

## UNIT-III

### Objective:

After this experiment you will be able to:-

1. Understand the concept of hybrid motor vehicle.
2. Classify the types of hybrid drives.

### **Theory**

#### **Hybrid Motor Vehicles**

A means of transport which combine two or more power sources can be considered as a hybrid vehicle.

#### **Examples:**

- Diesel Electric hybrids
- Petrol[gasoline] Electric Hybrids
- Nuclear Engines
- Pneumatic Engines

#### **Hybrid System Structures**

- The two power sources found in hybrid
- vehicles may be combined in different
- ways, either in parallel or series
- Either one will allow the gasoline engine to shut down when it is not needed.

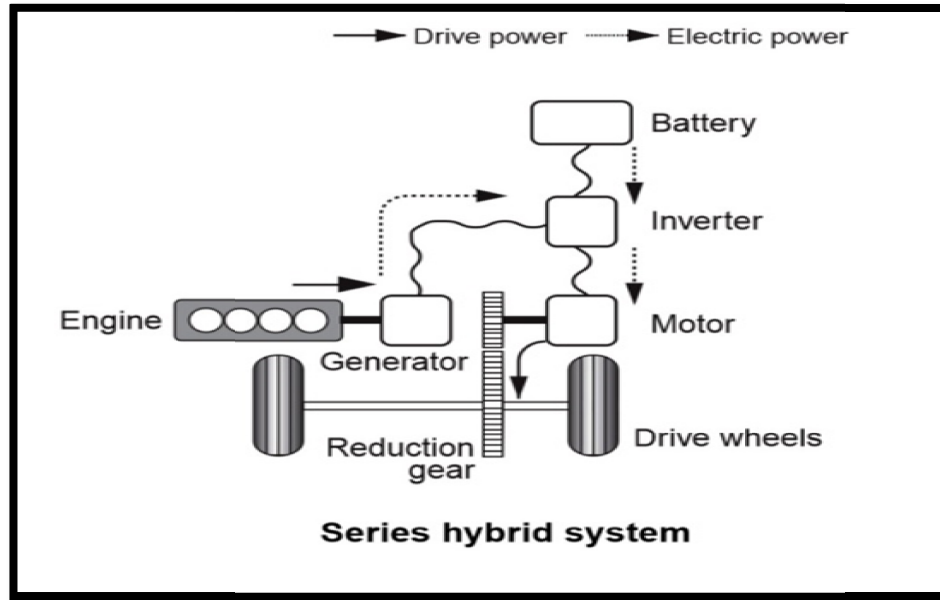
#### **Parallel Hybrid Structure**

- Gasoline motor
- Batteries which powers an electric motor
- Both can power the transmission at the same time
- Electric motor supplements the gasoline engine

#### **Types of Hybrid system**

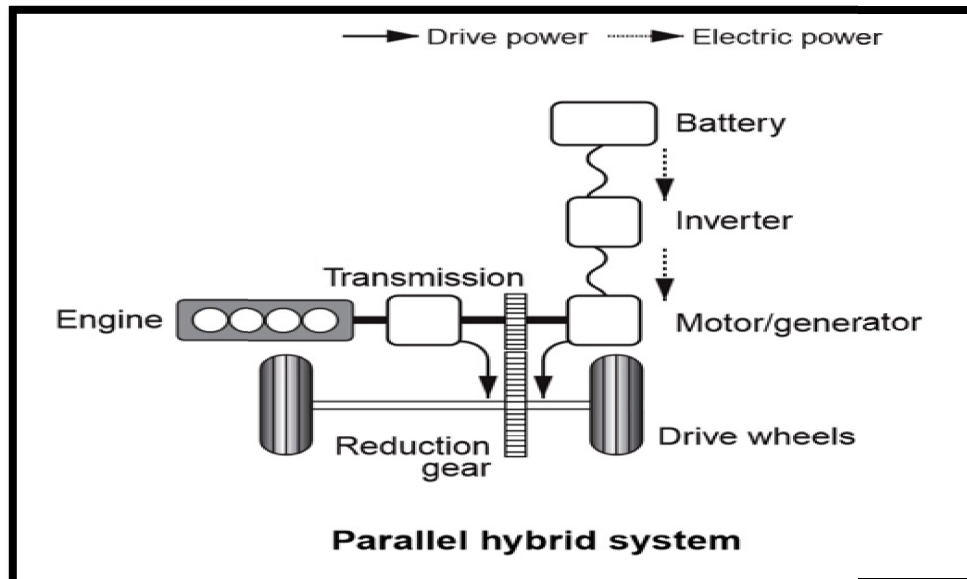
The following three major types of hybrid systems are being used in the hybrid vehicles currently on the market:

