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Recent Work in Charging of Electric Vehicle

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Abstract: Due to lot of pollution created by petrol and diesel cars, electric cars are gaining attention overall the world. All the automobiles company is building electric vehicles. This paper gives an idea of the recent work with electric vehicles. The paper describes the production of different component parts and their comparison. The main components are studied in battery technology, charger design, engine design, steering and braking. Electrical vehicle need charging station too for smooth running. To make EVs more comfortable and inspire car users to buy this new generation of vehicles, it seems important to have reliable, autonomous and effective charging stations in our homes or in the street. The real problem at present relates to two essential points, the charging time and the availability of the recharge station. However, numerous requirements relate to finding the best charger mode, which guarantees the efficiency and the minimum charging time. The minimum recharge time is expected to be related to the fixed recharge station and this mode is only efficient in fixed cars. The real problem, though, is connected to the running cars, where it is inappropriate that the vehicle should be stopped in the middle of travel and we cannot find a real recharge station.

Keywords: AFS, Batteries, Chargers Station, Electric Vehicle, PV, Statistics, Steering System, Wireless.

INTRODUCTION

Electric vehicle (EV) having electrical propulsion system. There is no internal combustion engine. All the power as the source of energy is based on electric power. The main advantage is the high power conversion efficiency through its electric motor proposal system[1]. Massive research and development work has recently been recorded in both academia and industry. Commercial vehicles are also available. Several countries have provided users with benefits through lower tax or tax exemption, free parking, and free charging facilities. By contrast, an alternative is the hybrid electric vehicle (HEV)[2]. It has been widely used in the last couple of years. Over hybrid electric vehicles almost all car manufacturers have at least one variant. In recent years, vehicle design has been based on version of electric vehicles. However, the latest statistics on car users in more than America and Europe showed that those drivers favored electric vehicle variant over internal combustion engine-based vehicle version. The researchers have proven the fragility and volatility of oil prices, as well as the adverse environmental effects.

Accompanying climate change with its energy matrix, which is based on fossil fuels, allows mass use of electrical mobility, a stylish choice due to fossil fuel independence[3]. The use of electric vehicles requires special control that supports the requirements of the mobile system and the corresponding organization that supports the supply of energy, particularly the refueling stations. The different architectures described in the word for electric vehicles are divided into two specific models. The hybrid electric vehicles (HEV) and the other

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types of electric vehicles, where there is more than one. The hybrid one is defined by two types of energy, fuel and electricity, while the other is based entirely on electricity. Every model has some advantages, such as the flexibility, price and weight. The inconvenience can be conveyed by difficulty of the device, and the touch of maximum speed. Electric vehicles are energy-based and environmentally friendly rechargeable but use a great deal of power every day. As a result, the power shortage is rising, forcing it to search for another energy source such as solar energy. It can be noted after a lot of studies that the main problem linked to those models of electric cars is related to the method of recharging[4].

EV AND HEV:

Over the past decade, HEV has been widely promoted. Almost every product is supplied with at least one HEV. At that time, it is supposed to rescue the battery power storage issue. It ensures the electrical power can be generated from the engine using hybrid vehicle (Fig. 1). The HEV is commonly divided into series hybrid and parallel hybrid. The series hybrid engine power is connected entirely to the battery[5]. The entire power of the motor is derived from the battery. Both the motor and the engine contribute the propulsion power for the parallel hybrid. Torque is the number of both the engine and the motor. Often, the motor is used as a generator for storing engine power through the transmission. The Bothe series or hybrid can absorb power during braking or deceleration by regeneration[6].

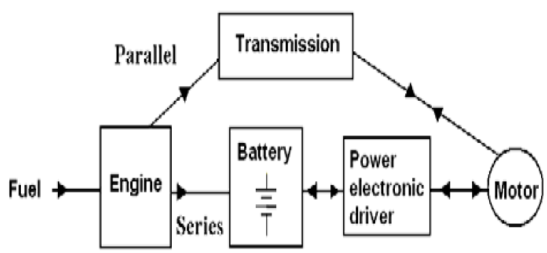

Figure 1: The Series or Parallel Path of an HEV

Nevertheless, emissions from HEV remain. Introducing HEV plug-in solves some of the problem. It accepts electrical power from the mains to battery via plug-in. Therefore, users may charge the battery from the mains using AC when it's convenient.

THE MOTOR

DC motors:

It is a standard motor and has long been used in motor control. All the power involved in electromechanical conversion is transferred to the rotor via stationary brushes in contact with the commutator's copper segments. This needs some care, and has a shorter lifespan. It is however ideal for application with low power. It has found applications in wheelchair, transporter, and micro car electrics. Many golf-carts use DC motors today. The power level is < 4kW[7].

