

Hybrid Electric Vehicle

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Abstract:- A Gasoline-Electric Hybrid Engine Vehicle is a vehicle which works on electrical power as well as fuel like petrol. It has many benefits over its predecessors, which developed power using only fuel. The thought is to design and construct a Hybrid Electric Vehicle (HEV) powered by battery as well as petrol. The vehicle is made dynamic in nature by making use of electrical power from battery and fuel power. It consumes less fuel and creates comparatively less pollution as compared to conventional vehicles. Hybrid electric vehicles consist of a battery, to drive the electric motor and power system with an IC engine to increase fuel economy reduce harmful emissions from the exhaust. Also there is a provision for recharging the battery using a generator which is run using a turbine, which runs on the exhaust of the IC engine. In HEV, the battery single handedly provides power for driving at low speeds where the efficiency of IC engine is least. In cruising and high load conditions like moving up the hill, the electric power assists the engine by providing additional power. Thus the HEV is the best alternative in areas with high traffic like urban metropolitan cities.

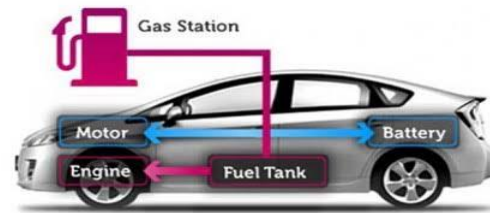


Fig.1

GASOLINE HYBRID ELECTRIC VEHICLE:

- Hybrids consist of internal combustion engine so can be fueled like normal cars but also has an electric motor and battery.
- It can achieve significantly better fuel efficiency than normal vehicle, they also pollute less and saves drivers money through fuel savings.

GASOLINE POWER Vs ELECTRIC POWER:

GAS POWERED CAR	ELECTRIC POWERED CAR
It has a fuel tank, which supplies gasoline to the engine. The engine then turns a transmission, which turns the wheels	It has a set of batteries that provides electricity to an electric motor. The motor turns a transmission and then it turns the wheels

ALTERNATIVE NEEDED:

- Reduce the pollution caused by conventional cars.
- Decrease the consumption of fuel.
- Better mileage.
- To decrease the use of fuel because it is a limited natural sources.

ADVANCED TECHNOLOGY USED IN HYBRID VEHICLE:

- Regenerating braking.
- Electric motor driven /assist.
- Automatic start/shut off.
- Low rolling resistance tires.
- Use of light materials.

HYBRID VEHICLE

A 'gasoline-electric hybrid vehicle' is an automobile which relies not only on gasoline but also on electric power source. In HEV, the battery alone provides power for low-speed driving conditions. During long highways or hill climbing, the gasoline engine drives the vehicle solely. Hybrid electric vehicles comprise of an electric motor, inverter, battery as electric drive and an internal combustion engine with transmission connected as gasoline based drive. It is to achieve better fuel economy and reduce toxic emissions.

It is the combination of the conventional IC engine system with an electrical propulsion system for better performance.

EXAMPLES:-

Trains ---Diesel-Electric Hybrid
Cars – Gasoline- Electric Hybrid
Submarines- Nuclear –Electric,
Diesel-Electric

WORKING OF HEV:

In HEV, the battery alone provides power for low-speed driving conditions where internal combustion engines are least efficient. In accelerating, passing, or hill climbing where high power is required battery provides power to electric motor as an additional power to assist the engine. This allows a smaller, more efficient engine to be used. A throttle position sensor (TPS) is a sensor used to monitor the position of the throttle in an internal combustion engine. It consists of a hall sensor. When the accelerator throttle angle changes magnetic field is created and it creates voltage across position sensor terminal. Thus for various angles, various voltages are obtained. HEV consists of a throttle position sensor, hall sensor. It gives voltage as output with respect to the angle displacement in the accelerator. The analog voltage generated is converted to digital through ADC and is given to microcontroller. If the speed corresponding to the angle deviation in accelerator is less than 30km/hr then the relay is switched on. The relay switching completes the circuit of the battery, inverter and hub motor; and vehicle is motioned by electric power. If the speed directed by accelerator is greater than 30km/hr, then the engine is started by closing the circuit of starting motor through a relay. The starting motor circuit is activated for five hundred milliseconds such that the vehicle is started. Once the vehicle starts the valve of engine for gasoline intake opens by servo motor. The amount of opening is controlled by the PWM generated by the microcontroller as directed by the accelerator.

