A Literature Review on Hybrid Electric Vehicles

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***Abstract*:- The presented paper discusses the diffusion of Hybrid electric technology in vehicles. The hybrid engine in vehicles has the potential to reduce fossil fuel use, decrease pollution, and allow renewable energy sources for transportation. Conventional vehicles use gasoline or diesel to power an internal combustion engine. Hybrid vehicles also use an internal combustion engine and can be fueled like normal cars but have an electric motor and battery, and can be partially or wholly powered by electricity. Hybrid cars can be configured to obtain different objectives, such as improved fuel economy, increased power, or additional auxiliary power for electronic devices and power tools. Many technologies like regenerative braking, electric motor drive, automatic start or shutoff are being used in hybrid cars to make them as good as conventional vehicles.**

INTRODUCION

In today's world, we face the problem of dwindling fuel resources for vehicles. There is no doubt that the emission of carbon-dioxide from an automobile exhaust is a concern for the increasing rate of global warming. One of the optimistic solutions for such problems is the hybridization of the vehicle. HYBRID ELECTRIC VEHICLE is a combination of a conventional internal combustion engine and an electric propulsion system. It implies that HEV can be driven on I.C. engine as well as on electric power. HEV produces less emissions compared to a similar-sized gasoline car as the gasoline engine of the HEV can be geared to run at maximum efficiency. The significance of electric power train is that it runs with lesser power loss, hence improving the overall fuel economy. Hybridization of vehicles can reduce CO2 emission and also the fuel costs. At present, hybrid electric vehicles are widely available in commercial vehicles, military vehicles and passenger cars.

BASICS OF HEV'S

1)Hybridization

A hybrid vehicle is a vehicle with multiple energy sources which could be separately or simultaneously operated to propel the vehicle. Many hybridization configurations such as fuel cell, gas turbine, solar, hydraulic, pneumatic, ethanol, electric and many more were proposed over the years. Among these, the hybrid electric vehicles, integrating two technically and commercially proven and well established technologies of electric motors and I.C. engine, allowing drawing upon their individual benefits have been widely accepted by the technologies and users across the world.

2) Hybrid Electric Vehicle (HEV)

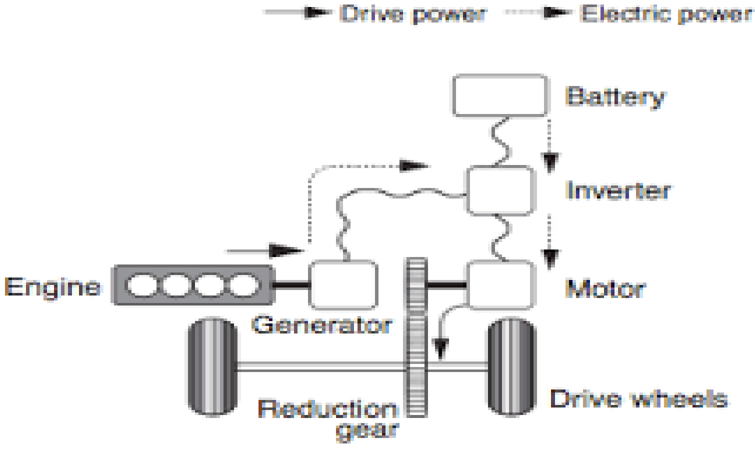
This is the most commonly adapted hybrid vehicle. It combines the propulsion system of an electric motor and an I.C. engine. The power supply to the electric motor comes from the onboard batteries. In a HEV, the I.C. engine combines with an electric motor which leads to a more optimal use of the engine. Driving in city traffic involves frequent starts and stops of the vehicle. During idling, the engine consumes more fuel without producing useful work thus contributing to higher fuel consumption, less efficiency and unnecessary emission from exhaust. The HEV solves the problem by switching to power transmission through the motor and shutting off the engine. This way no fuel will be consumed during idling with no exhaust emission. Another major advantage of HEV is that when fuel tank gets empty while driving the engine, the vehicle can be driven on electric power within its maximum range.

c) TYPES OF HYBRID POWER TRAIN's

Power train of any vehicle refers to the group of components that generate power and deliver it to the road surface. Hybrid vehicles can be classified into three basic categories of power train systems which are briefly discussed below

- Series hybrid
- Parallel hybrid
- Series parallel hybrid

1)Series Hybrid

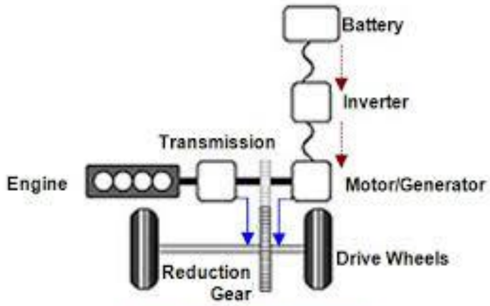


Series hybrid system

This is an electric power train for which an I.C. engine acts as a generator to charge batteries and provide power to the electric drive motor. These vehicles usually have a larger battery pack and larger motors with smaller I.C. engines. Series hybrids can be assisted by ultracaps, which can improve the efficiency by minimizing the losses inside the battery. They can deliver peak energy during acceleration and take regenerative energy during braking. A complex transmission between motor and wheel is not needed, as electric motors are efficient over a wide speed range. Some vehicle designs have separate electric motors for each wheel. Motor integration into the wheels has the disadvantage that the unsprung mass increases decreasing the ride performance.

