Scientific Journal of Impact Factor (SJIF): 5.71

e-ISSN (O): 2348-4470
p-ISSN (P): 2348-6406

International Journal of Advance Engineering and Research Development

Volume 5, Issue 04, April -2018

A REVIEW PAPER ON OVERVIEW OF HYBRID VEHICLE AND ITS RECENT MARKET SIZE OF ELECTRIC VEHICLE.

[1]Ramesh Sapariya, [2]Sulay Patel, [3]Gaurav Sutaria,[4]Anil Shah

[1,3,4]*M.E Student, Department of Mechanical Engineering, L.D.College of Engineering, Ahmedabad, India.*
[2]*Assistant Professor, Department of Automobile Engineering, L.D.College of Engineering, Ahmedabad, India.*

ABSTRACT- *Hybridization of a vehicle is one of the praising step as the substitution of conventional vehicle and also one of the best alternative solution to reduce the amount of automotive emissions that why these vehicle over a last decade gain great attention due to eco friendly nature and lower green house gas emission as compare to conventional vehicle .But due to expensiveness and limited driving range hybrid vehicle is not getting too much approbation from consumer side.*
This review paper gives you the basic information about hybrid vehicle and types of hybrid vehicle and also the recent market size of electric vehicle and plug hybrid vehicle.

KEYWORDS: *Hybrid vehicle, Series Hybrid vehicle , Parallel Hybrid vehicle, Market size of EV.*

1. INTRODUCTION

In 1834, the first vehicle, actually a tricycle, powered by battery, was developed. But with the improvement in theinternal combustion engine (ICE) and invention in internal combustion technology, ICE vehicles have occupied an absolute share in themarket pure electric vehicles (PEVs) have almost disappeared since 1930's [1]. Leading climate alarmists claim that global greenhouse gasemissions need to decrease to 60% below the present levels by2050 if humans are to avoid catastrophic climate change [2]. But sucha drastic emissions reduction is at odds with the world's energyneeds. Fossil fuels account for 85% of the world's primary energyfor a very simple reason: they are the world's least expensivesource of energy. The production and consumption rates ofpetroleum increase year by year due to the muchlower cost of petroleum. Fig 1 shows the Indian petroleum and other liquids production and consumption.[3].

There is huge attention for low emission and independence to the fossil fuel energy sources to decrease global warming on the world. If all vehiclesare powered by internal combustion engines, the gasolineand diesel oil will be depleted quickly, and the emissionwill result in green house effect. So, the energy conservation and environmental protection are growing concerns around the world. According to [4], 39.2% of total emissions in 2007 is raised from transportation. Vehicle manufacturers and global laboratories have started projects about electric vehicles to reduce carbon emission and the dependence to fossil fuel energy. Many configurations of electric vehicles are designed to attain these objectives. Electric vehicles (EV) may include battery electric vehicles (BEV),hybrid electric vehicle (HEV) and hydrogen fuel cell electric vehicle (FCEV). Electric vehicle is a multi disciplinary subject that covers broad and complex aspects. The main idea of the electric vehicle is to reduce the engine size and power for fuel consumption andmeet the necessary energy from the carbon-free energy sources like fuel cells. Nevertheless the power is transferred by electrically instead of mechanically from energy sources to the wheels to reduce the loss of energy.

Meanwhile, fuel duty taxeswere imposed by government; higher crude oil price plusfuel duty taxes result in higher fuel prices. So, AutomobileCompany forced to develop EV for low-emission andhigh-fuel economy under laws and market together.EV is a road vehicle which involves with electric propulsion. EV can be classified into three types: pure electricvehicles (PEVs), hybrid electric vehicles (HEVs), and fuel cellelectric vehicles (FCEVs). Today, they are in different stagesof development due to existing technology. Table 1 showsInteraction of different vehicle types with the electric distribution system, contrasting the conventional view[8] and Table 2 shows the major characteristics and features of three types of EV.