Induction motor:

It's a common AC motor. For variable speed drive applications such as air conditioning, elevator or escalator, it also has a large market share. Many of the higher-power electric vehicles use induction motor for more than 5kW. A vector drive is typically used to provide control of the torque and rpm.

DC brushless motor:

The modern DC motor is mechanically poor due to the stationary low-power winding, the ground, while the main high-power winding rotates. The DC brushless motor is turned inside out. The high-power winding is placed on the motor's stationary side and a permanent magnet is used for the field excitation on the rotor. The engine has longer service life than the DC motor but is a few times more expensive. Most of the DC motor can be replaced with suitable driver by the brushless motor. Its applications are currently found in low power EV.

Permanent magnetic synchronous motor:

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The stator resembles that of an induction motor. We were fixed by a rotor with permanent magnets. It is similar to an induction motor; however a permanent magnet creates the air-gap recorded. Driving voltage is Pulse Width Modulation (PWM) provided by sine wave[8].

Switched reluctance motor:

Because of the fault tolerance it is a variable reluctance machine. It is popular recently because each process is decoupled from another. The power stage is distinct from that mentioned in the 2-4 engines. Every winding phase is connected in a fly back mode.

ENERGY STORAGE

Batteries:

The battery is the main storage power in the electric vehicle. In-fact the battery controls the electric vehicle's performance. Massive works are reported recently in battery production. The battery like Li-ion is now being used by new electric vehicle generation. Many have apparently researched the danger of the battery's instability. The LiFePO4 type seems to be preferred due to its chemically stable and intrinsically healthy existence. Certain li-ions such as LiCoO2, LiMn2O4 and Li (Ni1/3Mn1/3Co1/3) O2 may be concerned with thermal and overload. The lead-acid battery remains a dominant part of the market for low cost solution. The battery found applications in the air of electric wheelchairs, golf carts, micro cars and neighborhood cities. Also the recent RoHS has halted NiCd battery usage.

Ultra-capacitor:

Essentially, the capacitor is a static component. The elements are without chemical reaction. The rates of charge and discharge are very fast. Yet the storage of energy is small. Its amount of energy storage is less than 20 per cent of the lead-acid battery. Although the expected density of ultra-capacitors will increase in the next few years, its overall solution to main energy storage is a challenge. The number of cycles is great, and the temperature range. Hence ultra-capacitor is beneficial for fast speed or transient storage of energy. Because it enables high current charging, the charging time can be reduced to a few minutes. The ultra-capacitor is still being developed in the initial stage. The cost is expected to go down and the energy output is expected to increase steadily in the next few years. Table 1 shows the comparison of various energy storage units.

Table 1: Comparison of Various Energy Storage Units

	Lead-acid	NiMH	Li-ion	Ultra-capacitor
Energy density Whr/kg	40	70	110	5
Cycle life	500	8,00	1,000	500,000
Working temperature(°C)	-30 ~ +50	-40 ~+50	-40 ~ +60	-40 ~ +85
Cost $/kWhr	1,000	2,400	5,000	50,000

CHARGING SYSTEMS

General charger:

The charger needed for the slow charging or quick charger battery system is both critical for handling high power. It needs the H-bridge power converter. The converser is shown in Fig 2. The converter is well-known for its performance, and has found application in charger and DC-DC converter.

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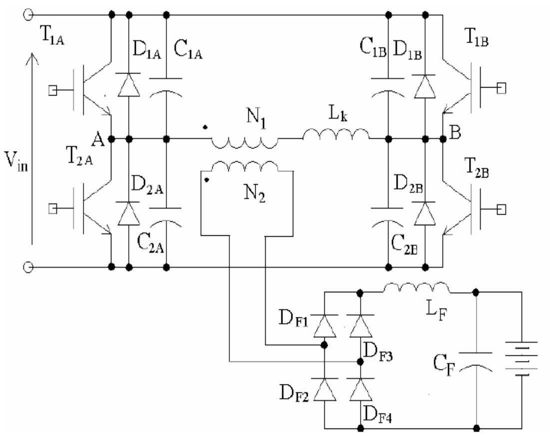

Figure 2: H-Bridge Converter for Charger

Ultra-capacitor charger:

The voltage ranges from high-voltage to zero on the ultra-capacitor as nits concentration of energy varies from full to zero. This is different from the battery because its voltage can vary only within 25%. The voltage of the condenser is internal, and is not in contact with users. Isolated converter transformer is not required. A tapped converter should be used for power conversion, as it will have higher efficiency. The power converter's efficiency is greater than that of the transformer-isolated version[9].

