Electric Vehicles and Its Power Sources

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ABSTRACT

As there are many vehicles in this automobile world recently the Electric vehicles are being introduced to the automobile industry. In addition to these electrical vehicles which are becoming popular .These vehicles decrease the pollution caused to the atmosphere. These vehicles do not release any harmful gasses into the atmosphere. This realization has made huge demand on Electric Vehicles and pressures on the industry to plan for electric vehicles manufacturing with high efficiency and minimizing the faults in motors.Batteries is the most expensive component in electric vehicles.Currently ,battery-powered vehicles use lithium-ion technology.Reducing the energy consumption of MES(main energy systems) and AES(auxiliary energy systems) of the vehicle battery is an effective means to increase the electric vehicle range.

Keyword : - *"Efficiency", "Electric Vehicle", "Marketing", "Optimisation".*

1.INTRODUCTION

In recent times, electric vehicles (EV) are gaining popularity, and the reasons behind this are many. The most eminent one is their contribution in reducing greenhouse gas (GHG) emissions. In 2009, the transportation sector emitted 25% of the GHGs produced by energy related sectors.EVs,with enough penetration in the transportation sector, are expected to reduce that figure, but this is not the only reason bringing this century old and once dead concept back to life, this time as a commercially viable and available product. As a vehicle, an EV is quiet, easy to operate, and does not have the fuel costs associated with conventional vehicles. As an urban transport mode, it is highly useful. It does not use any stored energy or cause any emission while idling, is capable of frequent start-stop driving, provides the total torque from the startup, and does not require trips to the gas station. It does not contribute either to any of the smog making the city air highly polluted. The instant torque makes it highly preferable for motor sports. The quietness and low infrared signature makes it useful in military use as well. The power sector is going through a changing phase where renewable sources are gaining momentum. The next generation power grid, called 'smart grid' is also being developed. EVs are being considered a major contributor to this new power system consisting of renewable generating facilities and advanced grid systems. All these have led to a renewed interest and development in this mode of transport. The idea to employ electric motors to drive a vehicle surfaced after the innovation of the motor itself. From 1897 to 1900, EVs became 28% of the total vehicles and were preferred over the internal combustion engine (ICE) ones. But the ICE types gained momentum afterwards, and with very low oil prices, they soon conquered the market, became much more mature and advanced, and EVs got lost into oblivion. A chance of resurrection appeared in the form of the EV1 concept from General Motors, which was launched in 1996, and quickly became very popular. Other leading carmakers, including Ford, Toyota, and Honda brought out their own EVs as well. Toyota's highly successful Prius, the first commercial hybrid electric vehicle (HEV), was launched in Japan in 1997, with 18,000 units sold in the first year of production. Today, almost none of those twentieth century EVs exist; an exception can be Toyota Prius, still going strong in a better and evolved form. Now the market is dominated by Nissan Leaf, Chevrolet Volt, and Tesla Model S; whereas the Chinese market is in the grip of BYD Auto Co., Ltd (Xi'an National Hi-tech Industrial Development Zone, Xi’an, China). EVs can be considered as a combination of different subsystems. Each of these systems interact with each other to make the EV work, and there are multiple technologies that can be employed to operate the subsystems. key parts of these subsystems and their contribution to the total system is demonstrated. Some of these parts have to work extensively with some of the others, whereas some have to interact very less. Whatever the case may be, it is the combined work of all these systems that make an EV operate.