VARIOUS TYPE OF HYBRID:

- Series hybrid vehicle.
- Parallel hybrid vehicle.
- Series and parallel hybrid.

SERIES HYBRID:

- Simplest hybrid configuration.
- Size of the engine is small.
- It is more expensive.
- Engine is not coupled to the wheels.
- It performs best at stop-and-go traffic.

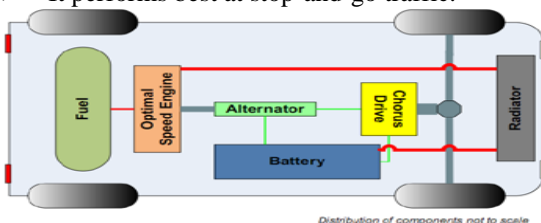


Fig.2

WORKING OF SERIES HYBRID:

- Gasoline motor turns a Generator.
- Generator may charge the battery or power an electric motor that drives a transmission.

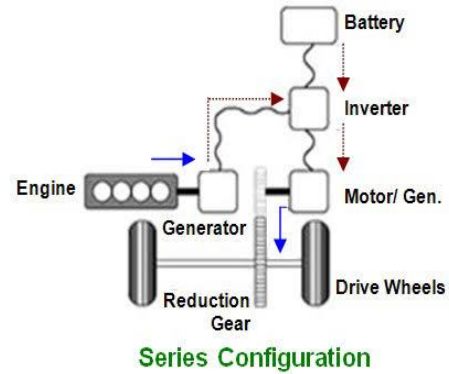


Fig.3

PARALLEL HYBRID:

- Engine size is small.
- Battery pack more powerful.
- Both IC engine or electric engine can power the motor.
- Since engine is connected with wheels so there will some difficulty in converting mechanical energy into electricity.

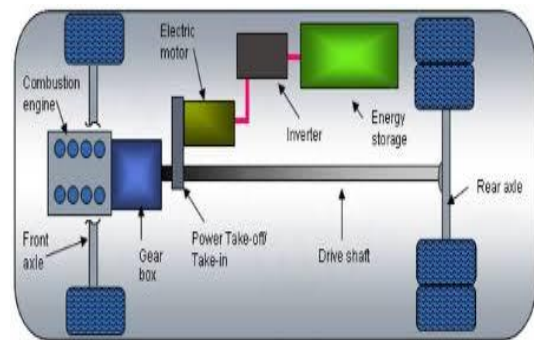


Fig.4

WORKING OF PARALLEL HYBRID:

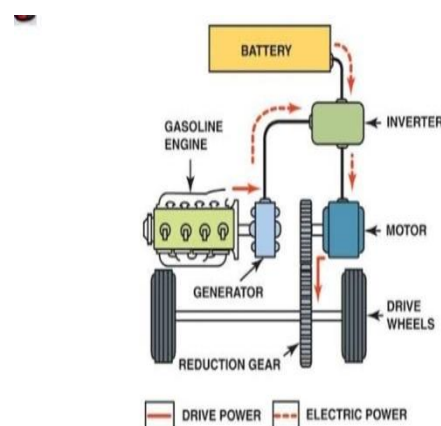


Fig.5

SERIES/PARALLEL HYBRID:

- It merge the advantages and complication of parallel and series drive train.
- Engine can both drive the wheels directly.
- At low speeds it works as series hybrids.

- It cost higher than pure parallel hybrids.
- Efficiency is more.
- Use less fuel.
- Toyota Prius, Ford Escape.

HYBRID MILEAGE TIPS:

- Drive slower.
- Maintain constant speed.
- Avoid abrupt stops.
- Avoid sudden acceleration.

COMMERCIAL MODELS:

- Toyota Prius .
- Toyota Highlander.
- Ford Escape.
- Mercury Mainer.
- Honda Insight.
- Honda Civic HEV.
- Honda Accord HEV .

CONCLUSION:

HEV is a vehicle that uses two sources of power- gasoline and battery. For low power application battery drive is used whereas for high power application where power requirement is very high gasoline engine is used. Gasoline drive is most efficient at high speed drive. Thus HEV's both mode of operation occurs at their maximum efficiency. But in gasoline engine low speed operation is not efficient. Its high speed mode is only efficient. Therefore, it gives twice the mileage given by a normal vehicle. As this hybrid vehicle emits 50% less emission than normal vehicle it plays an important role for reducing pollution to certain extent without compromising with efficiency. Thus it is most efficient in urban areas mainly in high traffic where gasoline engines are least efficient as the energy from gasoline is being wasted away and creates pollution.

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