Recent Innovation In Electric Vehicles

Vikram Patil[1], Mubin Nadaf[2], Ganesh Varude[3], Vaibhav Kadam[4]

[1]*Asst.Professor,Electrical Engineering, AMGOI Vathar, Maharashtra, India*
[2] *Student, Electrical Engineering, AMGOI Vathar, Maharashtra, India*
[3] *Student, Electrical Engineering, AMGOI Vathar, Maharashtra , India*
[4] *Student, Electrical Engineering, AMGOI Vathar, Maharashtra , India*

ABSTRACT

This paper provides an outline of the world's latest work on electric cars. The paper discusses the growth and contrast of various product components. It explores the major components of battery technology, charger design, engine, steering and braking. Finally, the paper displays several concept electric vehicles as a conclusion of the documents.

Keyword : - *AFS, steering system, ABS, battery management systems, BMS, inverter systems, electric motors.*

1. INTRODUCTION

Electric vehicle (EV) uses an electrical motor unit. No combustion engine is employed internally.Each the photographs as an energy supply, electricity relies on electric power. The key profit is that the high potency of energy conversion by its planned motor system. Large analysis and development activity has been documented recently in each academe and trade .Commercial cars are on the market. Several countries users area unit granted blessings by reduced tax or taxation, Free parking, exemption, and free charging services.

The hybrid electrical vehicle (HEV) is, on the alternative hand. It has been wide used within the previous couple of years. The bulk suppliers of cars have a minimum of 1 the Hybrid machine platform. The things that come back to mind that vehicle can dominate the market that one is suitable for future. This paper have little bit information about latest innovation of electrical vehicle and counsel the future development inside the area.

2. ELECTRIC VEHICLE AND HYBRID ELECTRIC VEHICLE

A hybrid electric vehicle has been upgraded extensively among the last 10 years. almost every manufacturer incorporates a minimum of one a HEV among the markets [1]. It's presupposed to save the battery energy a storage recoil at that point. Exploitation a hybrid vehicle it permits the electrical power is generally obtained from an drive. The hybrid vehicle is loosely divided into a series and a parallel path. The power is taken from the series hybrid and it will be given to the battery setup. After that battery provides this power to the motor. About parallel connection, each the engine and a electric motor give the propulsion power. The force is the add of each motor and an engine. We can employ the motor as generator which can generate the power. That generator is coupled with an engine. Both series or a hybrid will absorb a power through a regeneration throughout a braking or a retardation.

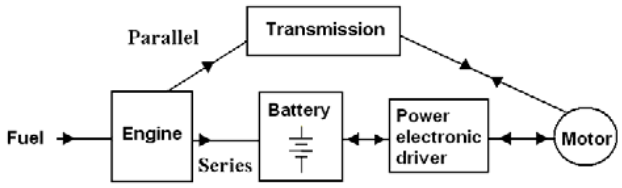

Chart -1: series and parallel way of an Hybrid Electric Vehicle

The initiation of a plug-in a HEV that solves a number of the matter [2]. It receive the electrical power to a battery through connect from the mains. So once convenient, users could charge the battery by using an AC supply from the mains.

3. THE KEY PARTS IN EV

This vehicle is very straightforward in a structure.

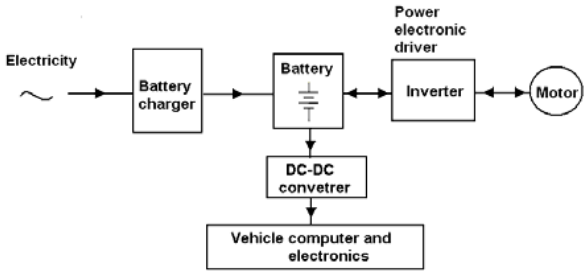

Chart-2: Main parts of an Electric Vehicle

The primary energy storage is that of the battery. The charger is designed to transfer a power from the mains to the battery charger [3]. The voltage of battery is in DC form and the motor is powered by an electric power inverter that is reversed into switched-mode signal. The remaining electronic parts in a electric vehicle also powered by the battery through DC-DC unit.

4. THE MOTORS

We have a lot of motors accessible for electrical vehicle. DC motors, an induction motor, BLDC motor, a permanent magnetic electric motor and switched a reluctance motor.

4.1 DC Motors:

DC motor is a basic motor which was used for a long period for the motor control. All the electromechanical conversion power is transmitted to the rotor by stationary brushes that are in touching the connection with the commutator 's copper segments. It needs some repairs and has a lower life cycle. It is, however, sufficient for the application of a low power. Likewise, It has discovered applications in an electric wheel-chair, a transporter and the micro-car. Now a days , DC motors are used for the lot of golf-carts. Which having less power level than 5kW.

4.2 AC Motors:

An AC motor is very common. In variable speed applications such as air conditioners, an elevator or an escalator, it still has wide markets shared. Many of the hybrid vehicles with a higher output use induction motors for more than the 5kw. A variable drive is normally used to control the speed and provide the torque.

