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A Review on Hybrid Vehicle and Hybrid Electric Vehicle

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***Abstract*: Pollution is the major problem to all over the world. At all circumstances to overcome the problem of pollution, HV (hybrid vehicle) and HEV (hybrid electric vehicle) is the better solution for such problem. Day after day increasing demand of fuel is much higher it cannot affordable for common people. Fuel ignition system vehicle produces more amount of hydro carbons (HC), nitrogen oxide (NOx), carbon monoxide (CO), hazardous air pollutants, greenhouse gases, sulfur dioxide (SO_2) it leaves directly to the atmosphere. Electric vehicle not produces such hazardous air pollutants. In this electric vehicle motor is driven by ac dc electric current through battery converter.**

***Keywords*: hybrid vehicle, series hybrid propulsion system, parallel hybrid propulsion system.**

1. Introduction

In our country , use of electric and hybrid electric vehicles is very benificial for our environment and it is very important factor to control the pollution and more particular for a healthier environment as electric vehicles are zero emission vehicles, as we are quite rapidly reaching to the end of the cheap oil era. Electric and electric hybrid vehicles are offering the best possible chances for the use of new energy sources, because electricity can result a transformation with high efficiency [1]. The electric vehicles are mainly classified in two different types as Plugin Electric vehicle (PEV) and Hybrid Electric vehicle (HE V) [2]. These electric vehicles improves the efficiency of vehicles and also se vers to reduce the environmental pollution due to IC engines.

A. HVs

Hybrid vehicles have two or more sources of energy and/or two or more sources of power onboard the vehicle. The sources of energy can be a battery, a flywheel, etc. The sources of power can be an engine, a fuel cell, a battery, an ultracapacitor, etc. Depending on the vehicle configuration, two or more of these power or energy sources are used. Hybrid vehicles save energy and minimize pollution by combining an electric motor and an internal combustion engine (ICE) in such a way that the most desirable characteristics of each can be utilized. Hybrid vehicles are generally classified as series hybrids and parallel hybrids. In a series hybrid vehicle, the engine drives the generator, which, in turn, powers the electric motor. In a parallel hybrid vehicle, the engine and the electric motor are coupled to drive the vehicle. A series hybrid vehicle can offer lower fuel consumption in a city driving cycle by making the ICE consistently operate at the highest efficiency point during frequent stops/starts. A parallel hybrid vehicle can have lower fuel consumption in the highway driving cycle, in which the ICE is at the highest efficient point while the vehicle is running at constant speed. Hybrid vehicles are also divided into mild hybrids, power hybrids, and energy hybrids, according to the role performed by the engine and the electric motor and the mission that the system is designed to achieve [3]. A plug-in hybrid vehicle can be a series or parallel hybrid, with the battery being charged onboard the vehicle and being externally charged by the utility grid, thus increasing the range when operating in pure electric mode.

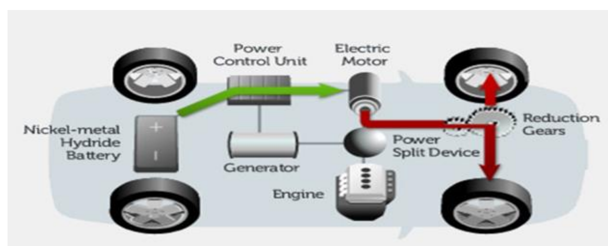

Fig. 1. Hybrid vehicle

1) Series hybrid vehicles

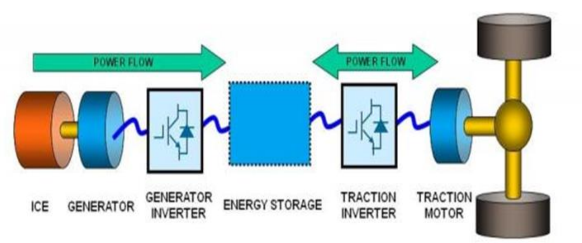

Fig. 2. Series hybrid vehicle configuration

A typical configuration of a series hybrid propulsion system is shown in Fig. 2. A series hybrid vehicle is essentially an electric vehicle with an onboard source of power for charging the batteries. In general, an engine is coupled to a generator to produce the power to charge the batteries. It is also possible to design the system in such a way that the generator could act as a load-leveling device that provides propulsion power. In this case, the size of the batteries could be reduced, but the sizes of the generator and the engine need to be increased. The power electronic components for a typical series hybrid vehicle system are: 1) a converter for converting the alternator output to dc for charging the batteries and 2) an inverter for converting the dc to ac to power the propulsion motor. A dc–dc converter is required to charge the 12-V battery in the vehicle as well. In addition, an electric air-conditioning unit needs an inverter and associated control system.

