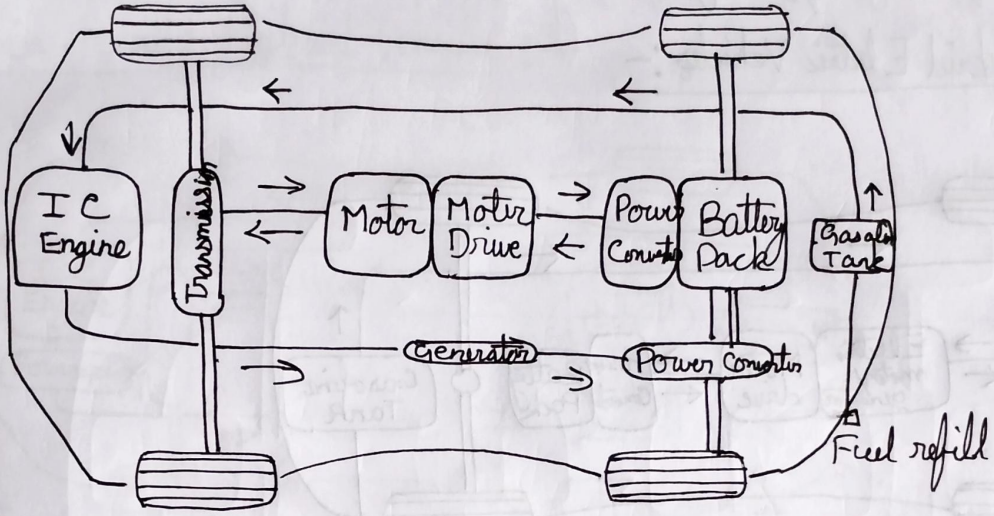
Assignment-1

- The first full scale functional automobile was built by Nicolus Cagnot in 1768 which worked on the principle of steam engine.
- Isac de Revaz built first I.C. engine vehicle in 1806 using hydrogen fuels.
- In 1826 Anyos Zedek built the electric motor. ~~Along with this motor~~
- In 1865 electric trams were introduced in Burmingham and london underground.
- In 1886 electric vehicle to undergo production.
- In 1884 Carl Benz made production I.C. engine.
- In 1890 Morrison Carrage made by William Morrison (U.S.A.) with speed of 20 mph (32 Kmph) and motor of 4hp (3KW) and battery of 58V & 112Ah
- 1906. 48% of the market was consumed by steam 32% by electric and 20% by gasoline.
- EV gained popularity because of its low emmission, efficiency, low cost and easy start.
- After 1910 EV market declined because Henry Ford came with assembly like production.
- Chevrolet in 1912 introduced self start mechanism.
- Because of world war Range and charging time were not reliable.
- Oil lobby
- In December 1950 12000 deaths happend in London
- In 1960s California 600 new cases/day of disease related to pollution were reported.
- The 98% pollution was caused by automobiles.
- In 1970S CARB (California Air resources Board) was formed.
- Since 1970's to 2000 they came up with regulation to decrese emmision by 80%
- In 1991 they came up with Low emmision Vehicle I (1993-2003) LEVI

- It was mandatory for all manufacturers to provide an EV alternative to market.
- The companies filled case against CARB in 1996 for forcing on the sale of electric vichele.
- In 2005 CARB came with LEV II
- The vichels under LEV were chatagrized as
  - LEV (Low Emmission Vichle) – 10-15 %
  - ULEV (Ultra low emmission vehicle) 70-80 %
  - PZEV (Pure Zero emission vehicle) 0% emission.
- In 2006 Santa Monica Auto Expo Tesla Roadster was introduced.
- In 2010 Nissan Leaf came as first affordable 5 door hachbook EV.

2. (a) Series Hybrid Electric Vehicles



In series HEVs the IC engine is used to run a generator which produces electricity. This electric power is converted from AC to DC using power converter and supplied to charge the battery pack. The battery pack is used as the source of power which is supplied to power converter to convert back into AC then goes through motor drive to motor the rotation of motor is transferred to wheel through transmission.

