

Recap

- Need of Electric and Hybrid vehicles
- Construction of Electric Vehicles
- Energy Devices for Electric Vehicles
- DC and AC machines for Electric Vehicles

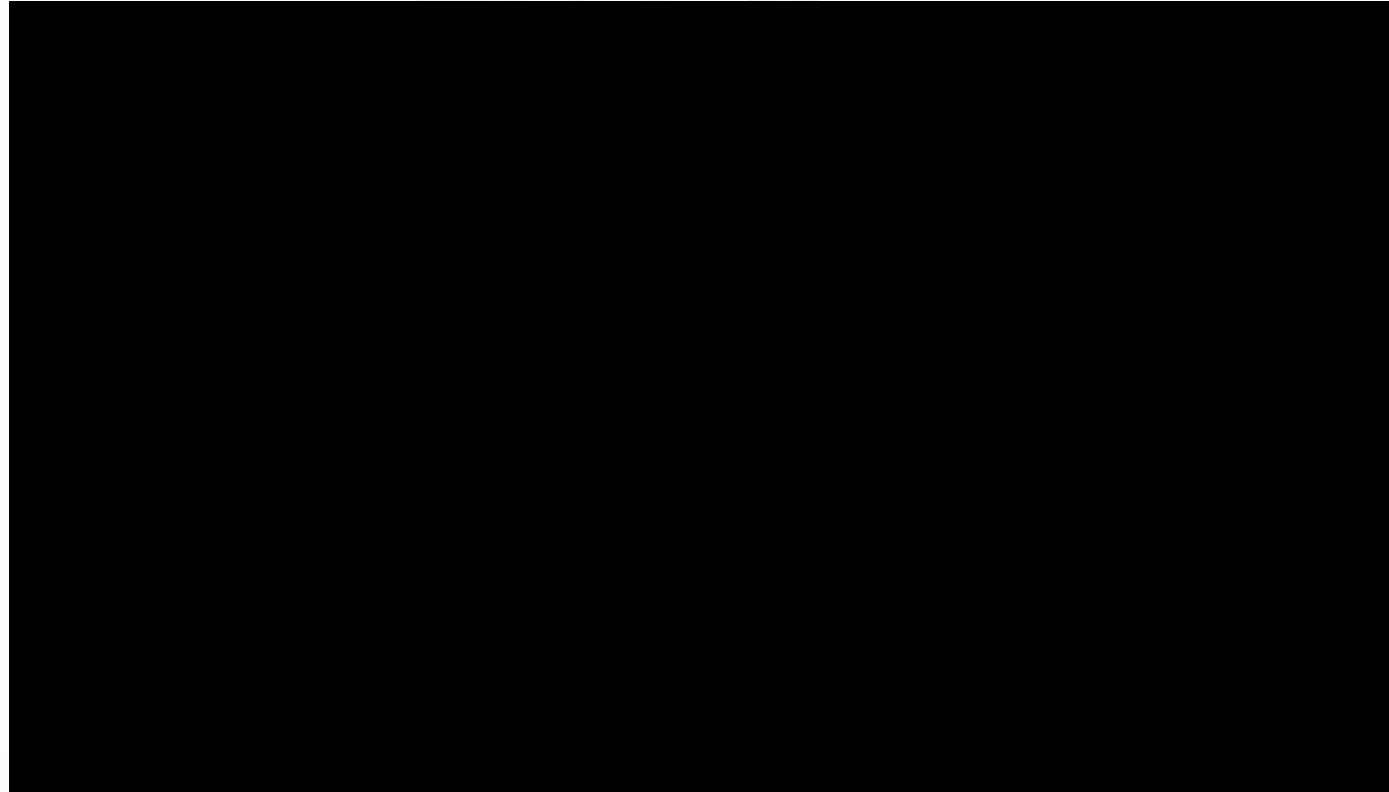
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Lecture Objectives

- Introduction
- Working Principle of Hybrid Vehicle
- Classification of HV
- Hybrid Solar Vehicle
- Plug-In Hybrid Electric Vehicle
- Advantages of Hybrid Vehicles
- Drawbacks of Hybrid Vehicles

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Video Clips for Visualization

