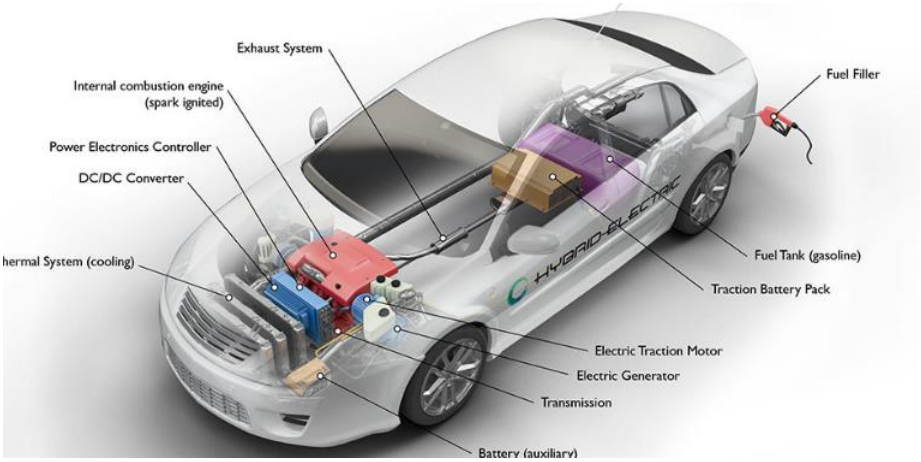
SNS College of Technology, Coimbatore-35

19MEE402 Hybrid Technology

UNIT 3-REQUIREMENTS IN HYBRID AND ELECTRIC VEHICLES

High voltage electrical system



Battery (auxiliary): In an electric drive vehicle, the low-voltage auxiliary battery provides electricity to start the car before the traction battery is engaged; it also powers vehicle accessories.

DC/DC converter: This device converts higher-voltage DC power from the traction battery pack to the lower-voltage DC power needed to run vehicle accessories and recharge the auxiliary battery.

Electric generator: Generates electricity from the rotating wheels while braking, transferring that energy back to the traction battery pack. Some vehicles use motor generators that perform both the drive and regeneration functions.

Electric traction motor: Using power from the traction battery pack, this motor drives the vehicle's wheels. Some vehicles use motor generators that perform both the drive and regeneration functions.

Exhaust system: The exhaust system channels the exhaust gases from the engine out through the tailpipe. A three-way catalyst is designed to reduce engine-out emissions within the exhaust system.

Fuel filler: A nozzle from a fuel dispenser attaches to the receptacle on the vehicle to fill the tank.

Fuel tank (gasoline): This tank stores gasoline on board the vehicle until it's needed by the engine.

Internal combustion engine (spark-ignited): In this configuration, fuel is injected into either the intake manifold or the combustion chamber, where it is combined with air, and the air/fuel mixture is ignited by the spark from a spark plug.

Power electronics controller: This unit manages the flow of electrical energy delivered by the traction battery, controlling the speed of the electric traction motor and the torque it produces.

Thermal system (cooling): This system maintains a proper operating temperature range of the engine, electric motor, power electronics, and other components.

Traction battery pack: Stores electricity for use by the electric traction motor.

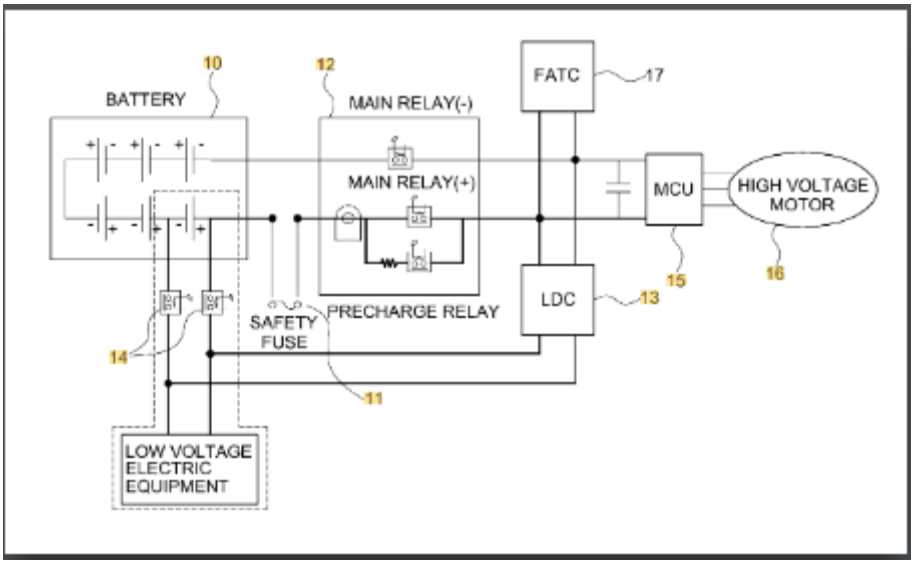
Transmission: The transmission transfers mechanical power from the engine and/or electric traction motor to drive the wheels.

High voltage electrical system

In hybrid vehicles, high-voltage electric systems typically consist of components like the traction battery, electric motor, and power electronics. These systems offer advantages such as improved fuel efficiency, reduced emissions, and regenerative braking, which captures energy during deceleration. However, they also pose challenges, including higher manufacturing costs, potential safety concerns due to the high voltage, and the environmental impact of battery production and disposal. Balancing these factors is crucial for optimizing the overall performance and sustainability of hybrid vehicles.

Working of high voltage electrical system

In a high-voltage electrical system, like those found in hybrid or electric vehicles, several components work together to enable efficient power distribution and utilization:



Traction Battery: Stores electrical energy in the form of chemical energy. Typically, lithium-ion batteries are used in modern high-voltage systems.

Power Electronics: Converts the DC (direct current) power from the battery into AC (alternating current) for the electric motor and vice versa. This is essential for controlling the speed and direction of the motor.

Electric Motor/Generator: Converts electrical energy from the battery into mechanical energy to drive the vehicle (in electric mode) or acts as a generator during regenerative braking, converting kinetic energy back into electrical energy.

Inverter: Converts DC power from the battery into AC power for the motor and controls the speed and torque of the motor.

Charging System (if applicable): Allows the battery to be charged, either through regenerative braking or by plugging the vehicle into an external power source.

Controller/Control Unit: Manages and coordinates the operation of various components to optimize performance, efficiency, and safety.

This system allows for the seamless integration of electric and internal combustion power in hybrid vehicles, providing improved fuel efficiency and reduced emissions.