Advantages of series Hybrid :-

- The need of complicated multispeed transmission and clutch is eliminated in series hybrids since only the electric motor directly drives the transmission, which may have one gear.
- Gasoline engines in series hybrids tends to be smaller and more efficient since they don't power the vehicle directly and are not subjected to high variable power demands of stop and go driving.

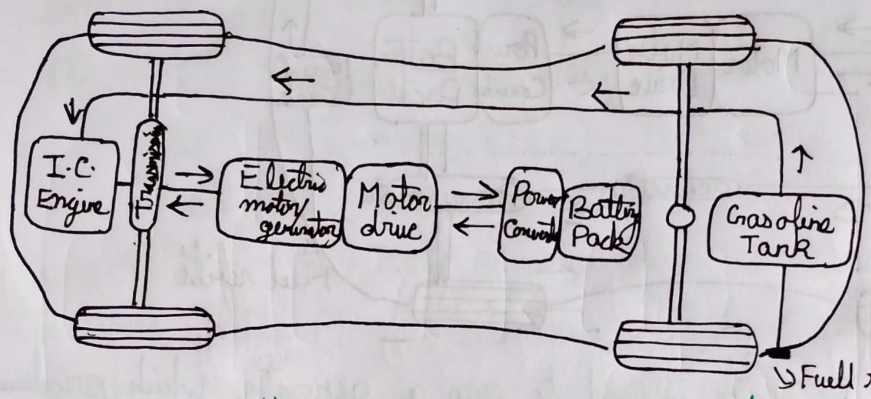
Disadvantages :-

- The series hybrid requires a larger, more complicated battery and motor to meet its power needs
- The larger battery and motor and the addition of generator often makes the series hybrid more costly than parrell hybrids

Industrial application:

It is used for high efficiency in low speed and short range applications.

(b) Parallel Hybrid Electric Vehicles :-



In Hybrid HEVs the IC engine can both charge the battery and power the vehicles. When the vechile starts IC engine rotates the generator to create electricity that is converted into DC using power converter and charges the battery. The battery pack act as the source of power for electric drive. Now the vehicle can operate in three configration, I.C. Engine drive when the IC engine is powering the vehicle as well as charging the battery, electric drive when IC engine is not running and battery is powering the vehicle through electric motor and the hybrid mode when both battery and through motor and IC engine are powering the ~~battery~~ vehicle simultaneously.

Disadvantages :-

- ICE is not decoupled with the wheels, so it can not be charged at standstill.
- It doesn't operate in a narrow range of RPM and so the efficiency is low at low rotation speed.

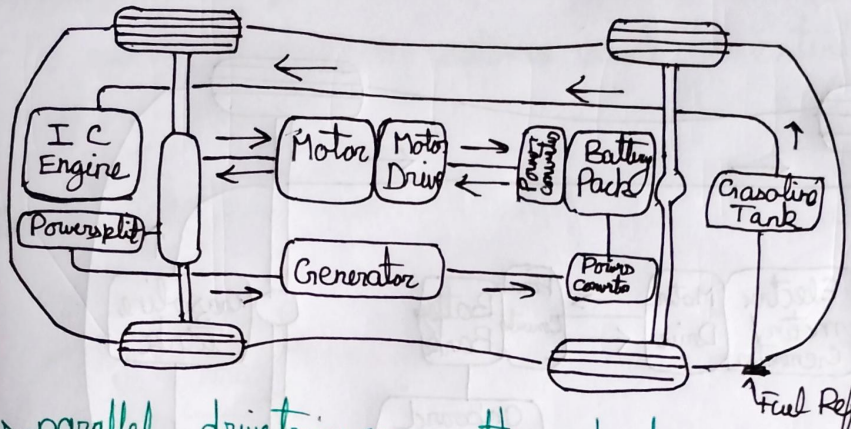
Advantages :-

- Overall efficiency is higher over long distances.
- Reduced traction motor size, no need for a generator, and the elemination of energy losses in multiple power conversion prosses between the electric machines and battery.

Industrial application :-

It is used for high efficiency in large range and high speed vehicles.