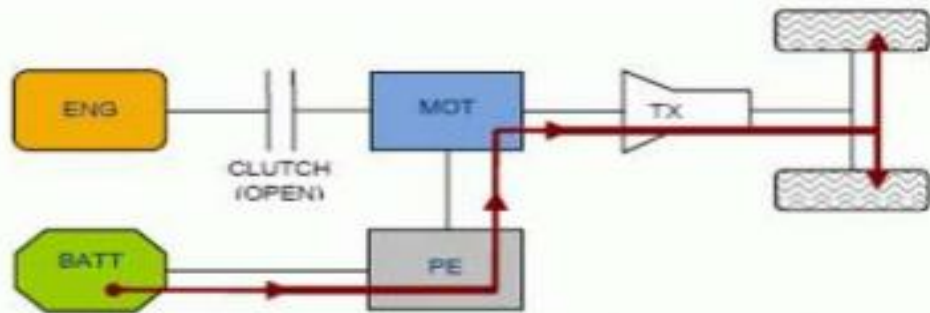


Introduction

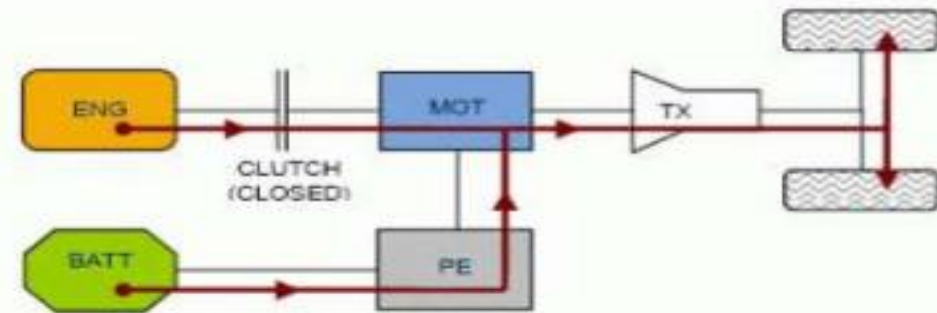
- IC engine invented by Nicholas Otto in 1861
- Automobile Technology in 20th Century Focus on Petrol and Diesel Engine.
- Automobile Technology in 21st Century Focus on Hybrid Electric Vehicle, Hybrid Solar Vehicle and Plug-In Hybrid Electric Vehicle.

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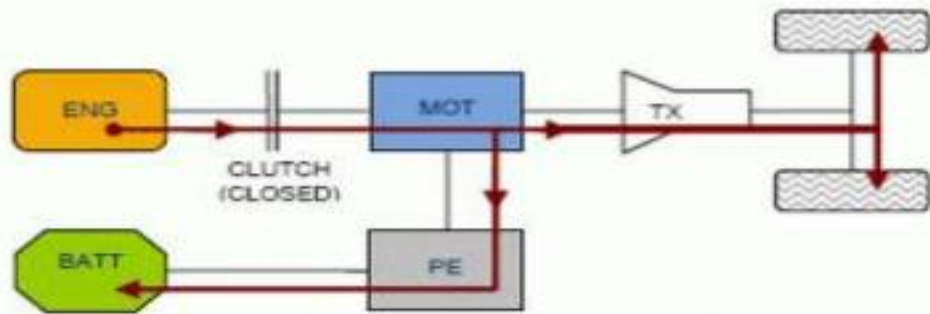
Working Principle of Hybrid Vehicle



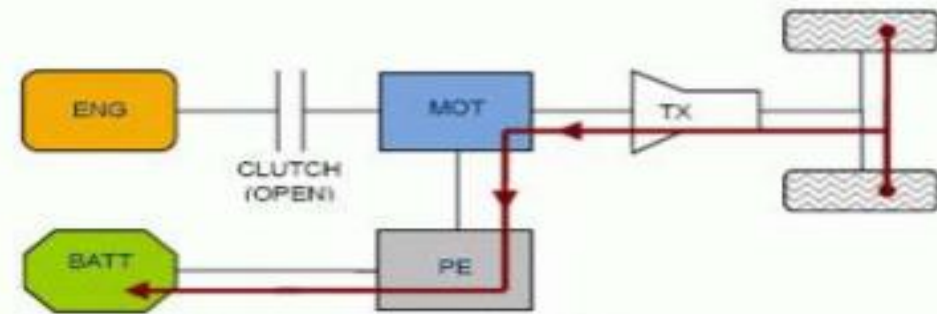
(a): electric only.



(b): hybrid / electric assist.

