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MODERN ELECTRIC VEHICLES: TRENDS AND CHALLENGES

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ABSTRACT

Now electric vehicles are used worldwide for single and multiple mass transportation. Due to some reasons the existing transportation system is changed. These are mainly depends on heat energy produced due to the engines of internal combustion, which are the more fuel prices, limitation on resources, production of gases, less efficiency. The one of the sustainable and effective way to solve all these problems without any changes to the existing system and comfort zone of consumer is electric power. But there are some problems in the present electric vehicle system. The big problem is lower distance is travelled on more charge this makes electric system uneconomical.in this paper we discuss different methods of energy management in the vehicles. Overall we discuss all the ways for making the electric vehicles efficient.

Keywords: *Electric vehicles (EVs), energy management, energy storage.*

I. INTRODUCTION

The demand of developed cities is basically an emphasis on green technology. The increased growth of the modern cities results into the more pollution due to this increase in harmful gases emission and produces problems to the biodiversity. Protective actions to be taken to minimize this emission of harmful gases and control the pollution of the environment. The use of combustion engines are reduced by using hybrid electric cars like Honda, Toyota. [1]Positive effect of these technologies on the environment is reduced gas emission. Now producing less emission powered vehicles is the biggest challenge in the research activities. Electric vehicles with renewable energies offer a best solution.

In this paper we discuss different challenges in the electric vehicles regarding with the general points, safety system, energy management in powertrain, passenger comfort energy management.

This paper aims to study power management and optimize the power requirements studied by previous researchers.

II. CHALLENGES

A.General Power Management Problems
B.Powertrain Energy Management
C.Safety Systems and Power Management
D.Passenger Comfort Energy Management
E.Energy Storage Management

Fixing these issues can increase efficiency of EV and make this type of transport more popular. [4]

A. General power management

Owners and society has many advantages of electric vehicles.

But because of the some major problems hybrid vehicles cannot be used for no of applications. Major problem is short distance is travelled which requires more energy and also consumes more time for the charging. Charging and discharging process is also another problem for energy management.in electric vehicles bank containing no of

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battery cells are used. Hence it is very important to take care of each battery cell in the bank.it makes the battery usages more economical. Electric vehicles required 5-6 hours for full recharging. Hence remaining storage of the battery is beneficial to the driver for planning the route of travelling.

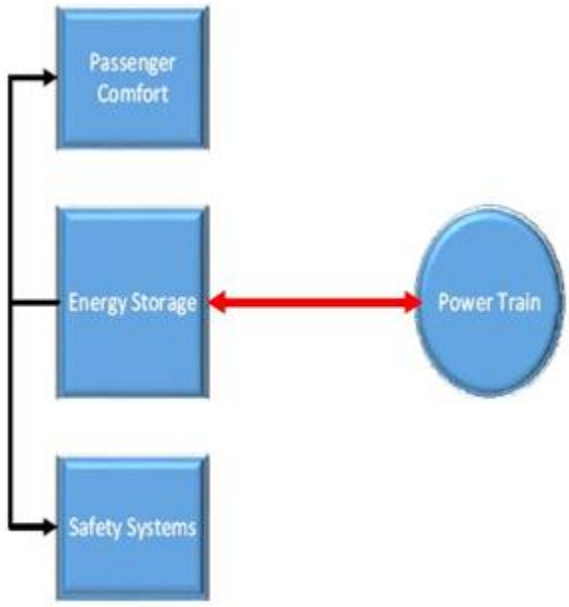

Fig.1 simple scheme of the power flows in EVs systems [4]

Modern concepts of electric vehicles are shown by fig.1. Energy consumption processes denoted by black arrow and bidirectional red arrow indicates the generating and energy consumption processes.

B. Powertrain energy management

Powertrain is the most essential component in electric vehicles.it generates as well as consumes energy. During braking a recovery of kinetic energy is done by electric motors and its components like alternator, gearbox. When all kinetic energy is converted into electric energy it is called ideal case and this energy is stored in the storing device which is battery. The energy to be stored is little bit higher and it must be stored within short interval of time.it requires special criteria from energy controlling device.

Several standard technics for powertrain energy consumption regarding to electric vehicles have been developed. NEDC (New European Driving Cycles) is one of the developed methods in Europe to minimize and control the power consumption for hybrid electric vehicles.

