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Hybrid Car

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Abstract: **With the advancement in 21st Century, there has been increase in usage of Oil and Gas leading to problems like Global Warming, climate change, shortage of crude oil, etc. Due to these reasons Automobile Companies have started doing research for making Hybrid Techonolgy usable into the daily life. The Paper starts from brief history about Hybrid Technology and also some brief introduction on it. Paper will also discuss the technologies used in the making of Hybrid Cars such as "Hybrid Solar Vehicle", "Hybrid Electric Vehicle" and "Plug In hybrid electric vehicles". Our Paper is based on the explanation of such technologies, their function, drawback of this technology, efficiency of Hybrid Cars, Case studies on the present commercial hybrid cars such as Toyota Prius series, Astrolab etc and the fuels and raw materials used in the Hybrid Cars. Paper concludes on the advantages and dis-advantages of Hybrid Cars and how this technology will take over the world in future and would become the alternative for Petrol and Diesel Cars.**

Keywords **- hybrid electric vehicle; hybrid solar vehicle; plug in hybrid electric vehicle; Toyota Prius series**

INTRODUCTION

With the invention of Internal Combustion Engine by Nicolas Otto, there was revolution in Automobile field. Later on, Petrol and Diesel became the main source of fuel for these vehicles. This technology made Human Efforts very easy through commercializing in the market. As, the world went through 20th Century, there happened many advancements for making this technology efficient and cost-effective. Due, to which it became the commercial success and its use in the day to day period increased. People could reach thousands of kilometres/miles in hours with the help of this technology. As we know everything has its own positive and negative side. The rate of Carbon Monoxide (CO) and Carbon Dioxide (CO_2) suddenly increased at the dangerous level in the beginning of 21st Century which made a negative impact on Ecosystem, reason for Global Warming, Health related issues, etc. This forced Scientist, Researchers and Policymakers to focus or made them start thinking for Green Technology or the technology which can stop the adverse effect happening on Nature. Hence, the 21st Century will become the Century for Evolution in various technologies with the main focus in AutomobileSector.

The technologies which will change the face of Automobile Sector would be "Hybrid Electric Vehicle", "Hybrid Solar Vehicle", "Hydrogen Fuel Cell", etc. From all this Hybrid Electric Vehicle is considered as the most industrially matured technology and has efficiency more than cars running on Petrol/Diesel/CNG while Hybrid Solar Vehicle has lower efficiency than vehicle running on Petrol/Diesel/CNG. So, this technology is for drivers who want to cover less distance. To overcome this constraint, "Plug-In Hybrid Electric Vehicle" came into existence.

"Toyota Prius Series" is an example of Hybrid Electric Vehicle technology, "Astrolab" is an example of Hybrid Solar Vehicle and "Chevrolet Volt" is an example of Plug-In Hybrid Electric Vehicle.

Fig. 1: Working Principle of HybridVehicle

Regenerative braking is an energy recovery mechanism which slows down a vehicle by converting its kinetic energy into another form, normally into electrical energy, which can be used immediately or stored until needed in high voltage batteries. The electric motor is operated in reverse during braking or coasting, acting as generator. The rotors of electric traction motor are coupled with wheels, they experience opposing torque as current is induced in the motor coils. [12] The wheels transfer kinetic energy via drivetrain to generator. At the same time, generator resistance produced from the electricity created, slows the vehicle. When more braking torque is required than the generator alone can provide, additional braking is accomplished by friction brakes.

TYPES OF HYBRIDVEHCILE

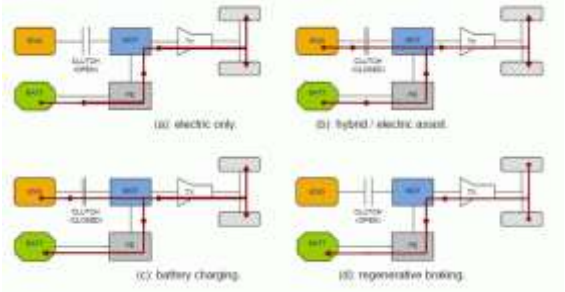
A. Hybrid Electric Vehicle(HEV)

Classification of Hybrid Electric Vehicle: -

Series Hybrid
Parallel Hybrid

Series-Parallel Hybrid

Complex Hybrid



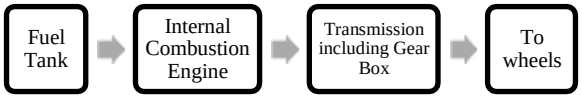


Fig. 2: Flow of energy within a mechanical drive train [10]

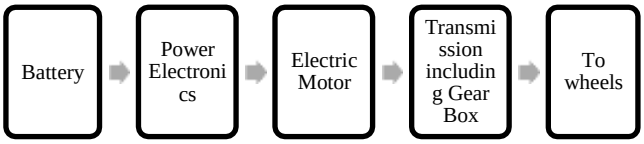


Fig. 3: Flow of energy within a electric drive train [10]