2) Parallel hybrid vehicles

Parallel hybrids can offer the lowest cost and the option of using the existing manufacturing capability for engines, batteries, and motors. However, a parallel hybrid vehicle needs a complex control system. There are various configurations of parallel hybrid vehicles, depending on the roles of the electric motor/generator and the engine. In a parallel hybrid vehicle, the engine and the electric motor can be used separately or together to propel a vehicle. The Toyota Prius and the Honda Insight are some examples of parallel hybrid systems, which are commercially available [3]. A typical configuration of a parallel hybrid propulsion system is illustrated.

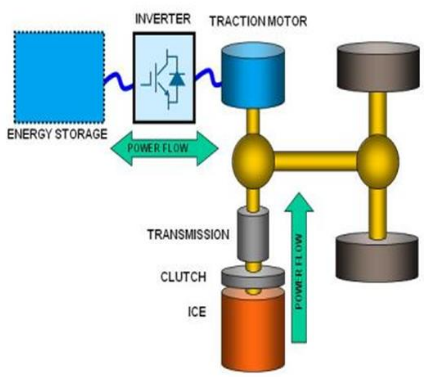

Fig. 3. Parallel hybrid vehicles configuration

3) Crankshaft-mounted ISG system

Many automotive companies are working on the development of crankshaft-mounted-ISG-system-based hybrid vehicles. The ISG concept provides the ability to reduce fuel consumption through the use of engine off during coast-down and idle times, early torque converter lockup with torque smoothing, regenerative braking, and electric launch assist. The feature stop–start, which means ICE off at idle, integrates quiet starting and high-power generation into one single machine [4]–[6]. This specific feature offers a high potential for reducing fuel consumption, exhaust, and noise as a whole, compared to general vehicles in which ICE suffers from an extremely low miles per gallon (MPG) during stops/starts and the cold start of the ICE is the most polluting region of operation. In addition, ISG provides the capability for generating higher power than today's conventional automotive alternators. This higher power would enable us to incorporate features such as electric power steering, electric heating ventilation air-conditioning, electric valve trains, mobile ac power, and many entertainment features.

4) Side-mounted ISG

Recently, there has been an increasing interest in the side mounted ISG, i.e., the belt-driven starter–generator system. The side-mounted ISG can be realized using the conventional generator of today's vehicle. With the addition of position sensors and a three-phase inverter, the generator can be operated as a motor and can provide enough torque through the belt to the combustion engine to perform a fast and quiet restart for a warmed-up engine. On smaller engines, it is possible to cold crank the engine, eliminating the conventional starter. Further improvements in the generator and power electronics technology will increase the system efficiency, the power generation, and the cranking torque to fulfill future requirements and also allow the cold cranking of larger engines. The benefits of this system are: 1) low cost; 2) simple implementation; 3) minimal changes in the electrical system; and 4) use of the present belt driven machine. The electronic system consists of a three-phase MOSFET bridge inverter with the associated gate drives and control electronics. Although the normal generation current is much lower, the power electronics need to be designed for higher starting currents. The packaging and the cooling of the devices need special consideration.

2. Conclusion

Several technologies are in the horizon to be implemented in the next generations of automobiles. There are still a lot of technology challenges to overcome, particularly in the area of fuel-cell vehicles. Major obstacles must still be overcome in the areas of weight, volume, and cost to achieve the expected efficiency and performance. Other issues are manufacturability, reliability, safety, and durability, and the most important is the value to the customer as a function of the cost. The barriers to the introduction of a "More Electric Vehicle" depend on the economics and not much on the technology. The value of a hybrid or plug-in hybrid vehicle has to be greater than the cost. This value equation includes the payback in fuel cost savings for the extra cost of the vehicle, adding to the manufacturer's corporate average fuel economy value, vehicle performance and boost, amount of onboard electric power for entertainment features and other conveniences, emissions reduction, and, finally, the image for the original equipment manufacturer. Progress has been made in the area of power electronics and rotating machines to reduce the cost and improve the efficiency of the system. The issues related to power conversion and rotating machines are similar in electric, hybrid, and plug-in hybrid vehicles. The cost of the power electronics and the motor drive system is being reduced more to make the hybrid and plug-in hybrid vehicles at par with ICE-based vehicles.

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