

Saturday

1st ICE car

1796

1806

1828

1837

1st successful electric locomotive

origin of steam engine

1st electric motor

1896

1st successful EV by William Morrison

Peak production of EV

1912

1924 - 1960 → Domination of EV by gasoline cars

Limited production of EV

1970

1990

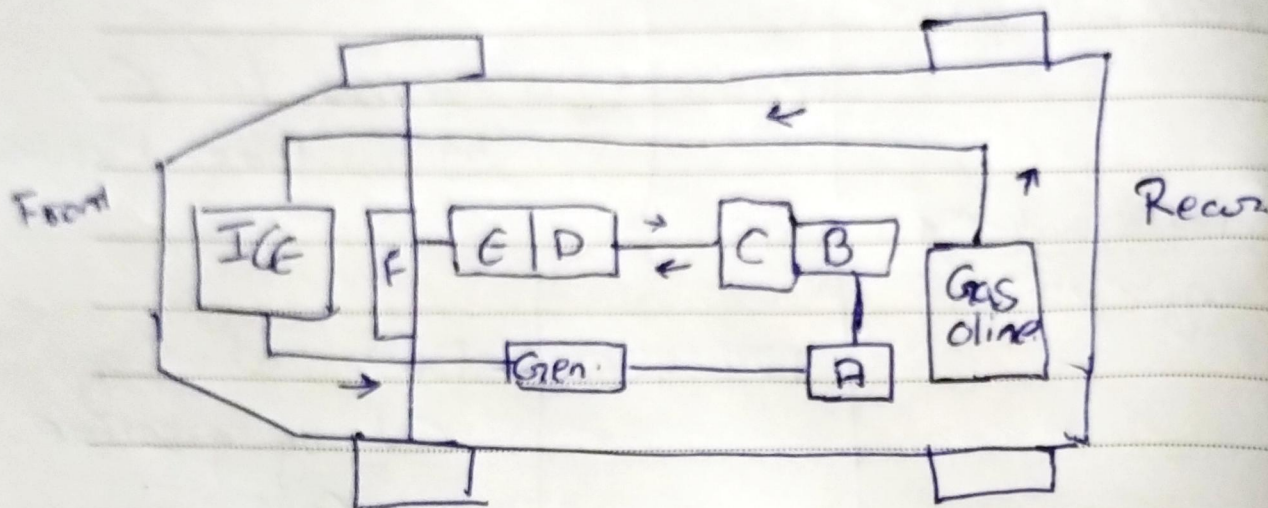
1st Generation of EV

Hybridised EV & increasing level gas supply demand

2000

Sunday

2/21 Series Hybrid EV.



A → Power converter.

B → Battery Pack.

C → Power converter.

D → Motor drive.

E → Motor.

F → Transmission.

8

Tuesday

Adv.

→ Ideal torque-speed characteristics of electric motor make multi gear transmission unnecessary.

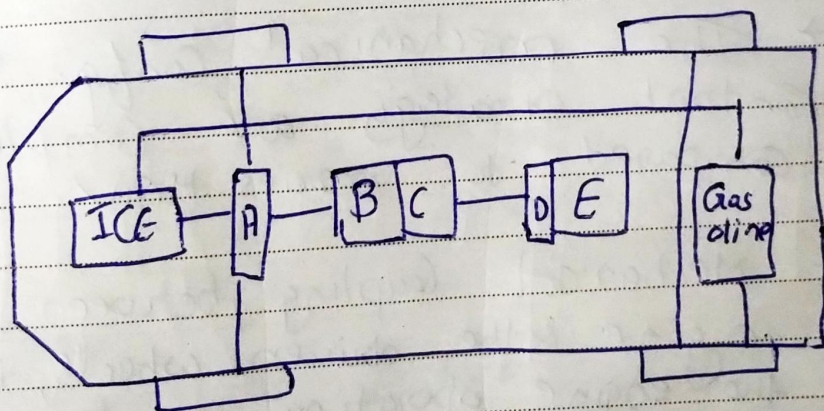
→ Mechanical decoupling between the ICE & driven wheels allows the IC engine operating in very

Wednesday

narrow optimal region.

Disadvantages

- The energy is converted twice & this reduces the over all efficiency.
- 2 electric machines are needed & a big traction motor is reqd.

Parallel Hybrid EV.

- A → Transmission
- B → Electric motor / Generator
- C → Motor drive
- D → Power converter
- E → Battery

11 Friday

Adv.

- Both engine & electric motor directly supply torques to the driven wheel.
- Compactness due to no need of the generator & smaller traction motor.

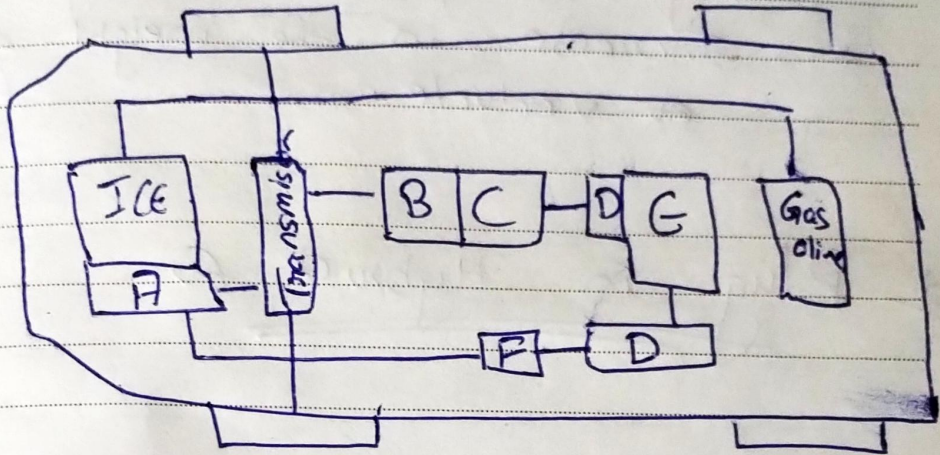
Dis adv.

