Module3

SR

Insight into future mobility technology

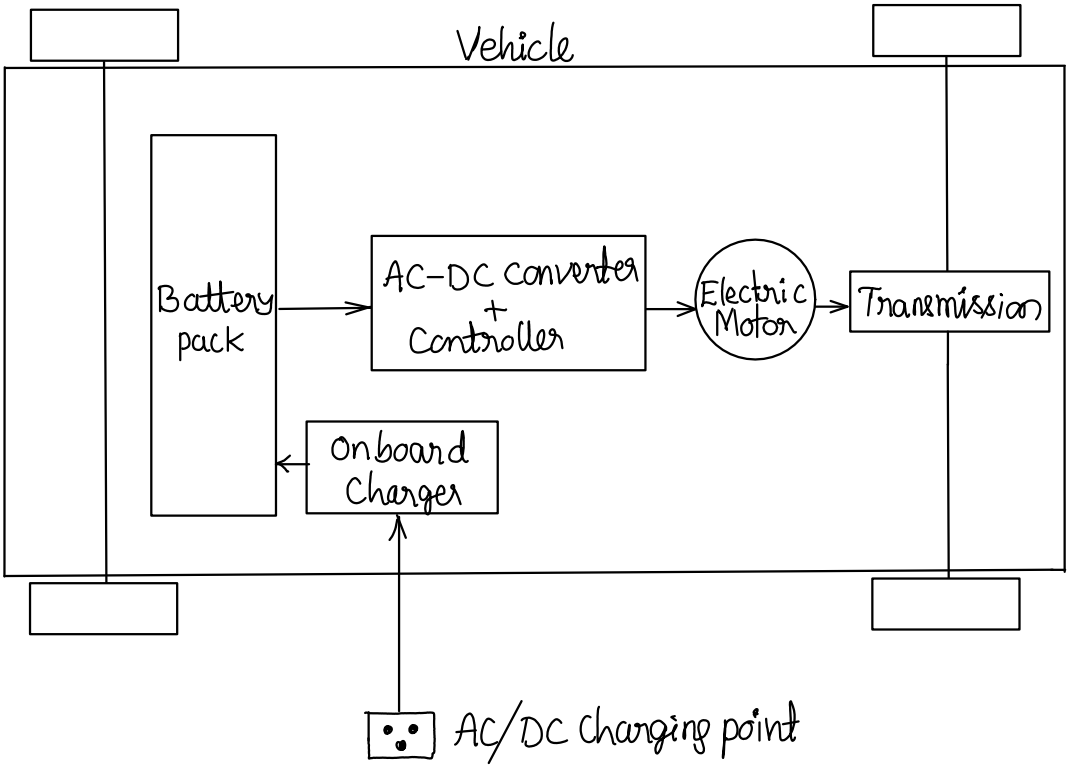
Introduction to electric vehicles (EVs)

Electric vehicles are vehicles that are either partially or fully powered on electric power.

Battery electric vehicles (BEV's)

Vehicles which run only with the help of batteries are called battery electric vehicles (BEV's). Compared to vehicles which run on IC engines, BEV's have very less number of moving parts. This is the reason for low maintenance cost and operation is less noisy. BEV's do not use exhaust, spark plugs, clutches or gears. As they don't burn fossil fuels, they reduce air pollution. Limited driving range, high costs, battery issues, long charging time, inadequate charging infrastructure etc. are the major challenges.

Important components of BEV's include; rechargeable batteries, AC-DC converter, controller, electric motor, transmission elements etc. Electric motors are used which gets energy from rechargeable batteries which can be recharged by common household electricity. Controller regulates the amount of power based on the driver's use of an accelerator pedal. Inverter (DC-AC converter) converts the voltage as desired by the motor. Transmission elements transmit the power to the wheels.