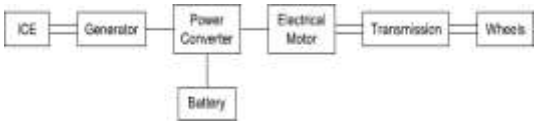


Fig. 4: Series Hybrid Structure

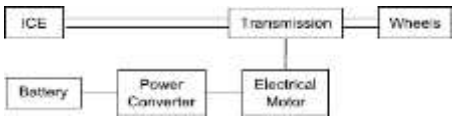


Fig. 5: Parallel Hybrid Structure

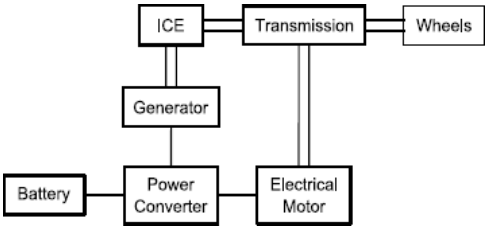


Fig. 6: Series-Parallel Hybrid Structure

B. Plug-In Hybrid Electric Vehicle(PHEV)

Classifications of Plug-In Hybrid Electric Vehicle:-

Series Plug-In Hybrids

Parallel or Blended Plug-In Hybrids

Advantages andDisadvantages

The reason for two motors is in the strengths and weaknesses of both types. Specifically, electric motors use no energy during idle - they turn off - and use less than gas motors at low speeds. Gas motors do better at high speeds and can deliver more power for a given motor weight. That means during rush hour stop and go driving, the electric motor works great and, as an added benefit, does not produce any exhaust thus reducing smog levels. At higher speeds - above 40km/hr
- the gas motor kicks in and gives that peppy feel so many car owners look for when driving on the highway. Another benefit of having the gas motor is it charges the batteries while it‟s running. Many an electric car owner has been stranded just out extension cord range of an outlet. Hybrid owners can forget about this annoyance; the gas motors starts automatically when the battery gets low and proceeds to charge the battery - a hybrid never needs to be plugged into an outlet. Of course, if you forget to fill the tank. Still, you can carry a gas can a half mile while a tow truck is necessary in a straight electric car. Honda Insight, All this new technology comes at a price: a hybrid car is complex and expensive. It has two motors and all the ancillary systems to manage them plus a heavy battery and a regeneration system used to produce electricity during breaking. All of these systems must work together, adding complexity. While cars and, just as importantly, the computers that control them, have become more reliable, they still suffer from failures. So owners of hybridscanexpectmoretimeintheshopandlargerrepair bills. Hybrids are the most gasoline efficient of all cars - they typically get 20.4 to 25.51 kmpl (claimed).

Not bad, but only about 20% to 35% better than a fuel efficient gasoline powered vehicle - like the Honda Civic, for example, that gets 15.3 kmpl. But, when comparing prices - hybridscostfrom$19,000to$25,000andgassaver carscost
$14,000 to $17,000 - the justification to buy becomes less clear. Indeed, the difference in average annual fuel bills-
$405 for a Honda Insight versus $635 for a Honda Civic - means you may never recoup the added initial cost of a hy- brid.

Over a ten year period owning a hybrid will save you only
$2,300 - less than the cost difference for comparably equipped cars. Much of the fuel efficiency comes from improvements in aero dynamics, weight reduction and, the biggest change: a smaller, less powerful gas engine. In fact, any car will get substantially better mileage just by reducing the engine size. The main reason this is not done has to do customer demand - they want the extra power andzippiness.

Divers find that real mileage from hybrids is actually about 10% less than claimed. When consulting manufactures web pages for mileage tips, they list the same ones that would give better fuel economy from any car: drive slow, no jack rabbit starts, etc. But hybrid cars offer more than just great fuel economy, they offer many green advantages as well. Even a small increase in fuel economy makes a large difference in emissions over the life of the car. Also, in large cities where pollution is at its worst, they make an even larger difference since they produce very little emissions during low speed city driving and the inevitable trafficjams.

While the US has just started producing hybrids, the Japanese are the recognized leaders. Honda and Toyota are the two largest producers with the Insight and Prius. US car makers are well behind. In fact, during recent introduction of a new hybrid by GM - the Mercury Mariner, they admitted they had to license over 20 separate technologies from the Japanese. US car makers still specialize in SUVs and trucks - Ford has even introduced a hybrid version of its popular Escape SUV. Industry analysts say US hybrids are just token models - not a serious attempt to get into the market.

The reason for hybrid introduction has to do with Corporate Average Fuel Economy (CAFE) regulations. Current standards mandate that average mileage of the fleet of cars sold by an automaker should be 11.69 kmpl. This means that if an automaker sells one hybrid car that gets 25.51 kmpl, it can then sell four less efficient cars - like SUVs

and trucks – that only get 8.5 kmpl.

CONCLUSION

Hybrid Cars use no energy during idling state; they turn off and use less energy than petrol engines at low speeds. At lower speeds, no smog is emitted maintaining its sustainable advantage. Till lower speed, the car runs on the electric motor and on cruising speed, it runs on IC engine. They offer greater mileage than conventional cars. Noise pollution and emission of CO_2 is considerably reduced. But, they are more expensive than conventional cars, are more complex in constructionand working than IC engine cars, offer larger repair bills, capacity of batteries is not much advanced.

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