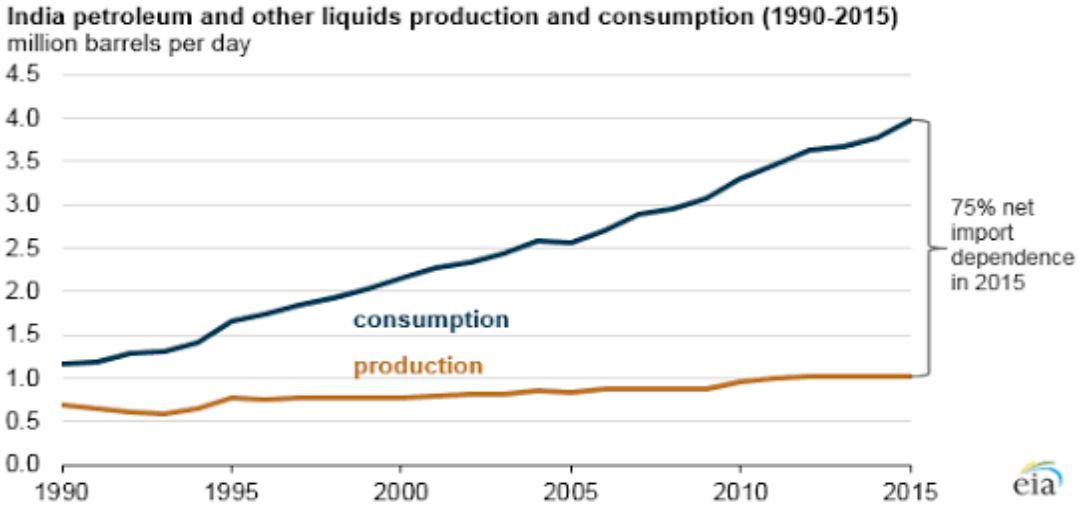

Figure 1 India's petroleum production and consumption

Motive force	Energy storage and conversion	Fuel source	Interaction with electric system		Electric industry benefits	
			Conventional view	Proposed view	Conventional view	Proposed view
Mechanical drive	Fuel tank, internal combustion engine	Liquid (gasoline, diesel, possibly natural gas)	None	None	None	None
Electric Drive	Battery	Electricity from grid	Load	Storage and load	Revenue	Revenue, reliability, lower cost

Table 1 Interaction of Mechanical drive vehicle types with the electric distribution system

Types of EV	Pure EV	Hybrid EV	Fuel cell EV
Propulsion	(i) Battery	(i) Battery/Ultracapacitor (ii) Internal combustion engines	(i) Fuel cells
Characteristics and feature	(i) Zero emission (ii) Short driving range (iii) Higher initial costs	(i)Very low emission (ii)Long driving range (iii)Higher fuel economy as compared with ICE vehicles	(i)Zero emission or ultra low emission (ii) Highest initial costs (iii) Medium driving range
Major techniques	(i) Electric motor control (ii) Battery management (iii) Charging device	(i) Electric motor control (ii) Battery management (iii) Managing multiple energy sourcesand optimal system efficiency (iv) Components sizing	(i) Fuel processor (ii) Fueling system (iii) Fuel cell cost
Major issues	(i) Battery and batterymanagement (ii) High performance propulsion (iii)Charging facilities	(i) Managing multiple energy sources (ii) Dependent on the driving cycle (iii) Battery sizing and management	(i) Fuel cell cost (ii) Hydrogen infrastructure (iii) Fueling system

Table 2 The major characteristics and features of PEV, HEV, FCEV

2. HEV POWERTRAIN CONFIGURATIONS

Series Hybrid

A series hybrid is similar to an electric vehicle with an on-board generator. The vehicle runson battery power like a pure lectric vehicle until the batteries reach a predetermineddischarged level. At that point the APU turns on and begins recharging the battery. The APUoperates until the batteries are charged to a predetermined level. The length of time the APUis on depends on the size of the batteries and the APU itself. Since the APU is not directlyconnected to the drive train, it can be run at its optimal operating condition; hence, fueleconomy is increased and emissions are reduced relative to a pure IC engine vehicle. A schematic of a series hybrid is shown in Figure 2 [5].