Battery management systems:

It is also known as BMS. A series of battery cells make up the battery system. They are connected in parallel or in series that are built accordingly. Each one of the cells should be monitored and controlled. Monitoring of the conditioning shall involve voltage, current and temperature. The calculated parameters are used to provide feedback and security of the system's decision parameter. This usually provides two parameters. These are state of charge (SoC) and state of health (SoH). SoC is similar to oil tank meter providing the requirement for charging the battery. It is determined by Voltage and Current data. The SoH is to report the state of health or ageing. There are some meanings but the most common is:

SoH = (Nominal Capacity – Loss of Capacity)/ Nominal Capacity

Cell balancing is to ensure that each cell operates under the same conditioning, or a regulation is used by the balancing control to charge or discharge each cell. It prevents overloading of a single cell.

Wireless Charger:

This system's theory is focused on the magnetic connection between a transmitter and a receiver, due to the wireless power transmission system. This approach combines vandalism with ease of use and robustness. The electric vehicle wireless charging system, as shown in Fig. 3, is divided into two main parts: primary mounted on the ground and secondary incorporated at the EV edge.

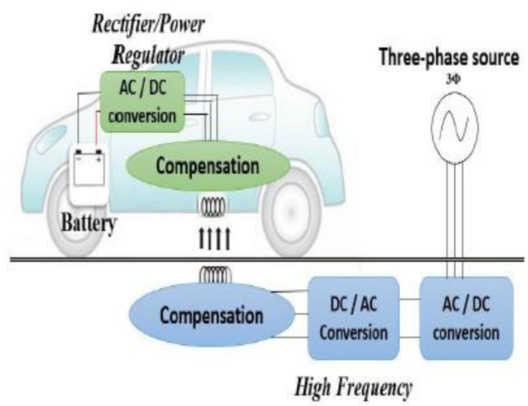

Figure 3: Diagram of Wireless charging system of electric vehicles

The main parts are AC / DC converter, DC / AC converter, which improve the frequency and the compensation. The secondary components provide compensation and AC / DC converter. The power technology for charging systems requires high efficiency and high power density to convert the power. Use of a resonant converter in a variety of power switching applications has become popular. The system must therefore run at a high switching frequency imposed by the AC / DC inverter as this charging system is characterized during transmission

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by a lot of energy losses. Globally, the wireless charging system consists of two converters, such as DC / AC and AC / DC. The DC input is obtained from the source for the DC / AC conversion, and is filtered through the capacitor. After this DC input is an inverter that operates at a switching frequency. Thus this step transforms the DC current of the DC input into an alternating high frequency current. The inverter output current is the input current at a high frequency emission of the primary resonant side. The AC output of a resonance inverter is corrected and filtered in the AC / DC conversion. The roughly sinusoidal current is rectified by a Diodes Bridge network and filtered by a condenser to supply a DC voltage or electric vehicle battery.

CHARGER IN HYBRID ELECTRIC VEHICLE

The first features an electric motor coupled with a gasoline engine. Electric motor operation has two modes. Motor mode assists the motor during the start and for a low speed zone. Nevertheless, the electric motor will be an electrical generator at high speed region, and the ICE must take the action phase. The batteries are then charged via the generator mode. On hybrid electric vehicles, the electric motor can put energy into the batteries as well as pull energy from them. The motor / generator converted the kinetic energy into electricity to recharge the batteries during the deceleration phase, thus ensuring an increased role of motor braking and relieving the mechanical brakes[10]. An ICE is there in electric hybrid vehicle, also known as a combustion engine, also seen on most vehicles. The system consists of five main components: the battery, the electric motor / generator, the internal combustion engine (ICE) and the power-sharing unit shown in Fig.4.

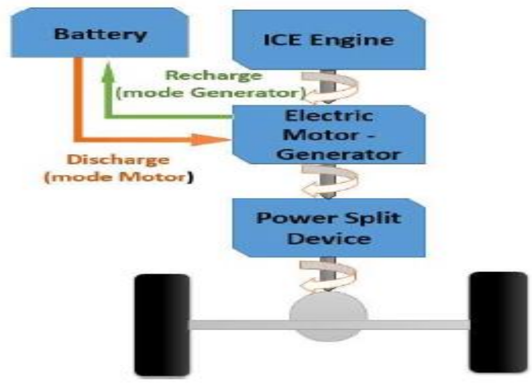

Figure 4: HEV Basing on Pure Electrical Charger

The second electric hybrid vehicle is composed of two electric motors, an ICE, and a battery system. Every electric motor has its own particular power and dimension. The main electrical motor has important power inside the vehicle, the electrical generator has a size and power less than the first type, and when the batteries reach a particular limit point, the ICE will be working. Usually, the main electric motor drives the car in all situations and has input from the batteries. When the battery charge level is below the fixed limit the ICE will be operated through the electrical generator for a particular speed for the given power (Fig. 5). It is also possible to have power when the car to the vehicle connection is stopped through the Grid. The machine contains five main components: the battery, the electric motor, the turbine, the internal combustion engine (ICE) and the power-sharing unit[11].