(c) Series-Parallel Hybrid vehicles :-



Series-parallel drivetrains merge the advantages and complications of the parallel and series drivetrains. By combining the two designs the engine can both drive the wheels directly (as in the parallel), and be effectively disconected, with only the electric motor providing power (as in series). With gas-only and electric only option, the engine operates at near optimum efficiency more often. At lower speeds it operates more as a series vehicle, while at higher speeds, where the series drivetrain is less efficient, the engine takes over and energy loss is minimized.

Advantages :-

- Its efficiencies mean that series-parallel can perform better - and use less fuel - than either the series or parallel systems alone.
- Engine's optimum operation frequency may be reached as far as feasible by carefully balancing the energy distribution between the engine and motor.

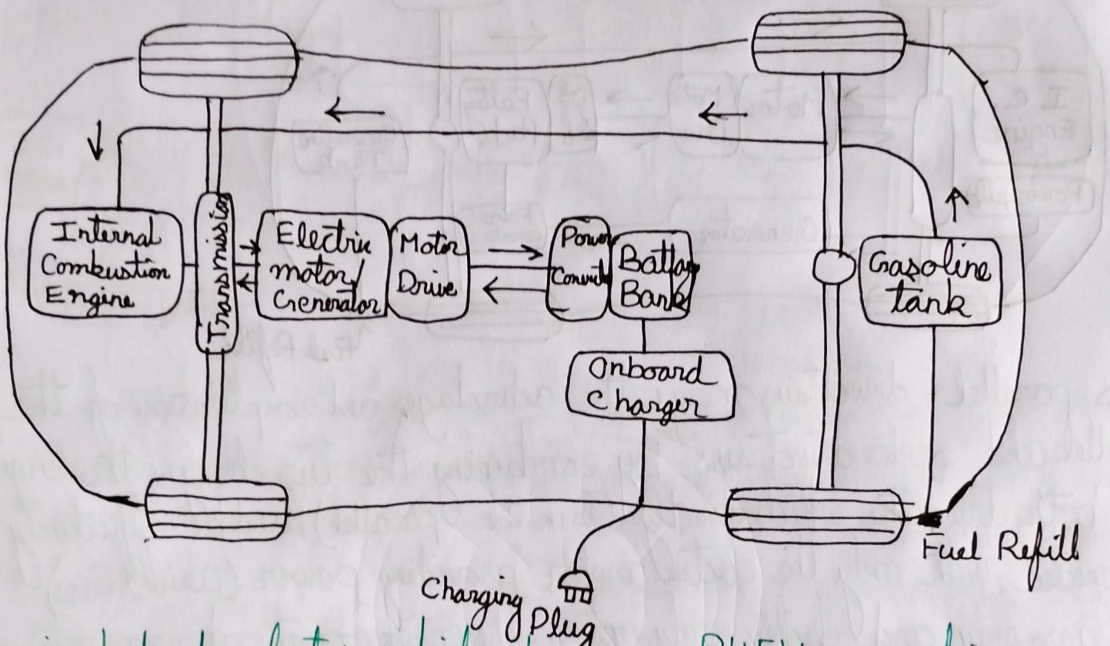
Disadvantages :-

- This system incurs higher costs than a pure parallel hybrid since it requires a generator, a larger battery pack and more computing power to control the duel system.
- More emmissions compared to series and parallel hybrid drive train.

Industrial application

- It used as an optimum hybrid vehicles which can give optimum efficiency over wide range of speed for both long and short distances.

(d) Plug-in Hybrid electric vehicles



Plug-in hybrid electric vehicles - known as PHEVs - combine a gasoline or diesel engine with an electric motor and a large rechargable battery. Unlike conventional hybrids, PHEVs can be plugged-in and recharged from an outlet, allowing them to drive extended distances using just electricity. Most plugins can operate in atleast two modes, all electric in which the motor and battery provide all of the car's energy and "hybrid", in which both electricity and gasoline are used.

Advantages :-

- The electric motor and battery helps PHEVs use less fuel and produce less pollution than conventional cars, even when in hybrid mode.
- Because the electric motor supplints the engine's power smaller engine can be used, increasing car's fuel efficiency without compromising performance.