1.1 Electricity sources connection

to generator plants

- Direct connection to generation plants as is common among electric trains, trams, trolleybuses, and trolley trucks (overhead lines, third rail and conduit current collection)
- Online electric vehicle collects power from electric power strips buried under the road surface through electromagnetic induction

1.2Onboard generators and hybrid EVs

Generated on-board using a diesel engine: diesel–electric locomotive and diesel–electric multiple unit (DEMU)

- Generated on-board using a fuel cell: fuel cell vehicle
- Generated on-board using nuclear energy: nuclear submarines and aircraft carriers
- Renewable sources such as solar power: solar vehicle

It is also possible to have hybrid EVs that derive electricity from multiple sources, such as:

- On-board rechargeable electricity storage system (RESS) and a direct continuous connection to land-based generation plants for purposes of on-highway recharging with unrestricted highway range[34]
- On-board rechargeable electricity storage system and a fueled propulsion power source (internal combustion engine): plug-in hybrid

1.3Onboard storage

These systems are powered from an external generator plant (nearly always when stationary), and then disconnected before motion occurs, and the electricity is stored in the vehicle until needed.

- Full Electric Vehicles (FEV). Power storage methods include:
    - Chemical energy stored on the vehicle in on-board batteries: Battery electric vehicle (BEV) typically with a lithium-ion battery
    - Kinetic energy storage: flywheels
    - Static energy stored on the vehicle in on-board electric double-layer capacitors

Batteries, electric double-layer capacitors and flywheel energy storage are forms of rechargeable on-board electricity storage systems. By avoiding an intermediate mechanical step, the energy conversion efficiency can be improved compared to hybrids by avoiding unnecessary energy conversions. Furthermore, electro-chemical batteries conversions are reversible, allowing electrical energy to be stored in chemical form.

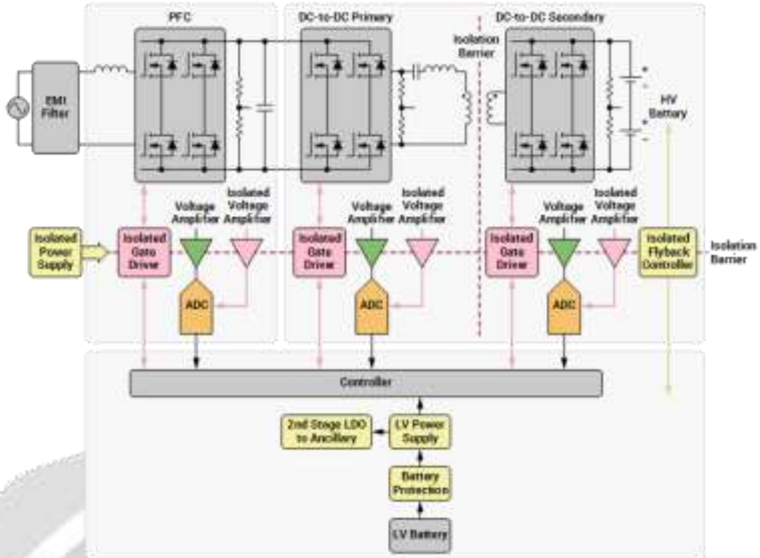

Fig -1: On-Board Charger

2. BATTERY PARAMETERS

Batteries were the limiting factor that led the electric vehicle to disappear from the transport field; the component that was the only energy storage was the component with the highest cost, weight and volume. In addition, autonomies reached by batteries were significantly lower than autonomies of fuel powered vehicles

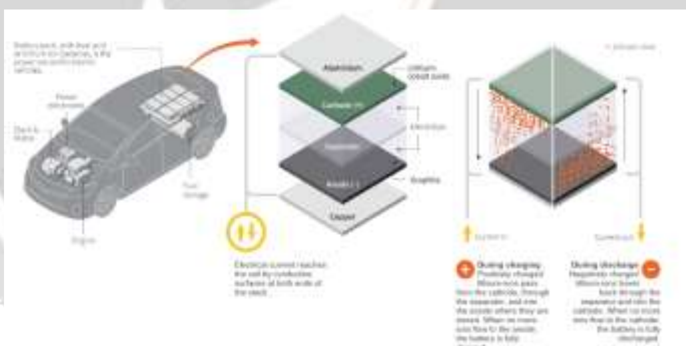

Fig -2 lithium-ion batteries

2.1 Battery Capacity

The capacity of a battery is the most important parameter and it is usually expressed in Amphour. If a battery is of 10 Amphours, this means that it can provide 1 A for 10 hours. However, the same battery would not deliver 10 A in 1 hour because the capacity of a battery depends directly on the way the energy is extracted; the quickest the energy is extracted the less capacity the battery has.

