric batteries these type are goes up to 35 mph speed zones.

Light duty is an available for all passengers' vehicles that gets some of the momentum from electric batteries.

2. MECHANICAL DESIGN

The electric cars are the mainly getting famous now a days to transportation system.in this the vehicle consisting of mechanical components that are assembled to move a people and martials to transport in different Areas. There is no matter on which source it is running the only thing in this chapter is how the delivery of output is done by mechanical elements is done.in electric car a motor is the ICE.this motor is also a mechanical design which is made up of different materials. The car which is having brakes, instruments, seat, head lights, chassis, wheels etc. these all are comes under mechanical parts.

Electric cars make less pollution compared to gasoline powered cars, so these electric vehicles are an environmentally friendly substitute for the gasoline powered vehicles (especially in traffic and crowd areas).

The updated story's about hybrid cars are usually talks about the electric cars also.

Electric Vehicles based on the fuel cells that are runs the vehicle, and these fuel cells are the more attention in in research areas.

In this we are designed car that is electric car that is powered by batteries and runs with motor which is substituted of ICE .by seeing the car we cannot recognise which is powered by a electricity. From outer part we probably don't have idea that car is the electric based car.in our project the electric care which is designed from a conversion of gasoline car in to an electric car .in this conversion process have mechanical work that is discussed in below. The electric car which is driving that time only we can recognise the silence smooth operation is makes to sense the car is working under gasoline or electric.

The engine which is not properly working so that the car is taken less price but the body breaks and all the parts are really good.in this car we placed a front wheel transmission the motor is placed in front that is aligned with crank shaft with the use of conveyer belt. The motor placing is specially designed and the base of the motor is fabricated and placed motor in correct position without any loose contact. The electrical components are taken place overall weight is 30kgs and the curb weight is nearly 600 kegs.

3. CONVERSION

- The vehicle having gasoline engine, muffler catalytic converter fuel tank tail pit etc. parts are removed.
- Except transmission the other parts clutch related are disconnected and the gear box is placed safely.
- The front part at the place of engine the motor which is dc motor is placed in platform. That is connected with conveyer belt to the transmission part.
- The motor which is wired that to the controller and controller is placed.
- In the back side the place is arranged for batteries.
- The batteries that are 12v sealed maintains free are placed back side. The batteries were placed is four in number. The four set of batteries that creates the 48v.
- The manual transmission which is placed as same but the switch is placed and that switch is the automatic that can be done the front and back movement by reversing the switch on off.
- The fuel tank openers is removed and that place we put a socket for charging purpose that is two modes which is 120 volts and 240 volts.depends on adapter the car will charge and also the solar regenerative is also given to it. Figurer 3.4 shows the charging port.
- The excess parts that are like giving weight to the car those are removed safely. Some use full parts like air condition, some controllers are not removed.
- The motor which is having the place that is an iron plate which is having attachment to the shafts of the car. The motor is perfectly mounted to it.
- In general the electric motors for maximum efficiency the minimise gear is required.so that the gear system is pinned to the existing the gear box which runs by variable speed by giving gears the motor speed is changes. The system which is available outside with more cost but in this we designed a low cost variable system that is perfectly tested.
- The controller which is having different wirings.
- At the back side a placed safe to them to build a safety holder to the battery installation is take place perfectly without any loose connections and the connections are safely fitted with the nooks, crannies to avoid the failure and short circuit.
- The batteries wiring is taking place to controller with one square mm wire.
- Our car is not power steering if the power steering is there so wiring is given to motor and steering pump.
- The car is having air condition so that is also wired and mounted to the system.
- The electric water heater is placed and that is spaced perfectly for heating core.
- The vehicle is have the vacuum breaks if power brakes are there so replace it with brake booster.