4.3 BLDC Motors:

It is the same as DC motors with Permanent Magnets. It's referred to as brushless because it doesn't has the commutator and a brush arrangement. The commutation is completed electronically in this motor due to this BLDC motors are a maintenance free. BLDC motors have traction characteristics like high starting torque, It's having high efficiency near about 94.00%-98.00%, etc. BLDC motors are suitable for a high power density design approach. The BLDC motors are the most popular motors for the electrical vehicle application due to its traction characteristics.

4.4 Synchronous Electric Motors:

Stator of synchronous motor is equivalent to asynchronous motor. We fitted a rotor with permanent magnets. It is similar to an electric motor, but a permanent magnet produces the field air-gap. Voltage is having the sin wave produced by PWM.

4.5 Switched Reluctance Motors:

Due to fault resistance, This is a machine which have variable reluctance and is recently popular because each stage is decoupled from another. The power stage of this motor is different from the motor which is discussed in 2-4 point. In a fly back circuit style, every phase winding is linked.

5. CHARGING ARRANGEMENT

5.1 Common charger:

Every battery requires charger for charging. For dull charger, or rapid charger both need to control more power. You require an H-bridge power converter [12].The converter is known for its reliability and it utilized in chargers and DC-DC converters.

5.2 Super-capacitor charger:

When the storage of power is varies from full to zero, voltage of Super-capacitor varies from full voltage to zero. This differs from battery as it can only vary about 25% in voltage. The voltage of the capacitor is internal, and does not come into contact with consumers. There is no need of transformer isolated converter. We can use tapped converter which has greater efficiency for power conversion [13]. This is simple in structure.

5.3 BMS (Battery Management System)

We require a strong Battery Management System. A collection of battery cells shape the battery structure. According to the structure, batteries are linked with each other in the of parallel or series. Monitoring and management of each of the cells should be carried out. In the condition monitoring the electric parameter and temperature are included. To provide a decision parameter for device management and safety, the calculated parameters are used. A battery-management system (BMS) usually consists of many purposeful blocks, together with a cut-off field-effect transmitters (FETs), fuel-gauge monitor, a cell-voltage monitor, a cell-voltage balance, a time period clock, temperature monitors, and a state machine. Many forms of BMS ICs are on the market. The grouping of practical blocks varies wide from an easy analog forepart, like the ISL94208 that gives leveling and observation and needs a microcontroller, to a standalone integrated resolution that runs autonomously (e.g., the ISL94203). Currently let's examine the aim and technology behind every block, similarly because of the execs, and cons of every technology.

5.4 Energy management systems

The energy storage also for the ultra-capacitor system, provided by capacitors. Other devices that hold an electricity, such as batteries. The same one, the same the control and a maintenance system for a conditioning will be used.

6. CHARGING ARRANGEMENT

6.1 Charging set-up

Due to the uncertainties of the power availability, locality as well as charge period, the EV charging system is problematic. In the latest development, battery charging time has been observed to be shorter. The Acid-LeadIts hardware limits batteries. The charge speed is fewer than 0.2C also its life span is severely reduced by a faster charge rate. Some batteries, including Li-ion recommended charge speed of 0.5C. The majority of electric cars usually have an own battery charger set up. There is power cable is connected between the car and charging spot. In the case of charging station they can have a variety of charging points. A usual charge capability is typically less for personal cars.A standard charging power is less than 2.8kW. Single-phase power line is used. Each normal car is required to be charged every 3 days.

6.2 Rapid charging station

A high current is needed for rapid charging, so three-phase electricity is commonly used. That station must provide the system of connecting the 3-phase socket to consumers. As not all civilians can tolerate the use of the 3-phase socket system, There has been discussion of the following:

a. Contactless charging:

Here is no contact with metal, all the flow of power is by magnetic induction. This reduces the issue as a civilian has no need to touch the conductors to treat a high-power cable.

b. High voltage power transmit:

With a high voltage link, the strong and the size of cable and 3-phase socket will be decreased . The power supply is step up to a multiple high voltage and the cable is shortened. The car has another step-down converter that lowers the high voltage to an acceptable lowers voltage to charge the batteries.

c. Battery rental:

From the 1st day of the EV promotion, this was proposed. Users go to the charging station for switch the batteries to fully charge ones. User cannot operate the both batteries, but in a leased agreement. Only a few minutes is the time needed. These improvements should be made to the configuration of the EV.

7. BRAKING AND STEERING

7.1 Braking and power regeneration

In the past, a vehicle's braking was based on a mechanical method, like disc brake. Both mechanical and electrical. Braking should be incorporated into the braking a system of EV. In the original braking a wait should be added to the electrical power recovery brake pedal. Usually, the kinetic energy of the engine will be returned to a deceleration or down a slope. Today, we can manufacture motors with a high regeneration capacity at the expense the size of motor, which requires a balance between a motor weight, cost, efficiency of a power regeneration and a protection. Motor must be rendered with the approval of the high power configuration plugging a manner, that will provide high reverse torque to stop the vehicle, in an order to maximize the area of a power regeneration.