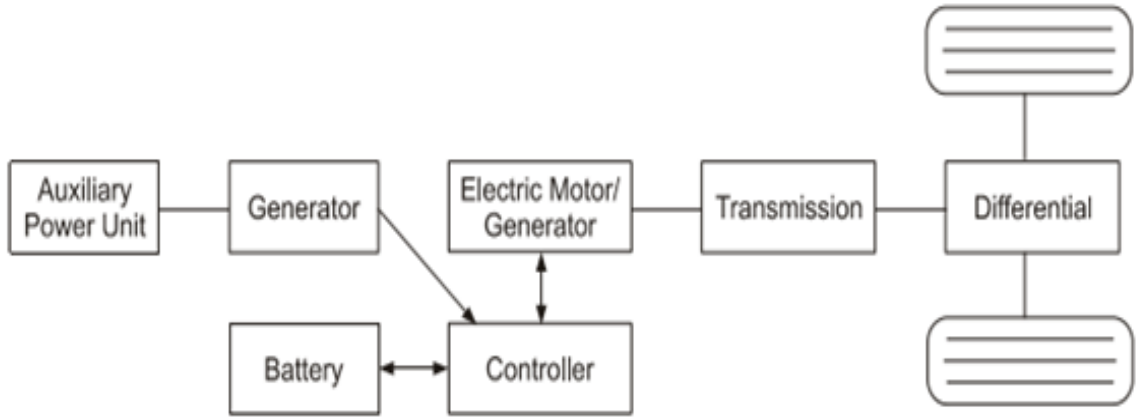

Figure 2 Schematic of a Series HEV

Parallel Hybrids

In the parallel hybrid configuration, an APU capable of producing motive force is mechanically linked to the drive train. This approach eliminates the generator of the series approach. When the APU is on, the controller divides energy between the drive train (propulsion) and the batteries (energy storage). The amount of energy divided between the two is determined by the speed and driving pattern. For example, under acceleration, more power is allocated to the drive train than to the batteries. During periods of idle or low speeds, more power goes to the batteries than the drive train. When the APU is off, the parallel hybrid runs like an electric vehicle. The batteries provide electricity to the electric motor where it is converted to mechanical energy to power the vehicle. The batteries also provide additional power to the drive train when the APU is not producing enough and to power auxiliary systems such as the air conditioner and heater.

The drive train for a parallel hybrid is more complex than that of a series hybrid as both the electric motor and the APU must be mechanically linked to the driveshaft. Since parallel hybrids only work with APU's that produce a mechanical output, fuel cells cannot be used for this option. Figure 3 shows a schematic of a parallel hybrid [5].

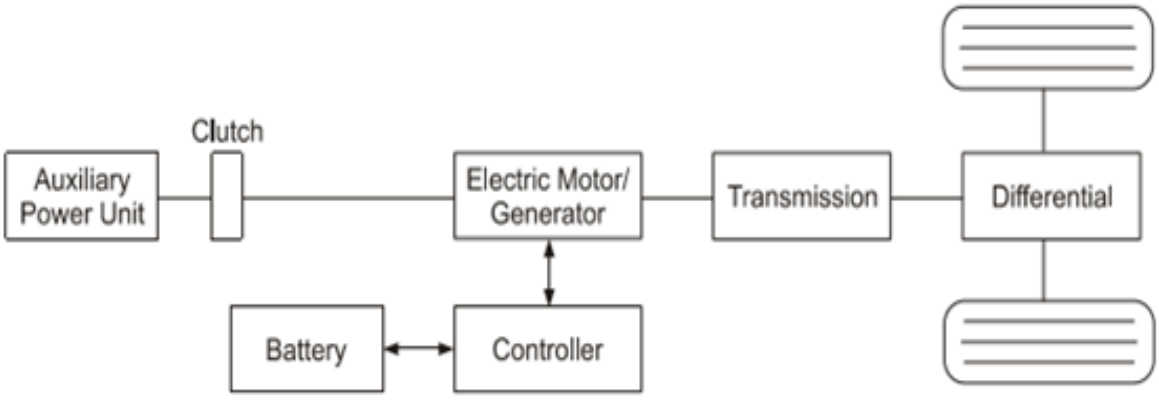

Figure 3 Schematic of a Parallel HEV

Combination of series and parallel hybrid vehicle

In series- parallel hybrid vehicle accommodate electric motor, internal combustion engine and a power splitter (set of sun and planet gear) the ratio of power using is 100% electric motor or 100% IC engine or severance of power between electric motor and IC engine (like 40% electric motor & 60% IC engine). IC engine also work as generator charging the batteries. Power split hybrid are more efficient over all at lower speed series hybrid is more efficient and at higher speed parallel hybrid is efficient [6].

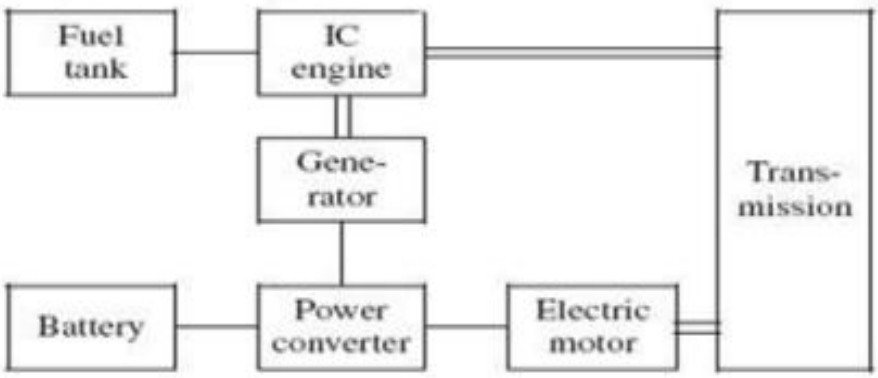

Figure 4 Schematic of combination of Series and parallel HEV

3. BASIC INFORMATION ABOUT SOME ELECTRIC VEHICLE AND MARKET SIZE OF EV AND PHEV IN DIFFERENT COUNTRIES.

Some modern HEVs prefer to adopt thissystem typical products of HEV are listed in Table 3[7].

