A Comprehensive Review of Evolution of Hybrid Electric Vehicle

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Abstract:

The increased fuel consumption in the vehicle has encouraged many researchers to find an alternative method of running the vehicle. The Hybrid Electric Vehicles [HEV] are more efficient and less polluting in nature. The recent advancement in battery technology, hub motor, hybridization put present world more economic, greener and ease of use. The objective is to run a vehicle by multiple energy sources, which increases fuel efficiency, reduces emission and pollution. Problems like global warming, climatic change, difficulty in storage of crude oil etc. have made the automobile industry to plan for use of hybrid vehicle in our daily life communication.

Keywords:Hybrid Vehicles; Parallel Hybrid; Series Hybrid; Fuel Cell Vehicle (FCVs; Integrated Motor Assist (IMP)

I. INTRODUCTION

The present paper represents the different types of hybrids electric vehicle with the internal configurations. Literaturesare reviewed and the necessary documentation has been made. The parallel, Series and series parallel combinations of the HEV are presented in this paper. The continuous growth of the electric vehicles has a huge impact in this field and the necessary global and environmental considerations were look after

II. Architecture of the Drivetrain:

- Here power source 1 [fuel] means ICE can drive the vehicle individually.
- Here power source 2 [battery] means battery can drive the vehicle individually.
- Both the power source 1 and 2 can drive the vehicle simultaneously.
- Power source 2 can get back power andCan charge the battery (regenerative breaking
- Power source 2 can get power form power source 1.
- Power source 1 give power to load and load give power to the power source 2.

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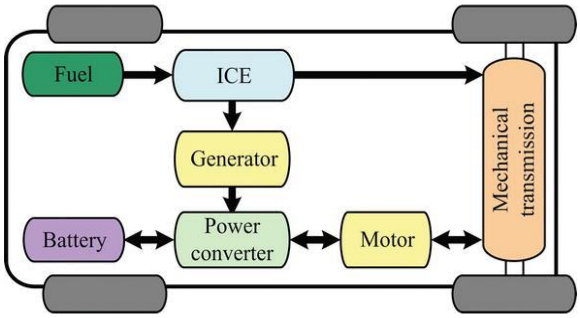

Fig 1: Architecture of Drivetrain

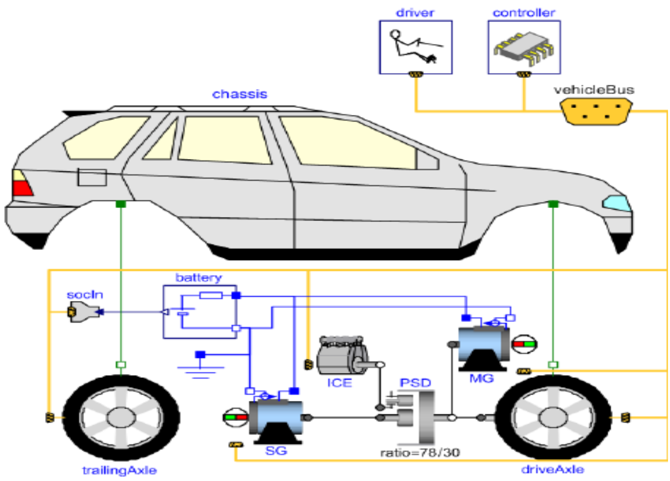

Fig.2. Parts of a hybrid electric Vehicle.

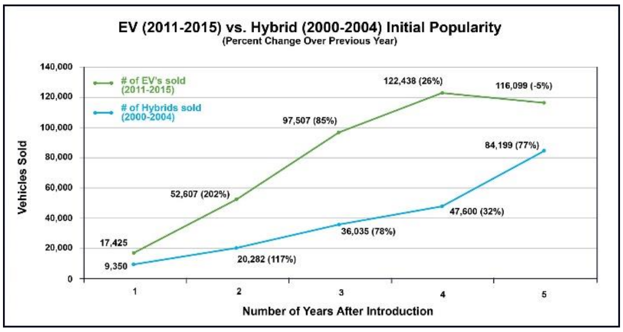

Fig.3. selling data of hybrid and electric Vehicle

III. Classification of Hybrid Electric Vehicle:

Hybrid Electric Vehicles are classified based on how power is transmitted to the load from the source. Based on this it can be classified into three types such as:

1. Series connection.

2. Parallel connection.

3. Series-Parallel Hybrid (Split Type).

Series connection:

Series connection is a connection where only energy converter can provide propulsion power. In this case IC engine acts as a main mover. It can drive an electric generator which helps to charge the electric cell or battery and at the same time it drives the motor and the motor transmit power to the load. And the battery cell can drive the vehicle when driver wants to drive the car by the electric powersupply.