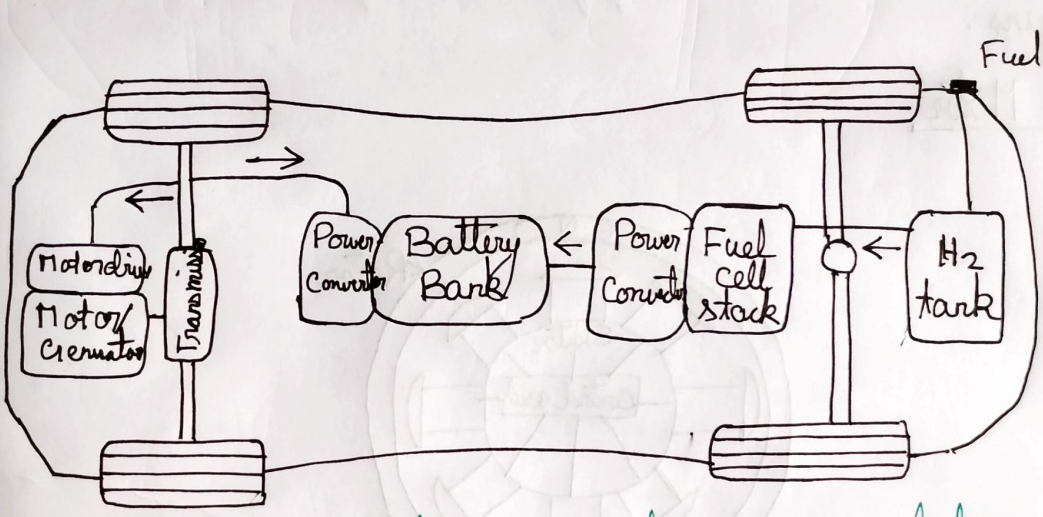
Disadvantages :-

- Because of presence of IC engines they have tailpipe emmissions
- It has costly maintainence and battery replacement.

Industrial application :-

— It is used as an optimum vehicle for extended range and less fuel consumption.

(e) Fuel cell electric vehicles (FCEV)



Fuel cell vehicles use hydrogen gas to power an electric motor. Unlike conventional vehicles which run on gasoline diesel, fuel cell cars and trucks combine hydrogen and oxygen to produce electricity, which runs the motor. Since they are powered entirely by electricity, fuel cell vehicles are considered electric vehicles.

Advantages :-

- Hydrogen fuel cell vehicles combine the range and refueling of conventional cars with the recreational and environmental benifits of driving on electricity.
- Fast refueling and large distances make fuel cells particularly appropriate for larger vehicles with long distance requirements.

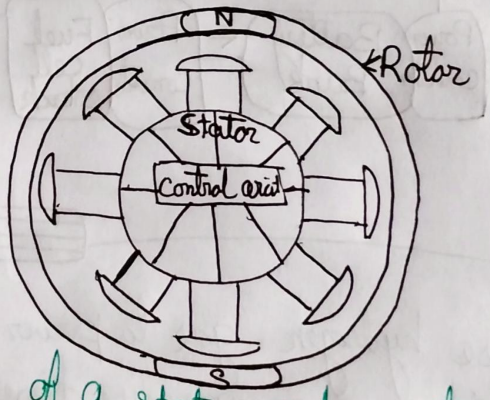
Disadvantages :-

- Storage and transportation of hydrogen is more complex than normal fossil fuels
- Hydrogen is highly flammable fuel source, which brings understandable safety concerns.

Industrial application :-

It can be used as the replacement of fossil fuels for extended range and not need to plugins.

3. BLDC Motor



BLDC motor consists of a stator and a rotor. The stator consists of pair of coils adjacent to each other arranged in a circular fashion. Rotor consists of magnets with this pole at the opposite end of the circumference of circular arrangement which are free to rotate around the coils. When the current is passed through the coil it creates the magnetic field which pulls the magnets on the rotor to arranged alongside them then the current is passed to the adjacent coil to attract magnets to get arranged towards it. In this way the passing of current keep changing to adjacent coils and rotor keeps on moving in the circular fashion.