Comprehensive Analysis of Electric Vehicles

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***Abstract*:- This paper proposes the recent development of electric vehicles across the global automobile industry. It provides an overview about the transportation infrastructure through the electricity. Electric vehicle drives offer a number of advantages over conventional internal combustion engines, especially in terms of lower local emissions, higher energy efficiency, and decreased dependency upon oil. EVs first came into existence in the mid-19th century, when electricity was among the preferred methods for motor vehicle propulsion. EVs saw a rising again due to technological developments, and an increased focus on renewable energy. This paper emphasizes the various components of electric drive and their choice of selection to make use.**

Keywords: HEV, IC Engine, BLDC Motor, Automobile Industry

I. INTRODUCTION:

In future electric vehicles had the main role in transportation. Existing fuel based internal combustion an engine has been replaced by EV. More research analysis and implementation had take place in automobile industries by means of electrical energy sources due to exhaust of oil resources [1]. In the other way EV have more efficiency, less noise and no pollution. This paper provides the information about the system of EV and need for that in the environment. Many of the car manufacturers and heavy vehicle factories were focusing on the electric based locomotive for future usage.

II. EV AND HEV:

As the renewable energy become emerging technology in the production of electrical energy and it is the cause for EV and HEV came in to existence. Subsequently the development of power electronics and their concepts will make the EV and HEV more reliable and stable in operating. By the above the EV and HEV has got promoted extensively in the last decades [2].

III. TYPES OF EV:

In general the EV can be categorized or analyze as plug in electric vehicle, hybrid electric vehicle, on and off road vehicle Rail borne electrical vehicle and many more.

IV. PARALLEL AND SERIES HEV:

The term hybrid refers to the optimum utilization of electric power as well as the engine power .Engine power of series HEV is provided totally from the battery. As the battery provides the power to motor and it drives the transmission, where as the parallel HEV obtained the power from both battery and engines. It is parallel powered through battery and IC engines and drives the transmission. The torque is sum of both motor and engines. Moreover the parallel and series HEV the motoring as well as generating phenomenon can take place. It is like to be a flywheel in internal combustion engines.

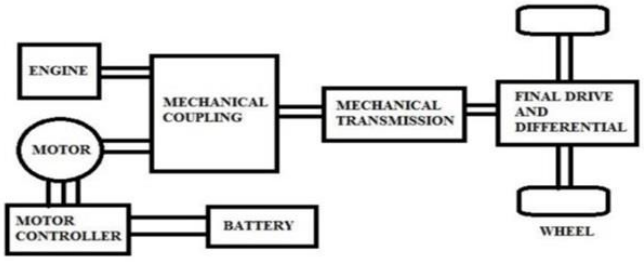

Fig.1 Block Diagram of Series and Parallel HEV

V. VARIOUS SYSTEMS IN EV

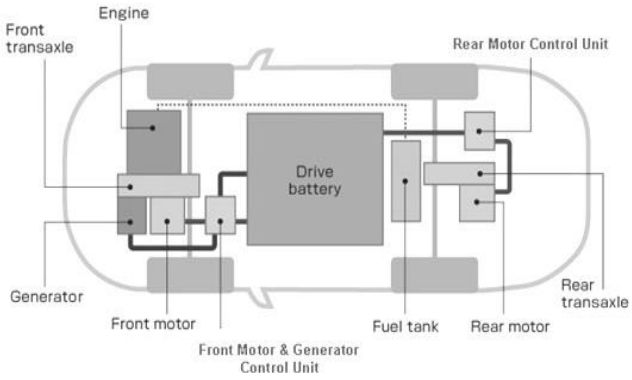

Fig.2 Outline of a EV system

VI. MOTOR AND DRIVE SYSTEM:

Automakers had the possibilities in the implementation of EV and HEV to real time operation with the dominant support of motors and electronic control technology. There are various motors available to for green vehicle like BLDC motors, AC induction motors, PM synchronous motors and switched reluctance motor [3].

Almost of EV were equipped with BLDC motors. Permanent magnet rotor surrounded by wound stator. The winding in the stator gets commutated electronically instead of brushes. This make the motor simple to maintain ,more durable, more efficient, lighter in weight and respond faster in high operating speeds. Also simple to control in regard to speed control and reversing. The motor can operate at unity power factor [4]. The composition of BLDC motor also keeps the machinery inside a vehicle cooler and thermally resistant. Since it is a brushless there is no dangerous brush sparking.