Advantages:

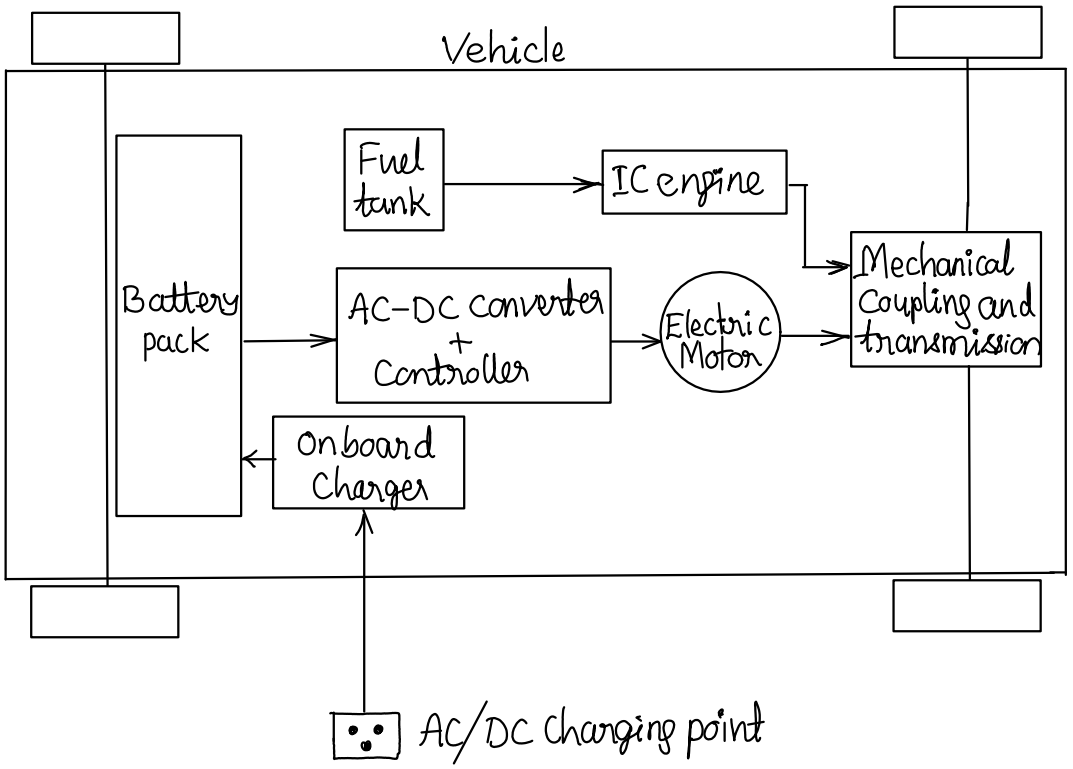
* Highly efficient
* Reduced emissions
* High performance and low maintenance
* Very good torque, good acceleration
* Less noisy and smooth
* Less moving parts (simplified power train)
* Low cost (less energy consumption)

Disadvantages:

* Storage batteries are expensive
* High vehicle cost
* Large time for charging
* Limited driving range
* Inadequate charging infrastructure
* Causes indirect pollution
* Can become heavy due to overloaded batteries

Hybrid vehicles:

Vehicles which run with the combination of any two power sources can be called as hybrid vehicles. For example, a car which has diesel engine supported with electric batteries. IC engine can be connected in parallel with electric motor is shown in the block diagram. While connected in series, IC engine charges the battery using a generator.



Important components of a hybrid electric vehicle are; fuel tank, IC engine, mechanical coupling and transmission elements, rechargeable batteries, AC-DC converter, controller, electric motor, generator etc.

Electric motors receive energy from rechargeable batteries which can be recharged by common household electricity. Controller regulates the amount of power based on the driver's use of an accelerator pedal. Inverter (DC-AC converter) converts the voltage as desired by the motor. IC engine can produce power by burning fuel, supplied from the fuel tank. Mechanical couplings couple the two power sources. Transmission elements transmit the power to the wheels.

Advantages:

* Reduce the use of fossil fuels
* Less pollution
* Cost saving in fuel refills
* High durability
* Increased driving range
* Reduced global warming
* Efficient usage of energy resources

Disadvantages:

* Pollution is not avoided completely
* High cost of vehicle
* Technology is not fully established
* Maintenance costs are considerably high
* Battery replacement and disposal issues.
* High voltage batteries can be dangerous.

Sample questions

1. Define electric and hybrid electric vehicles. [02 Marks]
2. Explain electric vehicles with the help of a block diagram. [06 Marks]
3. Explain hybrid electric vehicles with the help of a block diagram. [06 Marks]
4. List the advantages and disadvantages of electric vehicles. [06 Marks]
5. List the advantages and disadvantages of hybrid vehicles. [06 Marks]