Advantages of individual wheel motors include simplified traction control ie(no conventional mechanical transmission elements such as gearbox, transmission shafts, and differential), all wheel drive, and allowing lower floors.

2)Parallel hybrid

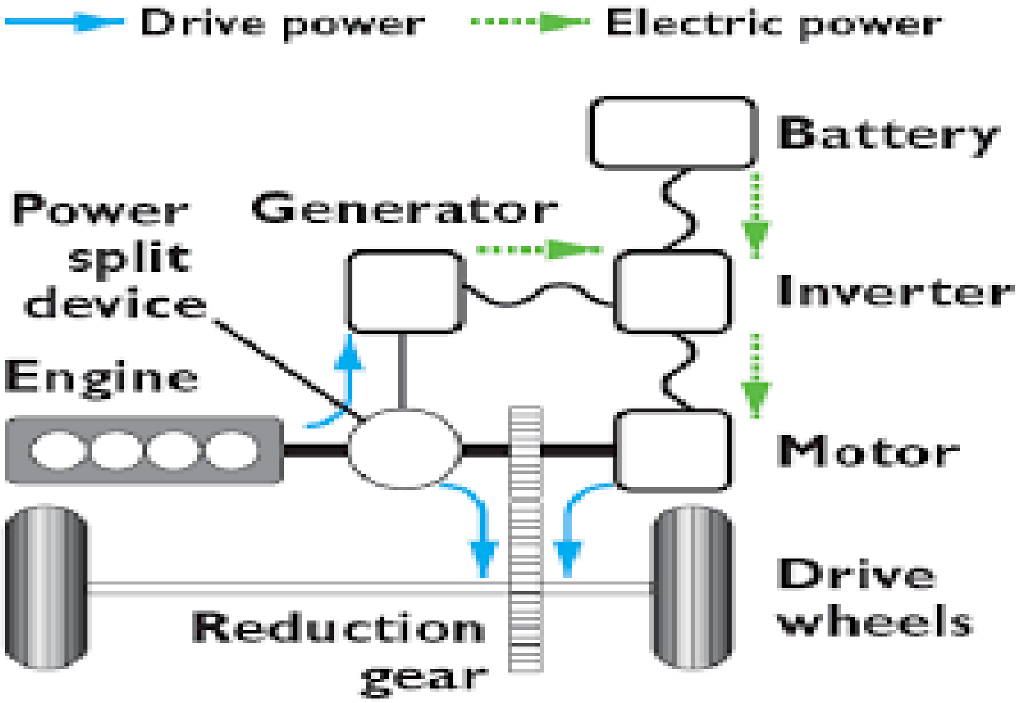


Parallel Configuration

Parallel hybrid systems have both an internal combustion engine (ICE) and an electric motor in parallel connected to a mechanical transmission. Most designs combine a large electrical generator and a motor into one unit, often located between the combustion engine and the transmission, replacing both the conventional starter motor and the alternator. The battery can be recharged during regenerative breaking, and during cruising (when the ICE power is higher than the required power for propulsion).

More mechanically complex than a series hybrid, the parallel power train is dual-driven, allowing both the combustion engine and the electric motor to propel the car. The given fig shows that the I.C. engine and motor operate in tandem. Usually the combustion engine operates as the primary means of propulsion and the electric motor acting as a backup or torque/power booster. The advantages of this are smaller batteries (less weight) and generally more efficient regenerative braking to both slow the car and capture energy while doing so. Another advantage is that it can easily be incorporated into existing vehicle models.

3)Series-Parallel Hybrid



In this type of drive train,it is a combination of the two drive train types, allowing for the vehicle to operate as all-electric (as a series hybrid), as an all combustion vehicle, or as a combination of the two (as a parallel hybrid). This is the most complex and least efficient power train for most applications. Combined hybrid systems have features of both series and parallel hybrids. There is a double connection between the engine and the drive axle: mechanical and electrical. This split power path allows interconnecting mechanical and electrical power, at some cost in complexity.

Power-split devices are incorporated in the power train. The power to the wheels can be either mechanical or electrical or both. This is also the case in parallel hybrids. But the main principle behind the combined system is the decoupling of the power supplied by the engine from the power demanded by the driver.In a combined hybrid at lower speeds, this system operates as a series HEV, while at high speeds, where the series powertrain is less efficient, the engine takes over. This system is more expensive than a pure parallel system as it needs an extra generator, a mechanical split power system and more computing power to control the dual system

CONCLUSION

Hybrid-electric vehicles (HEVs) combine the benefits of both IC engines and electric motors and can be configured to obtain different objectives, such as improved fuel economy, increased power, or additional auxiliary power for electronic devices and power tools. The transmission of power using freewheels and chain wheels are very cheap and reliable. One disadvantage is that driving on electric power is not a good option for a long distance travel. Though this combined power train system can become much useful in more stop and go traffic situations. With the use of this powertrain system, the overall fuel consumption and fuel economy is improved. Such vehicle would run on fuel but would use its electric motor to boost the power when needed. The costs of HEVs are a little more than the conventional cars but they more efficient and the exhaust emissions are less.

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