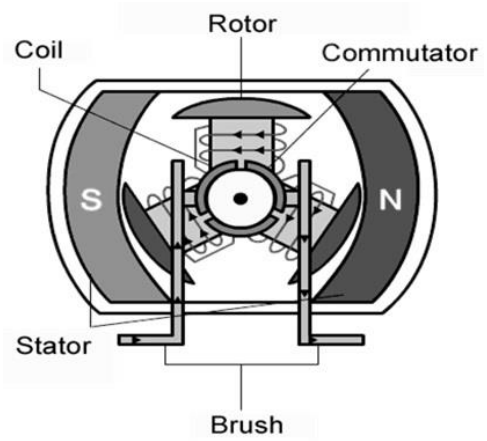

Fig.3 Construction View of BLDC Motor

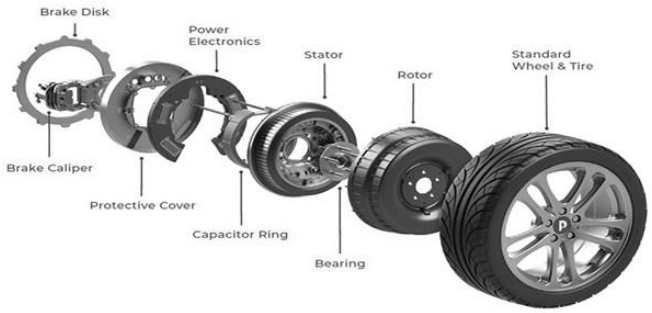

Fig.4 View of In Wheel Drive System in EV

VII. ENERGY STORAGE SYSTEM

The massive success of HEV is achieved by the energy storage systems that are batteries. As many components available in the HEV system of energy storage, batteries and capacitor had the vital role in the development of system. Recent strategy shows that lithium ion is the preferable battery for the optimum results of energy storage [5]. These batteries have high energy densities than lead acid batteries and nickel metal hydride batteries. By the lithium ion it is possible to make the battery size smaller than other and also retain the same storage capacity when compare to other batteries. Lithium ion battery technology uses materials which allow a higher density of lithium ions to be stored .This results in an increase in travel distance.

VIII. ULTRA CAPACITOR

Capacitor is a static component which works on the basis of dielectric. There is no chemical reaction in the component. The charging and discharging in ultra capacitor is very fast, however the energy storage is limited [7].

Fig.5 Block of Energy Storage

Till research and development on build the energy storage in capacitor for further improvement. Also it has the capability in high current charging and charged in few minutes. Although it has excellent in property it has some limitation in energy storage capacity.

IX. BATTERY CHARGING SYSTEM:

The battery charging system which is closely associates to the reliability of EV system. It is the mediate between energy storage system and source to the battery. This system deals with the charger requirements, charging stations, charger and time of charging. Battery charging system will provide the control and protection to the batteries from over voltage, over current and over temperature.

X. CHARGER REQUIREMENTS

The charger requirement is based on the type of vehicle and the number of cells which accommodate in the battery and the type of battery .Also the charger requirements is based on the electrical parameters of capacity (KWh), Voltage (volts), C rate (amps).

XI. CHARGING STATIONS:

Charging station merely deliver the energy to the vehicle in the form of high voltage AC or DC .It transforms the energy which can be directly applied to the battery through charger. Based on the supply, current and wattage ratings it can be of level1, level2 and level3 charging stations. Level 1 is of single phase AC up to 15amp and 120volts and 2KW of power. It is used in domestic applications with power cord and socket to connect. Level 2 is delivers up to 20KW of single phase or three phases AC with voltage levels of 400 and 80 amp. These connectors and cables are permanently fixed in the charging stations and the vehicle with the male connector being mounted and it is referred as coupler. Level3 refers to the DC charging or fast charging [6]. It will achieve very short charging times with high currents up to 400amp at 600volts delivering a maximum power of 240KW.

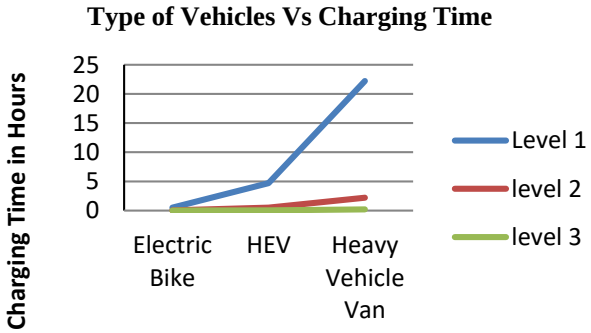

Fig.6 Chart of Various Level Chargers

XII. CONCLUSION:

This paper discusses the recent development in electric vehicle and also describes the various components and different systems in EV. In add to that explains about the energy storage and charging stations. It then extends to the future vehicle components.

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