- In the front side the charging system with display is placed.
- The charging circuit is designed for especially with normal charging we didn't prefer fast charging because it's having drawbacks it may reduce the life of batteries so.
- The display that consisting of voltage and charging status is shows. Its also shows how much power it consuming.
- The pedal accelerator is placed and its connected to controller
- The dc motor that is used in this proposed project is having forward and reverse movement that is given to the manually for car transmission system.in the case of ac motors this system needs special configuration so that this is also one reason to select the motor. The conversion what we need that reason basis we can select the motor. In this the reverse switch is given to the3 controller to motor.
- By installing a special circuit to the gear system for forward reverse directions. This relay circuit is for operation of motor is safe mode.
- The ignition wire is wired to all devices to turn on them.
- The gas gauge was removed.
- The below shows how the motor controller is installed.

4. WORKING

Electric cars are a diversification of electric vehicle (EV) in this propulsion is takes place by electric motor. These EV are in general used for short distances that is powered with electricity .depending on input we are giving to charging we call the vehicle names as the car is having input to the batteries is solar so we call solar car if its combination of electric and gasoline it is called as hybrid car. In our view the car is decided that depending on input source we name it.In our project we are giving input is Solar and 240 volts charging supply.so we can call it as, multi input source vehicle.

The conversion process which we discussed in chapter 3 that is somewhat easy compare to construct a new car so that it required elements are listed below:

- BLDC electric motors
- Electric controller
- Battery tray
- 12V Lead acid batteries
- Battery Charger
- Many motors for driving smaller parts

These above components are having connected in manner that is discussed in chapter 4 clearly. The each element is connected to controller that controls the whole system. This controller is like brain to car and motor is heart.

The battery are the source which gives all supply to the system. The working of electric car is simple from batteries the supply is giving to controller and controller delivers the power to motor will run the vehicle will moves forward/reverse depending on our requirement. The below we can see the diagrammatical representation how it works.

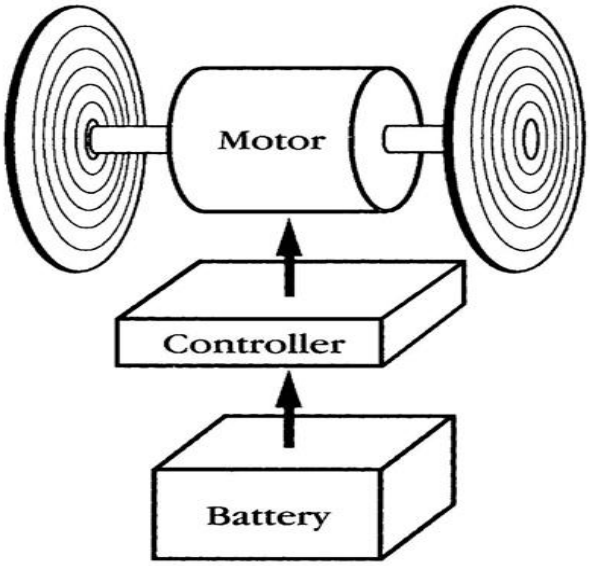

Figure 1:Working

In this car the batteries that are used is lead acid batteries these are expensive. The weight of the batteries are the one of the weight increasing factors. But these batteries are the base to car. The space occupying is less. But after the long drive we need to charge the batteries it require six to eight hours' time. Apart from this reason the vehicle is good and well performed.

The car is consisting of power elements that are like radio.AC, steering, Wipers etc. Are connected to separately to 12V battery to run it.

The above figure that shows the working of electric car in simple diagram. The input which is given is solar or power from electricity board that can charge the batteries and its stores in it. This batteries are wired to controller that controller is gives supply how much it require each element. The controller is consisting of throttle, motor, light, brakes, forward reverse, ignition etc. connections are having. The throttle that is fully pressed that time supply 12v goes to

motor and motor will run in maximum speed. In this manner the electric car will works. So this pedal accelerator will decide how much power should deliver to motor. This is nothing but potentiometer with variable. So, i.e. variable potentiometers are connected to car accelerator and controller. Where as in electric cars for safety reasons we are connected two potentiometers. If one is not working then replace and proceeds. In most of the electric cars that are don't have accelerator which only have the ON/OFF switches due to this driver can't operate perfectly. So that the project is solved this type of difficulty's in it.

Mostly the motors are AC/DC depending on the design. In most of the cases the AC is using due to the AC the cost will increase.so for that the motor which is direct current is chosen and also have better efficient performance.