7.2 Anti-lock braking (ABS)

In most cars, a conventional ABS is mounted to avoid skidding and to achieve reliable braking efficiency. The characteristic of the braking depends on both the wheel slip and the ground condition[14].

7.3 Slip steering

Steering is accomplished by differentially changing the velocities of the wheel lines on different sides of the car. The long-term slip should be managed to convince the necessity of the spin radius, so the simulation uses the technique of slip constraint feedback. When the vehicle turns on a slimy ground, the drive wheels can slip due to a drop in the road adhesion coefficient. The control of the traction the mechanism decreases the torque of the engine and takes the sliding wheel into the wanted range of skids.

8. ELECTRIC VEHICLE SHOW CASES

In many countries,There are lot of local and multinational companies and institutions are working on an electric vehicle. Developing the new technology in electronic parts and accessories from impulsion, security, and a control has been reported.

9. CONCLUSION

This paper provides the information about new innovation in an electric vehicle. The paper describes a structure of electric vehicle and the energy storage. Then it will extends to the longer term vehicle parts. This paper have an outline of the current work unit adds the region.

10. ACKNOWLEDGMENT

The author acknowledges the support of Ashokrao Mane Group Of Institute and the Electrical Department for the EV work.

11. REFERENCES

[1] Jones, W.D., "Hybrids to the rescue [hybrid electric vehicles]", IEEE Spectrum, Vol. 40(1), 2003, pp. 70 – 71.

[2] Jones, W.D., "Take this car and plug it [plug-in hybrid vehicles]", Spectrum, IEEE, Vol. 42, Issue 7, July 2005, pp. 10 – 13.

[3] Hyunjae Yoo; Seung-Ki Sul; Yongho Park; Jongchan Jeong, "System Integration and Power-Flow Management for a Series Hybrid Electric Vehicle Using Supercapacitors and Batteries", IEEE Trans. on Industry Applications, Vol. 44, Issue 1, Jan.-Feb. 2008, pp. 108 – 114.

[4] Haddoun, A.; Benbouzid, M. E. H.; Diallo, D.; Abdessemed, R.; Ghouili, J.; Srairi, K., "A Loss-Minimization DTC Scheme for EV Induction Motors", IEEE Trans on Vehicular Technology, Vol. 56(1), Jan. 2007, pp. 81 – 88.

[5] Jinyun Gan; Chau, K.T.; Chan, C.C.; Jiang, J.Z., "A new surface-inset, permanent-magnet, brushless DC motor drive for electric vehicles", IEEE Transactions on Magnetics, Vol. 36, Issue 5, Part 2, Sept 2000, pp. 3810 – 3818.

[6] Chau, K.T.; Chan, C.C.; Chunhua Liu, "Overview of Permanent-Magnet Brushless Drives for Electric and Hybrid Electric Vehicles", IEEE Trans. on Industrial Electronics, Vol. 55, Issue 6, June 2008, pp. 2246 –

2257.

[7] Rahman, K.M.; Fahimi, B.; Suresh, G.; Rajarathnam, A.V.; Ehsani, M., "Advantages of switched reluctance motor applications to EV and HEV: design and control issues", IEEE Transactions on Industry Applications, Vol. 36, Issue 1, Jan.-Feb. 2000, pp. 111 – 121.

[8] Jones, W.D., "Putting Electricity Where The Rubber Meets the Road [NEWS]", IEEE Spectrum, Vol. 44, Issue 7, July 2007, pp. 18 – 20.

[9] Affanni, A.; Bellini, A.; Franceschini, G.; Guglielmi, P.; Tassoni, C., "Battery choice and management for new-generation electric vehicles", IEEE Trans. on Industrial Electronics, Vol. 52(5), Oct. 2005, pp. 1343 – 1349.

[10] Chan, C.C. The Present Status and Future Trends of Electric vehicles, Science and Technology Review, Vol. 23, No. 4, Feb 2005

[11] Andrew Williams, "MIT Battery Breakthrough Could Revolutionize Electric Cars", March 12th, 2009 in Batteries, Electric Cars (EVs), http://gas2.org/2009/03/12/mit-battery-breakthrough-could-revolutionize-electric-cars/

[12] Y.Lu, Cheng K.W.E., S.L.Ho, J F Pan, "Passivity-Based Control of Phase Shifted Resonant Converter", IEEE Proc. Elect. Power Appl., Vol. 152(6), Nov. 2005, pp.1509 – 1515

[13] K.W.E.Cheng, "Tapped inductor for switched-mode power converters", 2nd Int. Conference on Power Electronics Systems and Applications, 2006, pp. 14-20.

[14] Chikhi, F. El Hadri, A. Cadiou, J.C. " ABS control design based on wheel-slip peak localization". Proceedings

of the Fifth International Workshop on Robot Motion and

Control, Publication Date: 23-25 June 2005, pp.73- 77