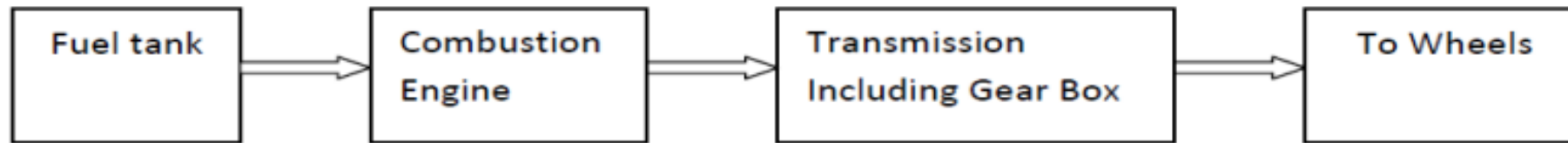


(c): battery charging.

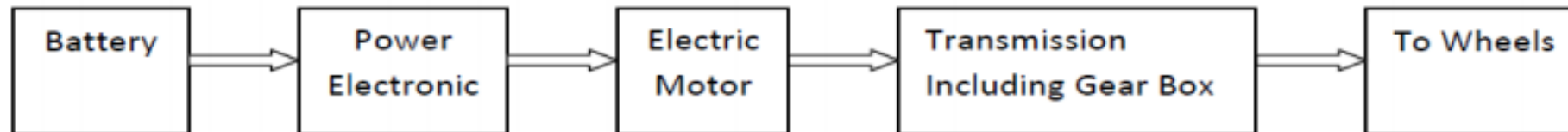


(d): regenerative braking.