2.2 Battery Characterization

Electrical and mechanical changes that occur in a battery due to its charging and discharging are essential to monitor in an EV. Battery failures may occur in an electric vehicle due to many reasons like loss of function in associated electronics,heat runaway on a charge, and connector failures. Precise detection of these failures was reported recently using a UV-based MEMS sensor that can detect electric arc as they develop.Electric vehicle's battery capacity is measured in kilowatt-hours (kWh),it is same as the units measured in home appliances in electric meter records to determine your monthly electric bill.In the EV world, kilowatt-hours are to batteries as gallons are to gas tanks. But a full battery can't be completely equated with a full fuel tank.

3. Charging stations

A charging station, also known as a charge point or electric vehicle supply equipment (EVSE), is a piece of equipment that supplies electrical power for charging plug-in electric vehicles (including electric cars, electric trucks, electric buses, neighborhood electric vehicles, and plug-in hybrids).

There are two main types: AC charging stations and DC charging stations. Batteries can only be charged with direct current (DC) electric power, while most electricity is delivered from the power grid as alternating current (AC). For this reason, most electric vehicles have a built-in AC-to-DC converter, commonly known as the "onboard charger". At an AC charging station, AC power from the grid is supplied to this onboard charger, which produces DC power to charge the battery. DC chargers facilitate higher power charging (which requires much larger AC-to-DC converters) by building the converter into the charging station instead of the vehicle to avoid size and weight restrictions. The station then supplies DC power to the vehicle directly, bypassing the onboard converter. Most fully electric car models can accept both AC and DC power.

3.1Battery swapping

Instead of recharging EVs from electric sockets, batteries could be mechanically replaced at special stations in a few minutes (battery swapping).

Batteries with greater energy density such as metal-air fuel cells cannot always be recharged in a purely electric way, so some form of mechanical recharge may be used instead. A zinc–air_battery, technically a fuel cell, is difficult to recharge electrically so may be "refueled" by periodically replacing the anode or electrolyte instead.[73]

Fig -2:Battery Swapping Stations

3.2 Dynamic charging

TRL (formerly Transport Research Laboratory) lists three power delivery types for dynamic charging, or charging while the vehicle is in motion: overhead power lines, and ground level power through rail or induction. TRL lists overhead power as the most technologically mature solution which provides the highest levels of power, but the technology is unsuitable for non-commercial vehicles. Ground-level power is suitable for all vehicles, with rail being a mature solution with high transfer of power and easily accessible and inspected elements. Inductive charging delivers the least power and requires more roadside equipment than the alternatives.

Alstom and other companies have, in 2020, begun drafting a standard for ground-level power supply electric roads. The European Commission published in 2021 a request for regulation and standardization of electric road systems. Shortly afterward, a working group of the French Ministry of Ecology recommended adopting a European electric road standard formulated with Sweden, Germany, Italy, the Netherlands, Spain, Poland, and others.The standard, CENELEC Technical Standard 50717, is scheduled to be approved and published by November 14, 2022

4. CONCLUSIONS

EVs are having huge potential for the future transport communication, by replacing the present conventional vehicles. EVs will be becoming much more eco-friendly by saving the planet from global warming, by reducing the greenhouse gasses emitted from present vehicles. Sensors are used in automotive applications, some of which are commonly used in EVs.

Finally, we have reported about the various kinds of microfabricated sensors which are recently coming into play through MEMS-based research and can be used for applications like motion sensing, battery sensing, energy harvesting, etc. This miniaturized sensor will help to reduce the cost, space, and give better sensing capability for the upcoming vehicles. Further, research needs to be done by the laboratories in collaboration with the automobile industries on EVs and its sensors to give all of us a better future with pollution-free environment.

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