Eco Friendly Vehicle
(Hybrid Electric Vehicle)

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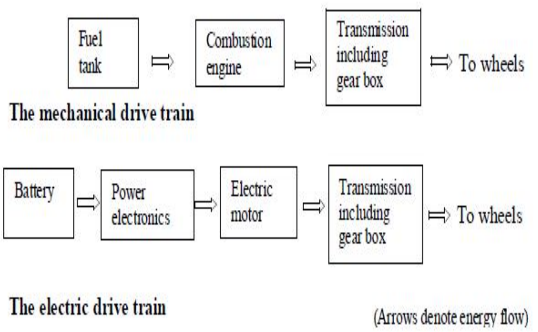
***Abstract*- One of the major problems we are facing today is global warming and dwindling of the natural resources. Global warming is mainly due to the emissions of carbon-dioxide into the atmosphere. Transport Sector plays a major role in emission of carbon dioxide. It contributes to about 17-18% of the emissions of carbon dioxide. One of the best ways to reduce the emissions is switching to HYBRID ELECTRIC VEHICLE. HEV reduces the both emissions of carbon dioxide and also the fuel economy .Hybrid Electric vehicle is a combination of both conventional internal combustion engine and electric propulsion. The presence of electric power train is intended to achieve the better fuel economy. Modern HEVS make use efficiency improving technologies such as regenerative braking which converts Vehicle's kinetic energy into electric energy for charging the battery rather than wasting its energy. HEV'S reduce idle emissions by shutting the ICE at idle and restarting it when needed it is called start-stop system. . A hybrid-electric produces less emission from its ICE than a comparably-sized gasoline car, since an HEV's gasoline engine is usually smaller than a comparably-sized pure gasoline-burning vehicle and if not used to directly drive the car, can be geared to run at maximum efficiency, further improving fuel economy. Currently hybrid electric vehicles are available in automobiles, light trucks, locomotives, buses, trucks; military vehicle's and taxi cabs.**

Encouraging hybridization of vehicle fleets through enabling the policies can reduce the lower of carbon dioxide emissions. Thus improving the public health energy security and reducing the fuel costs. tank for propulsion. Hybrid is between an electric and conventional vehicle. Hybrid electric vehicles are more expensive than conventional vehicles and this poised their entry into new market Hybrid electric vehicles offer 30% better fuel economy, and switching from petrol to diesel vehicles gives 20% reduction in fuel use CNG gives 10% fuel use. Reduction in fuel use also depends upon driving conditions. The more stop and go traffic the greater the potential for fuel savings when used as hybrid when compared to conventional vehicle. This is especially relevant for city buses and delivery trucks

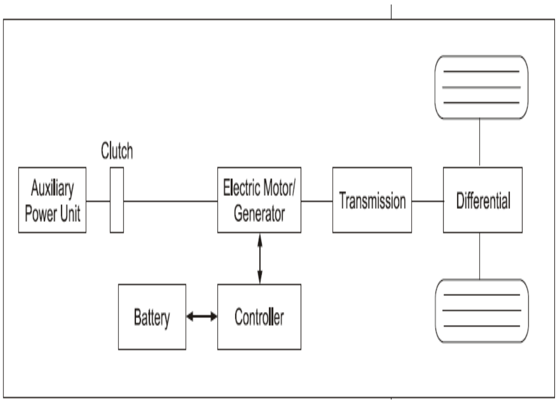
2. BASICS OF HEV

A conventional vehicle has a mechanical drive train that includes fuel tank, combustion engine, gear box, transmission to wheels. HEV has two drive trains. One is mechanical and another is electrical. Electric drive includes battery, an electric motor, and power electronics for control. These two drive trains can be connected with each other sharing some components such as transmission and gear box. The hybrid denotation refers to fact that both electricity and conventional fuel can be used. Electric drive train can handle a wide variety of speeds and loads without losing efficiency. Modern HEV'S make use of efficiency improving technologies such as regenerative braking which converts vehicles kinetic energy into electric energy to charge the battery.