5. CONCLUSIONS

The propose project we also call it as green vehicle becoming famous in world wide. In future this type of cars are important in transportation system. The government is also focusing on electric based transportation mostly which is green energy basses. additionally, the fossil fuels that are in earth is digging continuously so the scarcity will occurring day by day this reason the price the fuels are increasing. So this type of cars has to use is further.

Commonly now a days the electric vehicles that are not in affordable cost. The vehicles are designed semiconductor based electronics is using which included the embedded, power electronic controlling in tithe vehicles which are coming in latest smart technologies. Up to now the basic transmission is resulted in this project the result of the project is we can travel the up to full charge is 100km in every charge. The vehicle that we choose is the perfect for mechanical conversion.

In market the car manufactures are focusing of design of the body only the main consideration we have to focus on batteries that has to with stand power for long time. The main aim of this project is to equal the EV to ICE vehicles.so that we achieved 70% in this project.

The most important thing is operation of EV is fabricated by mechanical design that included internal design. The outer body that is considered the all the parameters aerodynamic forces etc. The solar energy is also converted to electric energy.

The electric motor that is having the performance is tested the dynamic/linear properties are also tested.by using the ratting of motor the performance is known.

The design of EV the batteries placing is also one considering factor. The centre of gravity is taken in consideration. So in the result the project is have running condition and its using in transportation with good efficiency.

REFERENCES

[1] (2012, may) Regulation no 101, official journal of European Union. Economic Commission for Europe of the United Nations.

[2] A. Nordelöf, M. Messagie, A.-M. Tillman, M. Ljunggren Söderman, and J. Van Mierlo, "Environmental impacts of hybrid, plug-in hybrid, and battery electric vehicles—what can we learn from life cycle assessment?" The International Journal of Life Cycle Assessment, vol. 19, no. 11, pp. 1866–1890, 2014. [Online]. Available: http://dx.doi.org/10.1007/s11367-014-0788-0

[3] (2015) Global ev outlook 2015. IEA, International Energy Agency, EVI, Electric Vehicles Initiative.Accessed 2015-04-27. [Online].

[4] P. Mock. (2014) European vehicle market statistics, 2014. The International Council of Clean Transportation (ICCT).

[5] K. Rajashekara, "Present status and future trends in electric vehicle propulsion technologies," Emerging and Selected Topics in Power Electronics, IEEE Journal of, vol. 1, no. 1, pp. 3–10, March 2013.

[6] E. Ericsson. (2000) Driving pattern in urban areas - descriptive analysis and initial prediction model. Lund Institue of Technology, Department of Technology and Society, Traffic Planning. Accessed 2013-12-11.

[7] (2006, dec) Final technical support document, fuel economy labeling of motor vehicle revisions to improve calculation of fuel economy estimates. US Environmental Protection Agency (EPA), Office of Transportation and Air Quality. Accessed 2013-12-09.

[8] E. Ericsson, "Independent driving pattern factors and their influence on fuel-use and exhaust emission factors," Transportation Research Part D: Transport and Environment, vol. 6, no. 5, pp. 325 – 345, 2001.

[9] S. Samuel, L. Austin, and D. Morrey, "Automotive test drive cycles for emission measurement and real-world emission levels - a review,"Proceedings of the Institution of Mechanical Engineers, Part D: Journal of Automobile Engineering, vol. 216, no. 7, pp. 555–564, 2002,

[10] (2012) Advanced powertrain research facility, avta nissan leaf testing and analysis. Idaho National Laboratory (INL), Advanced Vehicle Testing Activity (AVTA). Accessed 2013-10-17.

[11] S. Williamson, A. Emadi, and K. Rajashekara, "Comprehensive efficiency modelling of electric traction motor drives for hybrid electric vehicle propulsion applications," Vehicular Technology, IEEE Transactions on, vol. 56, no. 4, pp. 1561–1572,July 2007.

[12] A. Boretti, "Analysis of the regenerative braking efficiency of a latest electric vehicle,"in SAE Technical Paper. SAE International, 11 2013.