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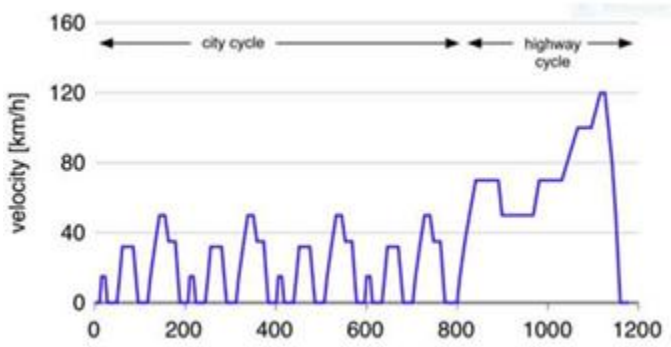

Fig.2 NEDC Cycles [5]

Acceleration, constant speed and braking time periods are displayed by fig.2, which describes the average run of city and highways. There should be less braking moments via the electric motors during cycle of the braking, in area where velocity of car is decreasing. The way for more energy generation is more braking moment's bye electric generators of the electric powertrain. [5, 6]

C. Safety system power management

Vehicle safety system consumes constant electrical energy.it includes passive safety system which contains airbags and seatbelts, active safety system contains steering and braking. For controlling the safety system there is no of sensors are placed on the each wheel of the vehicle to measure the spin of wheel and processor for controlling the system. Therefore, while driving on various surfaces it plays important role considering safety aspect. With the help of Anti – Block System (ABS) safe braking force distribution is applied for more effective braking process. Braking, seatbelt, airbags are the important units which gives safe condition for driver and passenger. Power steering requires 2.2kw power in critical condition which is the most consumable unit of the safety system.

D. Passenger comfort management

Condition of climate, lightening and resources for entertaining, are goes into the passenger comfort zone. Batteries are get cold in the wet climates and it requires heat energy to form the previous temperature condition of the battery it requires the warming up of the interior of electric vehicles. Coolant flow is the requirement of electric vehicles and it is fulfilled by using the electric pump. Hence temperature management in electric vehicle is the essential component. The sufficient range of the temperature is from -30 to +50oC. Cooling system can be used to cool down the batteries therefore no extra energy is required for that function. On other hand heating the battery is very complicated process.

The system which has significant effect on the electric vehicle is the ventilation system. As the high intensity of airflow can remove the dirt from wind screens, the more effective fans are required. Ventilation system consumes the power up to 1.1 KW.The Because of this ventilation system is vital challenge of safety system for effective energy consumption. [4]

E. Energy storage management

More recharge time and less energy density is difficult problem with the batteries. Battery packs weighing 500kg is the main requirement of modern electric vehicles for the better distance range. Bigger the battery packs then more the total inertia which increases vehicle mass also power required to move the vehicle. [10-12]

Increased performance and decrease the dependence on batteries is achieved by following storage systems.

[10] Capacitors storage systems

[11] Flywheel storage systems

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[12] Hydrogen Fuel Cells storing Systems.

All above systems have their benefits and limitation for Electric vehicle applications.

[1] Capacitor:-capacitor gives excellent charging-discharging time criteria, but stores lower amount of energy is main drawback. Hence commonly not in use.

[2] Flywheel:-When the flywheel is rotates at very high speed which is in the open air it can store energy effectively. The high efficiency and smallest size are the merits of flywheel. The main drawbacks of flywheels are high value and very a difficult system for transition. Because of which they have small range of usages. [12]

[4] Hydrogen fuel cells: - is the modified modern energy storage technique. The fuel cells of hydrogen have some special merits;

*A much ***higher energy density*** and ***lower energy losses*** within the system.
*Hydrogen storage is very ***effective for long-term energy storage.***
*An important feature of hydrogen storage is ***low recharging time.***

III. CONCLUSION

The main mottos of advanced searching activities are focused in controlling systems of electric vehicles. Management of power in all systems and generation processes are the main components of these activities. There is huge impact of power management systems on worldwide power network which are along with smart grid technologies. Hybridized vehicles which are using fuel cells of hydrogen as a stand by power source less emission can be maintained.

When considering range of driving and economy the energy density of pure electric vehicles are less compatible than the traditional internal combustion based vehicles. To overcome these problems there are many research activities that focus on increase the costs and travel distances of EV's. To improve the performance of electric vehicles, hybridization is used by power companies. Increased energy density in electric vehicles can be achieved by using the hybrid vehicles.

For energy storage hybrid hydrogen vehicles are the effective way. A set of medium sized battery and for backup purpose small fuel cell can be used for driving the electric vehicle conveniently.

Combining recovery as well as generation of energy in power management will improve performance of EV's significantly.

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