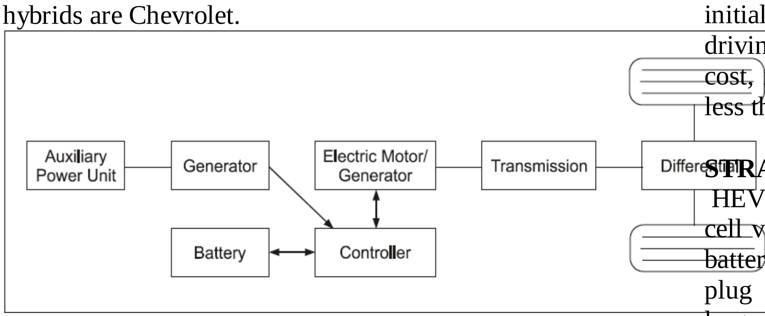


3. TYPES OF POWER TRAIN

PARALLEL HYBRIDS: In parallel hybrids the ICE and electric motor are both connected to mechanical transmission and can simultaneously transmit power to drive the wheels usually through a conventional transmission. These are also capable of regenerative braking and internal combustion can also act as generator for supple-mental recharging. Parallel hybrids are more efficient than comparable to non-hybrid vehicles especially during urban stop and go conditions and at times during high way operation where electric motor is permitted to contribute. Some of the examples of parallel hybrids are Honda insight, civic, Accord



SERIES HYBRIDS: In series hybrids only electric motor drives the train and ICE works as generator to power electric motor or to recharge batteries. The battery pack can be recharged through regenerative braking or by internal combustion engine. Series hybrids usually have smaller combustion engine but a larger battery pack as compared to parallel hybrids which makes them more expensive than parallel. This configuration makes series hybrids more efficient in city driving. Some of the examples of series hybrids are Chevrolet.



4. POWERSPLIT HYBRIDS: It has benefits of combination of series and parallel characteristics. As a result, they have more efficient at lower speed and parallel tend to be more efficient at higher speeds. Some of the examples of power-split hybrids are Ford, Lexus, Nissan and Toyota.

5. Components of the HEV Battery System

The battery in an HEV is the energy storage device for the electric motor. Unlike the gasoline in the fuel tank, which can only power the gasoline engine, the electric motor in a hybrid car can put energy into the battery as well as draw energy from it.

Battery: Two or more electrochemical energy cells connected together to provide electrical energy

Generator: The generator is similar to an electric motor, but it acts only to produce electrical power

Electric motor: Advanced electronics allow it to act as a motor as well as a generator. For example, when it needs to, it can draw energy from the batteries to accelerate the car. But acting as a generator, it can slow the car down and return energy to the batteries

SOC: The State of Charge of a battery is its available capacity expressed as a percentage of its rated capacity

6. COMPARSION OF HYBRID ELECTRIC VEHICLES TO CONVENTIONAL VEHICLES

EMISSIONS: Available HEV technology will decrease emissions of conventional air pollutants substantially as compared to standard vehicles today. HEV combines both carbon dioxide and non-carbon dioxide reductions.

ENERGY: HEV'S decrease fuel consumption substantially compared to conventional vehicles used today and also compared to CNG and new generation of cleaner diesel vehicles. Calculations have shown that over the average HEV useful life time saves an amount of 6,000 litres of fuel.

LIFE CYCLE COST: While HEV'S are more expensive initially the savings are recouped based on mileage and driving conditions. Analysis has shown that HEV life cycle cost, including cost of purchase, fuel and maintenance cost is less than conventional vehicle.

STRATEGIC STEPPING STONE:
HEV'S and plug in hybrids and full electric vehicles and fuel cell vehicles share basic technologies such as electric motors, batteries and power electronic devices. Therefore HEV'S and plug in hybrids function as stepping stone technologies for large scale electrification through reduction of carbon dioxide emissions from road transport and low carbon transport sector.

7. HYDROGEN AS FUEL:

Hydrogen can be used in cars in two ways: a source of combustible heat, or a source of electrons for an electric motor. The burning of hydrogen is not being developed in practical terms; it is the hydrogen fuel-cell electric vehicle (HFEV) which is garnering all the attention. Hydrogen fuel cells create electricity fed into an electric motor to drives the wheels. Hydrogen is not burned, but it is consumed. This means molecular hydrogen, H_2, is combined with oxygen to form water. $2H_2$ ($4e^-$) + O_2 --> $2H_2O$ ($4e^-$). The molecular hydrogen and oxygen's mutual affinity drives the fuel cell to separate the electrons from the hydrogen, to use them to power the electric motor, and to return them to the ionized water molecules that were formed when the electron-depleted hydrogen combined with the oxygen in the fuel cell. Recalling that a hydrogen atom is nothing more than a proton and an electron; in essence, the motor is driven by the proton's atomic attraction to the oxygen nucleus, and the electron's attraction to the ionized water molecule.

