ELECTRIC VEHICLE MECHANISM

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Abstract – *This paper deals with electric vehicle mechanism. The main aim of EVM is to overcome the pollution and to save the resources like petrol, diesel for future generation. In electric vehicles electric motors are used for the movement of the automobile, electricity is the only resources for this. Electricity can be obtained by batteries or by the solar panels. Electric generator converts solar energy into electricity. Lithium ion battery is used mainly. Components, energy sources, batteries, efficiency, electromagnetic radiation, charging, battery swapping and safety are the main properties of EV. Earlier these vehicles didn't came into proper picture, nowadays many countries are looking forward to this. Electric vehicle and IC engine are compared with their limitation and advantages. Series hybrid vehicle mechanism is the proper electric vehicle mechanism in present generation.*

***Key Words*: Working of EV, comparison with IC engines, electricity sources, motor types, future electric car**

1. INTRODUCTION

An electric vehicle, also called EV, it uses one or more electric motors or traction motors for pushing vehicle. These may be powered through a collector system be electricity from off-vehicle sources or may be self-contained with battery, solar panels or electric generator. Electric generator which converts fuel to electricity. The power of electric motor are measured in kilowatt (kW). 100kw is equal to 134horsepower. Electric motors can give their maximum torque over a wide RPM range.The performance of an internal combustion engine can also deliver its maximum torque within a limited range of the engine speed for 100KW, whereas the electric motor exceeds the performance of an internal combustion engine by delivering its maximum torque over a wide RPM range for the same 100KW of power, these are losses in the motor and the drivetrain during the process of connection of electrical energy to mechanical energy. Over 90% of the electrical energy from the battery in converted to mechanical energy.
Generally, Direct current (DC) electricity is fed to DC/AC inverter in order to convert it into alternating current (AC) electricity which is connected to a 3 phase AC motor.

1.1 History

Fig-1: Evolution of electric vehicle

Electric motive power started in 1827, Anyos Jedlik built the first crude but feasible electric motor, provided with stator, rotor and commutator and then he used it to power a tiny car. IN 1835, professor sibrandus stratingh of the University of Groningen, the Netherlands, built a small-scale electric car**.** In between 1832 and 1839, Robert Anderson of Scotland invented the first crude electric carriage powered by non-rechargeable primary cells. In 1838, a Scotsman named Robert Davidson built an electric locomotive that attained a speed of six km per hour. The first mass-produced electric vehicles appeared in America in the early 1900s.Due to the limitations of storage batteries, electric cars did not gain much popularity, and electric trains obtained more popularity due to their economics and fast speeds. By the 20th century, rail transport by electric method became more popular. The UK was the world's largest user of electric road vehicles.

1.2 Working

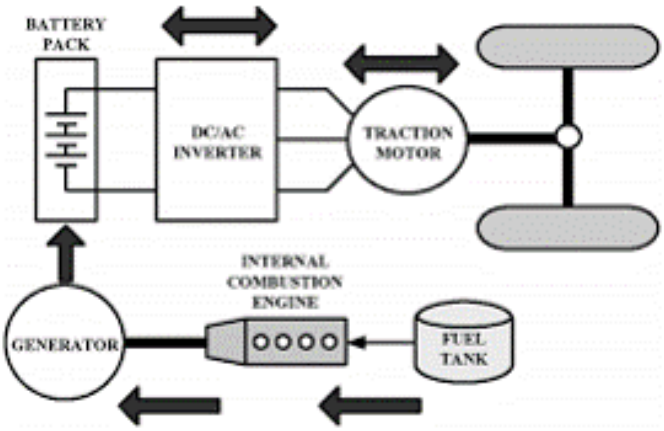

Fig-2: Series hybrid vehicle mechanism

Electric vehicles have achieved superior performance by analysing the technology behind the induction. Two types of motor are rotor-collection of conducting have short circuited by end rings and stator-3 phase AC input power is given to stator. The 3 phase AC current in the coils producer a rotating magnitude field, they induce current on the rotor ball to make it sun. In an induction motor the rotor always lags behind RMF. An induction motor does not contain brushes or permanent magnet but it is powerful and strong. N is directly proportional to f. The speed of the induction motor depends on the frequency of the AC power supply. By varying the frequency of the power supply we will be able to alter the drive wheel speed. This fact of the electric vehicle makes speed control easy and reliable the motor speed can rang 0to18, 000 rpm.This is the main advantage of electric vehicle when compose to the internal combustion vehicles.