Products	Configuration	Automobile companies	Year
Prius	Combination	Toyota	1997
Insight	Parallel	Honda	1999
Tino	Combination	Nissan	2000
Civic	Parallel	Honda	2001
Lexus LS 600h	Combination	Toyota	2007
Toyota Auris	Combination	Toyota	2010
Lexus CT 200h	Combination	Lexus	2011

Table 3 Basic information about some EV

Table 4 Shows the new EV and PHEV registration since 2011 in different countries [9].

Country	Year					
	2011	2012	2013	2014	2015	2016
China	5000	7000	9000	70000	205000	330000
United State	20000	50000	95000	120000	115000	160000
Norway	-	5000	7000	20000	35000	50000
United Kingdom	-	2500	4000	20000	30000	40000
France	2000	5000	5000	15000	25000	30000
Japan	2000	15000	25000	30000	35000	30000
Germany	-	3000	-	15000	23000	25000
Netherland	-	5000	20000	15000	45000	22000
Sweden	-	-	-	5000	7000	10000

Table 4 Battery EV and PHEV newly registered in different Countries in different year

4. BENEFITS OF HYBRID VEHICLES

There are large and growing reasons why hybrid vehicles are the future of auto-industry worldwide. Among many advantages that have given hybrid vehicle edge over its internal combustion engine counterpart are as follows:

- The internal combustion engine in a hybrid vehicle is much smaller, lighter and it ismore efficient than the one in a conventional vehicle. This is because the engine can be sized for slightly above average power demand rather than peak power demand because the distribution of load on IC engine and Batteries.
- A standard combustion engine is required to operate over a range of speed and power, yet its highest efficiency is in a narrow range of operation where as in a hybrid vehicle, the engine operates within its range of highest efficiency.
- The power curve of electric motors is better suited to variable speeds and can provide substantially greater torque at low speeds compared with internal combustion engines.
- Braking in hybrid electric vehicle is controlled in part by the electric motor which can recapture part of thekinetic energy of the car to partially recharge the batteries. In a conventional vehicle, braking is done by mechanical brakes and the kinetic energy of the car is wasted as heat.
- Hybrid vehicles are much more energy efficient than traditional internal combustion engine vehiclesbecause they generally provide greater fuel economy. This statistic has a major implication for the reducing gasoline consumption and vehicle air pollution emissions worldwide.
- There is reduced wear and tear on the gasoline engine.
- There is reduced wear on brakes from the regenerative braking system use.
- There is reduced noise emission resulting from substantial use of electric engine at low speeds leading to roadway noise reduction.
- There is a reduced air pollution emission due to less fuel consumption per mile thereby leading to improved human health with regards to respiratory and other illnesses [10].

REFERENCES

1) C. C. Chan, “The state of the art of electric and hybrid vehicles,” Proceedings of the IEEE, vol. 90, no. 2, pp. 247–275, 2002
2) Global Warming 101: Costs, William Yeatman; 2009
3) https://www.google.co.in/search?q=INDIA+PETROLEUM+CONSUMPTION+PRODUCTION&rlz=1C1CHZL_enIN763IN763&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjgqsiyhrnaAhXLMY8KHTatB_0Q_AUICygC&biw=1366&bih=662
4) http://www.epa.gov/climatechange/emissions/downloads09/GHG2007-ES-508.pdf
5) Hydrogen Fuel Cell Engines and Related Technologies: Rev 0, December 2001
6) Pavan R. S “A Review On Hybrid Vehicles’, IMPACT: International Journal of Research in Engineering &Technology (IMPACT: IJRET) ISSN (E): 2321-8843; ISSN (P): 2347-4599 Vol. 2, Issue 5, 59-64.
7) A Comprehensive Overview of Hybrid Electric VehiclesCaiying Shen, Peng Shan, and Tao GaoHindawi Publishing CorporationInternational Journal of Vehicular TechnologyVolume 2011, Article ID 571683, 7 pagesdoi:10.1155/2011/571683
8) Electric vehicles as a new power source for electric utilities willett Kempton College of Marine Studies and Center for Energy and Environmental Policy, University of Delaware, Newark, DE 19716, U.S.A.
9) Global EV outlook 2017 by International energy agency.
10) An Overview of Hybrid Electric Vehicle Technology by Omonowo D. Momoh and Michael O. Omoigu