An HFEV is an all-electric car featuring an open-source battery in the form of a hydrogen tank and the atmosphere. HFEVs may also comprise closed-cell batteries for the purpose of power storage from regenerative braking, but this does not change the source of the motivation. It implies the HFEV is an electric car with two types of batteries. Since HFEVs are purely electric, and do not contain any type of heat engine, they are not hybrids.

8. ENVIRONMENTAL IMPACT:

FUEL CONSUMPTION:

Current HEVs reduce petroleum consumption under certain circumstances, compared to otherwise similar conventional vehicles, primarily by using three mechanisms

1. Reducing wasted energy during idle/low output, generally by turning the ICE off
2. Recapturing waste energy (i.e. regenerative braking)
3. Reducing the size and power of The ICE, and hence inefficiencies from under-utilization, by using the added power from the electric motor to compensate for the loss in peak power output from the smaller ICE.

Any combination of these three primary hybrid advantages may be used in different vehicles to realize different fuel usage, power, emissions, weight and cost profiles. The ICE in an HEV can be smaller, lighter, and more efficient than the one in a conventional vehicle, because the combustion engine can be sized for slightly above average power demand rather than peak power demand. The drive system in a vehicle is required to operate over a range of speed and power, but an ICEs highest efficiency is in a narrow range of operation, making conventional vehicles inefficient. On the contrary, in most HEV designs, the ICE operates closer to its range of highest efficiency more frequently. 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. The greater fuel economy of HEVs has implication for reduced petroleum consumption and vehicle air pollution emissions worldwide.

NOISE:
Reduced noise emissions resulting from substantial use of the electric motor at idling and low speeds, leading to roadway noise reduction in comparison to conventional gasoline or diesel powered engine vehicles, resulting in beneficial noise health effects

POLLUTION: Battery toxicity is a concern, although today's hybrids use NiMH batteries, not the environmentally problematic rechargeable nickel cadmium. "Nickel metal hydride batteries are benign. They can be fully recycled

9. BENEFITS OF HEV:

Reducing wasted energy during idle/low output, generally by turning the internal combustion engine off.
Recapturing waste energy
Reducing the size & power of the ICE engine

10. DISADVANTAGES:

COST:

One of the main disadvantages of HEVs is that they cost more than conventional vehicles of the same or similar model. Online hybrid car information resource Hybrid Cars estimates that an HEV costs an average of $5000 to $7000 more than a non-hybrid version of the same car. Overall costs of owning a hybrid decrease over time due to a higher mileage per gallon rate, which means a reduction in the usage of gasoline. However, this is not always a consolation for those who would like to buy a "green" vehicle but cannot afford the initial price tag.

BATTERY LIFE AND FUNCTION:

Buying an HEV may mean that you will be spending more money on batteries over the life of your car, according to Hybrid Cars. Electricity to a hybrid is provided through the battery, and some car owners worry that the heavy demand on the battery could cause it to expire more quickly. However, research has not proven this theory as of yet. Some hybrid batteries are slower on the uptake in cold weather, according to Green Footsteps. This delayed reaction in the winter may mean more gas usage, which defeats the purpose of owning a hybrid. Frequent charging requirements may also be a disadvantage if you do not use your vehicle for weeks at a time. You might encounter delays on the road if you forget or do not have the opportunity to charge your car before heading to work.

11. CONCLUSION:

HEV technology for both light and heavy duty applications is commercially available today and demonstrates substantial reductions in tail-pipe emissions and fuel consumption, even when compared to other available low emission technologies .HEV are particularly effective for urban travel, significantly lowering pollutant emissions and providing cost-effective CO_2reductions in personal mobility. Encouraging hybridization of vehicle fleets through enabling policies and incentive structures can serve to lower both conventional and CO_2 emission ,thus improving public health, energy security, and reducing fuel costs. Continuing innovation in hybrid technology and a growing demand for cleaner vehicles will mean that costs are like to fall, particularly in second hand vehicle markets

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