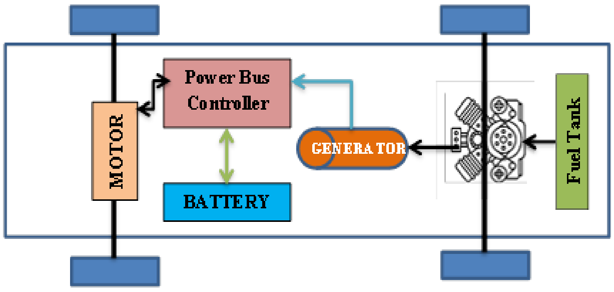

Fig 4: Series Connection

Parallel connection:

A parallel connection is a connection where more than more than one conversion device can deliver propulsion power to the wheels for drive the vehicle. Here the IC engine and the electric power supply are connected in parallel. Both connected with the mechanical coupling joint that blend the torque coming from the two power source. In this type of connection the power require to drive the motor is less than the power require in a pure electric vehicle and the series connection.

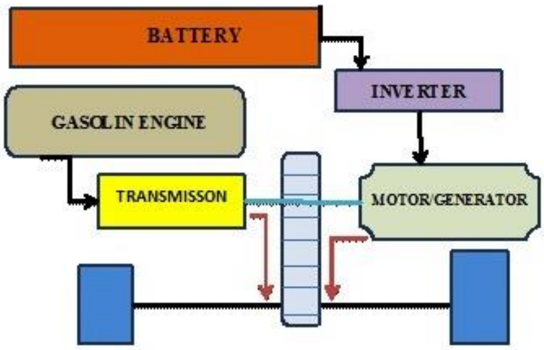

Fig 5: Parallel Connection

Series-Parallel Hybrid (Split Type):

In this type of configuration the IC engine is also used for the charging of the battery. This type of configuration is more complicated and uses more mechanical joint and linker as compare to series connection and parallel connection. In series parallel connection a small series connection is added with the architecture. In this type of connection the battery charge remain on when the vehicle stuck in the prolong traffic jams. The power split device allocated power from IC engine to front wheels through driveshaft and electric generator depending on driving condition. For short bursts of acceleration, power can be delivered to the driveshaft from both IC engine and electric motor. A central control unit regulates power flow for the system using multiple feedback signals from various sensors.

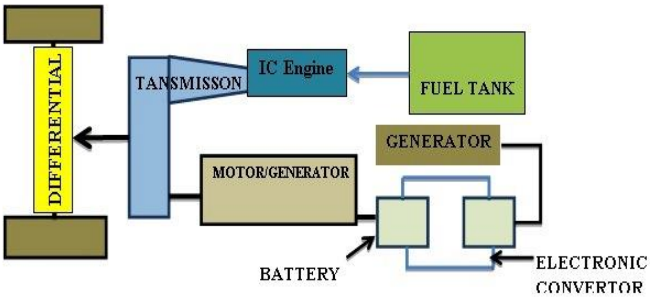

Fig 6: Series Parallel Connection

IV. Degree of Hybridization*:*

Parallel hybrid vehicle or combined hybrid vehicle are categorized according to degree of hybridization. Degree of hybridization is totally based on power supply by the IC engine and also based on power supply by the electric motor. In some vehicle IC engine act as main dominant and electric motor get switch on when the more power or boost is needed. Some cases both the IC engine and the electric motor take the equal load or the load divided equally between the IC engine and the electric motor.

Degree of hybridization = (motor power/ motor power + engine power)*100.

***Micro Hybrid*:**

Here start and stop of the engine automatically is performed by the electric motor when the vehicle stuck in the jams. In this type of case motor is not to help the vehicle by providing the additional torque. Electric motor supply power of 2.5kw at 12 volts power save is 5-10%.

Mild hybrid:

Electric motor generator is integrated to provide 10% of maximum engine power. These hybrids improve drawbacks of fossil fuel vehicles. Here motor or generator is in parallel with IC engine. Electric Motor supplies power 10 to 20 kW at 100-200 volts. Energy saving 20 to 30%

Full Hybrid:

.Electric motor provides at least 40% of engine power as additional torque. Bigger motor and battery reduces the required size of conventional engine. It has improved fuel consumptions and reduced emissions. Circa Electric Motor supplies power 50 kW at 200-300 volts. Energy saving 30 to 50%

Plug-in Hybrid:

Plug-in hybrid electric vehicles are known as PHEVs–combine a gasoline or diesel engine with an electric motor and a large rechargeable battery. Unlike conventional hybrids, these hybrids can be plugged-in and recharged from an outlet, allowing the vehicle to drive extended distances using just electricity. When the battery is emptied, the conventional engine turns on and the vehicle operates as a conventional, non-plug-in hybrid.

V. Conclusion:

We can say that by this process is possible to increase the fuel efficiency. By this process it is possible to decrease the amount pollution in the world. By this process we can minimize the size of the IC engine and at the same time we can increase the fuel efficiency of the vehicle. Regenerative braking system installed in most of the hybrid vehicles. It is a system where we can store the energy that normally lost due to friction. This energy is stored in the batteries andcan be used for propulsion. Electric hybrid vehicle can also avoids energy losses which is related with engine operation where a normal Internal combustion engineis inefficient at different speed at different load combinations.

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