1. **Series Hybrid System:**



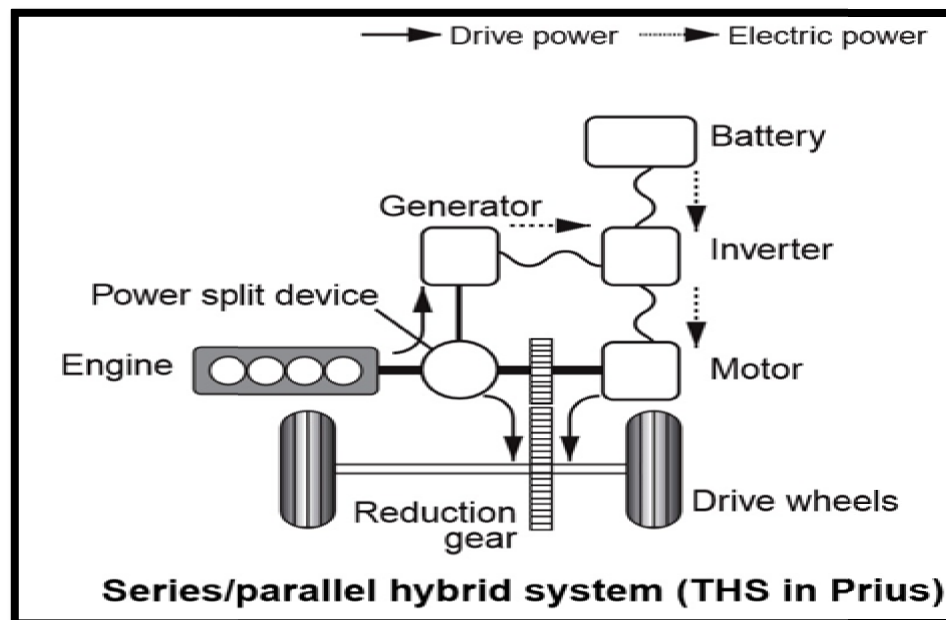
- The engine drives a generator, and an electric motor uses this generated electricity to drive the wheels. This is called a series hybrid system because the power flows to the wheels in series, i.e., the engine power and the motor power are in series.
- A series hybrid system can run a small output engine in the efficient operating region relatively steadily, generate and supply electricity to the electric motor and efficiently charge the battery. It has two motors—a generator (which has the same structure as an electric motor) and an electric motor. This system is being used in the Coaster Hybrid.

## 2. Parallel Hybrid System:



- In a parallel hybrid system, both the engine and the electric motor drive the wheels, and the drive power from these two sources can be utilized according to the prevailing conditions. This is called a parallel hybrid system because the power flows to the wheels in parallel.
- In this system, the battery is charged by switching the electric motor to act as a generator, and the electricity from the battery is used to drive the wheels. Although it has a simple structure, the parallel hybrid system cannot drive the wheels from the electric motor while simultaneously charging the battery since the system has only one motor.

### 3. Series/Parallel Hybrid System:



- This system combines the series hybrid system with the parallel hybrid system in order to maximize the benefits of both systems. It has two motors, and depending on the driving conditions, uses only the electric motor or the driving power from both the electric motor and the engine, in order to achieve the highest efficiency level.
- Furthermore, when necessary, the system drives the wheels while simultaneously generating electricity using a generator. This is the system used in the Prius and the Estima Hybrid.

#### Advantages of Hybrid System over Conventional I.C. Engine:

- Eco-Friendly i.e. it produces less pollutants.
- Due to smaller engine it uses less fuel. Hence, it is fuel efficient.
- Hybrid vehicle do not need to be charged externally unlike existing electric vehicles. Therefore, special infrastructure is not required to use hybrid vehicles.

- Produces less sound because of less number of mechanical parts.
- Can be refueled quickly and easily.
- Unlike electric vehicle, hybrid vehicle drive at least 300 miles (483 kilometers) between refueling.

**DISADVANTAGES OF HYBRID SYSTEM:**

- More complexity due to more electronic components.
- Servicing becomes little bit difficult due to more complexity.
- Costlier than conventional vehicle.