Working Principle of Hybrid Vehicle

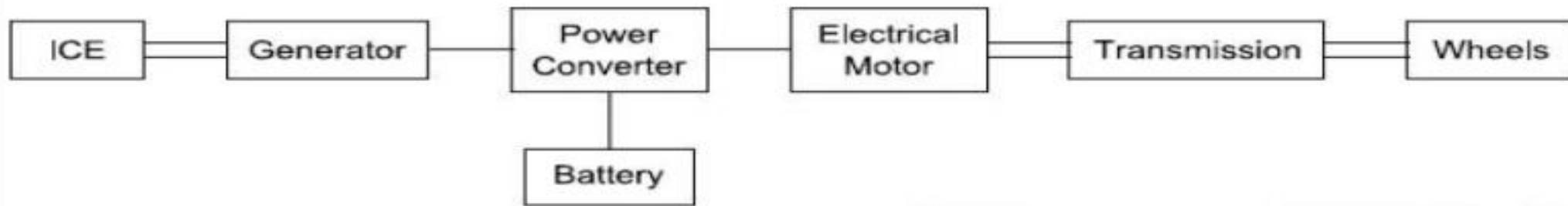


The Arrow depicts flow of Energy within a mechanical drive train

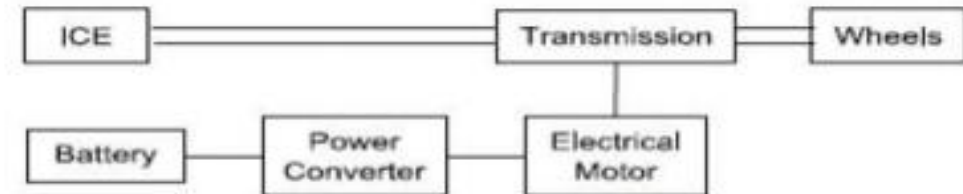


The Arrow depicts flow of Energy within an electric drive train

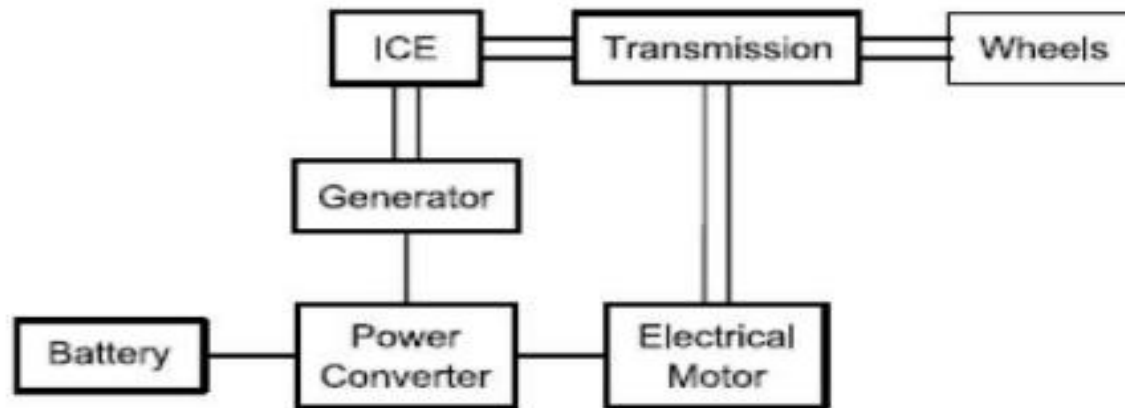
Classification of HEV



Series Hybrid Architecture



Architecture of Paralled Hybrid

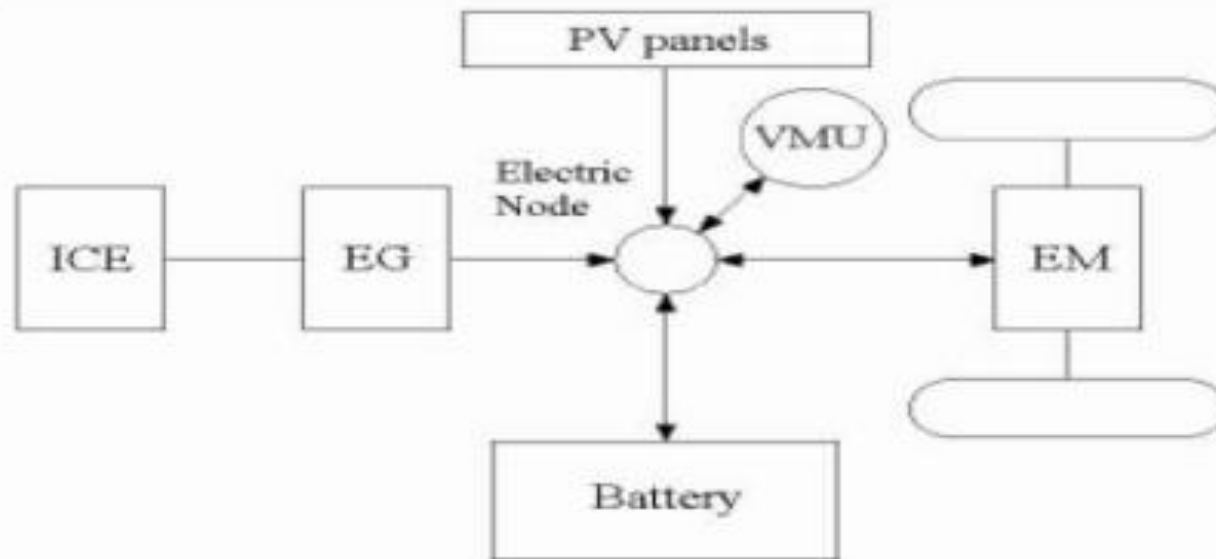


Architecture of Series-Parallel Hybrid

Complex Hybrid: There are two separate mechanical links obtaining a light transmission system and a flexible mounting.

Hybrid Solar Vehicle

- An integration of Hybrid Electric Vehicle and Photo-Voltic Panels.
- This technology is also classified into four types: - Series hybrid, Parallel Hybrid, Parallel-Series Hybrid and Complex Hybrid.



Basic Diagram of Series HSV

Plug-In Hybrid Electric Vehicle

- Next Version of Hybrid Electric Vehicle

- 1) it can be plugged in to an electrical outlet to be charged and
- 2) has some range that can be travelled on the energy it stored while plugged in
- 3) gasoline-independent for daily commuting
- 4) can also be multi-fuel supplemented by diesel, biodiesel or hydrogen

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Advantages of Hybrid Vehicles

- Hybrid cars use no energy during idle state, they turn off and use less than petrol engines at low speeds.
- At lower speeds i.e. in traffic no smog is emitted maintaining its sustainable advantage.
- Hybrid cars offers greater mileage than other cars.
- Noise pollution and emission of CO₂ are considerably reduced.

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Drawbacks of Hybrid Vehicles

- Hybrid cars are more expensive than normal cars.
- Hybrid cars are much more complex in construction and working than the IC engine cars.
- Hybrid cars offer larger repair bills.
- Batteries are not yet much advanced so as the car could run for a larger distance on batteries itself. (Toyota is researching on making higher capacity Li-ion batteries)

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Summary

- Development of hybrid electric vehicles is the need of the hour
- Hybrid cars offers greater mileage than other cars
- Noise pollution and emission of CO₂ are considerably reduced
- Automobile Technology in 21st Century Focus on Hybrid Electric Vehicle, Hybrid Solar Vehicle and Plug-In Hybrid Electric Vehicle.

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List the hybrid vehicles
running on the roads along
with their features