Internal combustion engine produces usable torque and power output only within limited speed range. Connecting the engine rotation directly to the drive wheel is not a level idea, therefore we introduce a transmission to vary the speed of the drive wheel. Inductor motor speed ranges from 2000-4000 rpm but in an electric vehicle, the speed varying transmission is not needed.For some electric cars and electric trains, DC motors are often used, but in some cases universal motors are being used. In recent production various such motor types have be implemented for example- Induction motor within Tesla motors and permanent magnetic machines in Nissan leaf and Chevrolet bolt

2. Comparison with IC engine

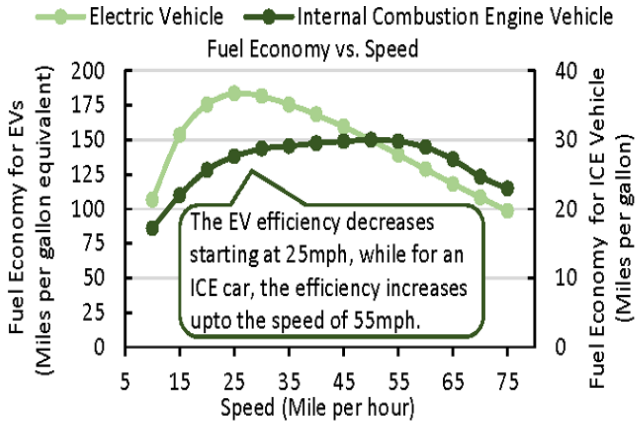

Fig-3: Comparison

An IC engine does not produce direct rotational motion. The linear motion of the given piston has to be converted to rotational motion, this causes major mechanical balance in problems. The power output of IC engine is always in even, therefore we need many accessorises to solve these problems. On the other hand electric vehicles will have direct rotational motion and uniform power output in addiction with an induction motor. Many components implemented in internal combustion engine. As a result of which we get a great response rate and a higher power to weight ratio resulting superior vehicle performance.

	IC	EVM
Weight	180kg	31.8kg
Power	140kW	270kW
W/p	0.8kW/kg	8.5kW/kg

Induction motor receiver the power from a battery package the battery produces dc power. So before getting rate the motor it has to be created into AC and inverter used for the conversion of DC to AC. The inverter can carry the amplitude of AC power which in turn control the output of the motor power. Therefore inverter acts as a brain of electric vehicle. Battery pack is a collection of lithium ion cells. These cells are connected in combination of series and parallel to produce the required power to run the electric vehicle. Glycol coolant id pass through the gaps between the cells. Instead of using big cells many small cells are used to promote effective cooling, this minimize thermal hot spots and also temperature is distributed evenly this ensures higher battery pack life. The power produced by the motor transferred to the drive wheels through gear box. Achieving reverse gear is quite easy in electric vehicles just by changing the order of power phase. The gear box consists of an open differential, these have a problem of traction control like in the case of slippery surface, even then the electric vehicle uses open differential because it is more rugged and can carry more torque. The problem that occurs in open differential can be overcome by two methods selective breaking and cutting the power supply. In internal combustion engine the power supply cut by cutting the fuel is not so effective therefore in induction motor this power supply cut is effective, because this complex mechanical hardware system is replaced with a smart software.

Electricity sources

The EV's derive electricity from multiple sources like diesel, fuel cell, nuclear energy and also solar energy. The EV's can also derive electricity by the on board rechargeable electricity storage system (RESS) and on highway recharging purpose we use a direct continuous connection to land based generation plants. For large EV's such as submarine, the chemical energy can be replaced by nuclear reactor that provides heat which initiates the stream turbine.

The power storage method of electric vehicles involves,

Chemical energy stored on the vehicle-battery electric vehicle, especially for lithium –ion battery.

Kinetic energy storage-fly wheels.

Static energy storage-electric double layer capacitor.

The Electric double layer capacitors and the flywheels are rechargeable. By avoiding unnecessary conversions the energy conversion efficiency can be improved. The Electro-chemical batteries conversion can easily be reversed by allowing the electric energy to be stored in the form of chemical energy.

3. Conclusions

Fig-4: Future electric car

Over 9000 Londoners may die early every year from toxic air. Emission vehicles are the major contribute to this problem, so the city plans for low emission vehicle capital and achieve zero emission from vehicle by 2050.

Improved batteries, intermediate storage, electric trucks and hydrogen trains are the major things that should be improvised. Rechargeable lithium-air batteries potentially offer increased range over other types and are current topic for

research. Another improvement is to decouple the electric motor from the battery through electronic control, employing supercapacitors to buffer large but short power demands and regenerative braking energy. This electric vehicles are better than IC engines in this present world and also to save resources for future.

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