12 Saturday

- The mechanical Config. & the control strategy are complex compared to series HEV
- Mechanical coupling between the engine & the driven wheels, thus the engine operating points cannot be fixed.

13 Sunday

Series Parallel Hybrid EV.



14 Monday

- A → Power Split.
- B → Motor.
- C → Motor drive.
- D → Power converter.
- G → Battery
- F → Generator

Adv.

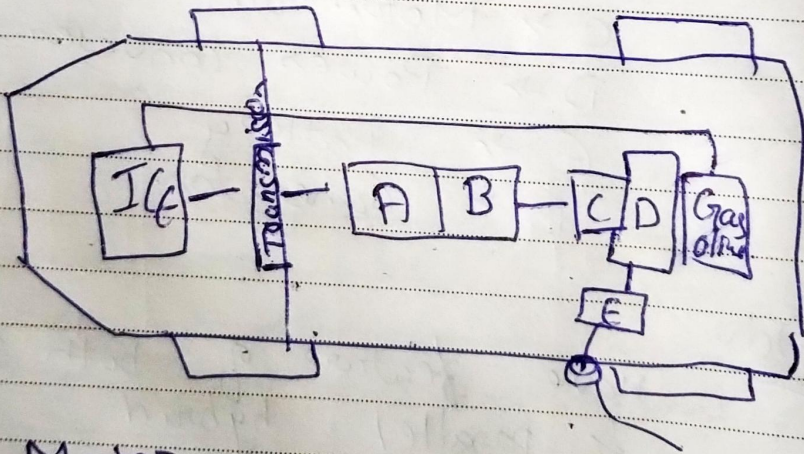
→ Have feature of both series & parallel hybrid.

→ Many diff. modes of driving are possible. ~~under~~

15 Tuesday

Disadvantage.

- Very complicated design.
- Increase in the weight of vehicle.

d. Plug in Hybrid Ev.
16 Wednesday


A → Motor.

B → Motor drive.

C → Power converter.

D → Battery

E → on board charger

17 Thursday

Adv.

- Fuel efficient in traffic.
- Easy to drive.

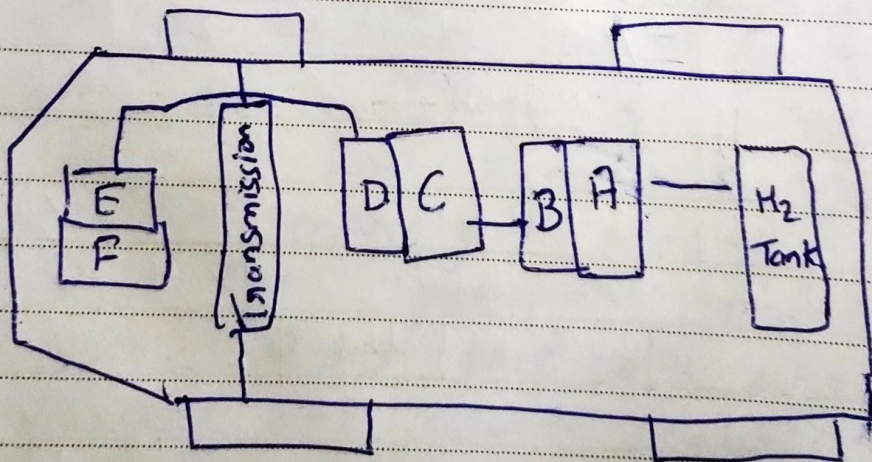
Disadvantages

- Battery life concerns
- Relatively expensive & complex to maintain.

18 Friday



Fuel Cell EV.



19 Saturday

- A → Fuel cell stack
- B → Power converter.
- C → Battery bank
- D → Power converter.
- E → Motor drive.
- F → Electric motor.

Dis Advantages.

- It produces ~~heat~~ ~~no~~
- The H_2 fuel is costly as compared to others.

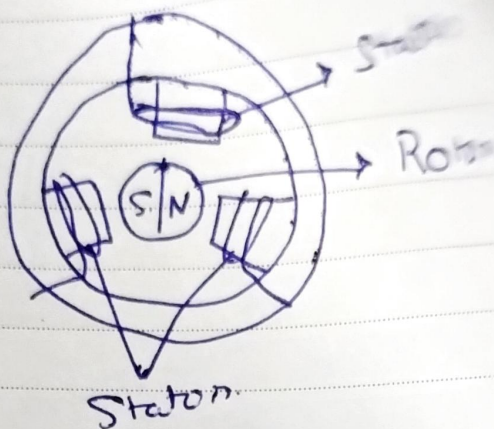
20 Sunday

- Larger H_2 storing capacity needed.

21 Monday

3.

Brushless Motor



Working

When the stator coil gets a supply from source it becomes an electronic magnet & starts producing the uniform field in the air gap.

Through the source of supply i.e. DC, switching makes to generate an AC voltage waveform.

With the switching of windings a high & low signal corresponding to winding energizes North & South poles. The permanent magnet rotor with ~~N-S~~ N-S poles aligns with the stator coil which causes the motion.

22 Tuesday