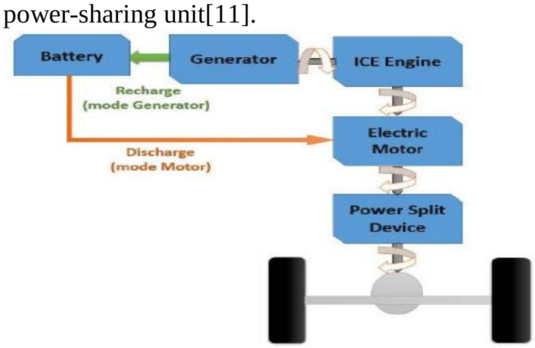

Figure 5: HEV Basing on Hybrid Charger

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CONCLUSION

This paper discusses the recent developments in electric vehicles. The paper first describes the general structure and discusses energy storage. Then it extends to the charging system used in electric vehicles. Comparison of various energy storage units is also represented and different methodologies for charging electrical vehicles are covered in this paper. At last charge in hybrid electrical vehicle is explained. Electric vehicles needs more research to become more advance for daily use of common people.

REFERENCES

1. R. C. Bansal, “Electric vehicles,” in Handbook of Automotive Power Electronics and Motor Drives, 2017.
2. M. Dijk, R. J. Orsato, and R. Kemp, “The emergence of an electric mobility trajectory,” Energy Policy, 2013, doi: 10.1016/j.enpol.2012.04.024.
3. S. Manzetti and F. Mariasiu, “Electric vehicle battery technologies: From present state to future systems,” Renewable and Sustainable Energy Reviews. 2015, doi: 10.1016/j.rser.2015.07.010.
4. N. C. Onat, M. Kucukvar, O. Tatari, and Q. P. Zheng, “Combined application of multi-criteria optimization and life-cycle sustainability assessment for optimal distribution of alternative passenger cars in U.S.,” J. Clean. Prod., 2016, doi: 10.1016/j.jclepro.2015.09.021.
5. M. A. Hannan, F. A. Azidin, and A. Mohamed, “Hybrid electric vehicles and their challenges: A review,” Renewable and Sustainable Energy Reviews. 2014, doi: 10.1016/j.rser.2013.08.097.
6. A. Orlov and S. Kallbekken, “The impact of consumer attitudes towards energy efficiency on car choice: Survey results from Norway,” J. Clean. Prod., 2019, doi: 10.1016/j.jclepro.2018.12.326.
7. M. Al, J. Van, and H. Gualous, “DC/DC Converters for Electric Vehicles,” in Electric Vehicles - Modelling and Simulations, 2011.
8. J. Gao and J. Kang, “Modeling and simulation of Permanent Magnet Synchronous Motor vector control,” Inf. Technol. J., 2014, doi: 10.3923/itj.2014.578.582.
9. S. Li, J. Deng, and C. C. Mi, “Single-stage resonant battery charger with inherent power factor correction for electric vehicles,” IEEE Trans. Veh. Technol., 2013, doi: 10.1109/TVT.2013.2265704.
10. N. Mohamed, F. Aymen, B. H. Mouna, and S. Alassaad, “Review on autonomous charger for EV and HEV,” in International Conference on Green Energy and Conversion Systems, GECS 2017, 2017, doi: 10.1109/GECS.2017.8066273.
11. W. Wang, X. Chen, and J. Wang, “Motor/Generator Applications in Electrified Vehicle Chassis-A survey,” IEEE Trans. Transp. Electrif., 2019, doi: 10.1109/TTE.2019.2934340.
12. Abhishek Kumar, Bishwajeet Pandey, D M Akbar Hussain, Mohammad Atiqur Rahman, Vishal Jain and Ayoub Bahanasse, “Low Voltage Complementary Metal Oxide Semiconductor Based Energy Efficient UART Design on Spartan-6 FPGA”, "2019 11th International Conference on Computational Intelligence and Communication Networks (CICN)" during 3rd - 6th January, 2019 at University of Hawaii, USA.
13. Abhishek Kumar, Bishwajeet Pandey, D M Akbar Hussain, Mohammad Atiqur Rahman, Vishal Jain and Ayoub Bahanasse, “Frequency Scaling and High Speed Transceiver Logic Based Low Power UART design on 45nm FPGA”, "2019 11th International Conference on Computational Intelligence and Communication Networks (CICN)" during 3rd - 6th January, 2019 at University of Hawaii, USA.

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