SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
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DEPARTMENT OF AUTOMOBILE ENGINEEIRNG

19AUT202 – HYBRID ELECTRIC AND FUEL CELL VEHICLE

II YEAR / III SEM

UNIT - 2 – ENERGY STORAGE SYSTEM

TOPIC – Types of Battery – Lead Acid Battery

PRESENTATION OUTLINE

- Definition.
- Hybrid Energy Storage System.
- Battery Types
- Rechargeable Battery
- Non Rechargeable Battery.
- Lead Acid Battery
- Construction
- Material
- Working
- Advantages
- Disadvantages
- Application
- Reference.

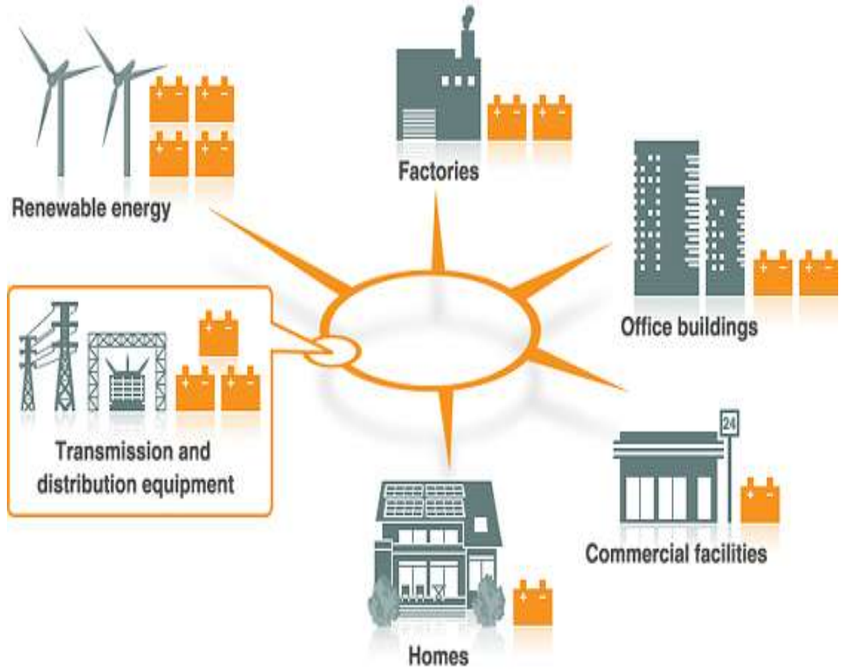
DEFINITION

- Energy storage is the capture of energy produced at one time for use at a later time.

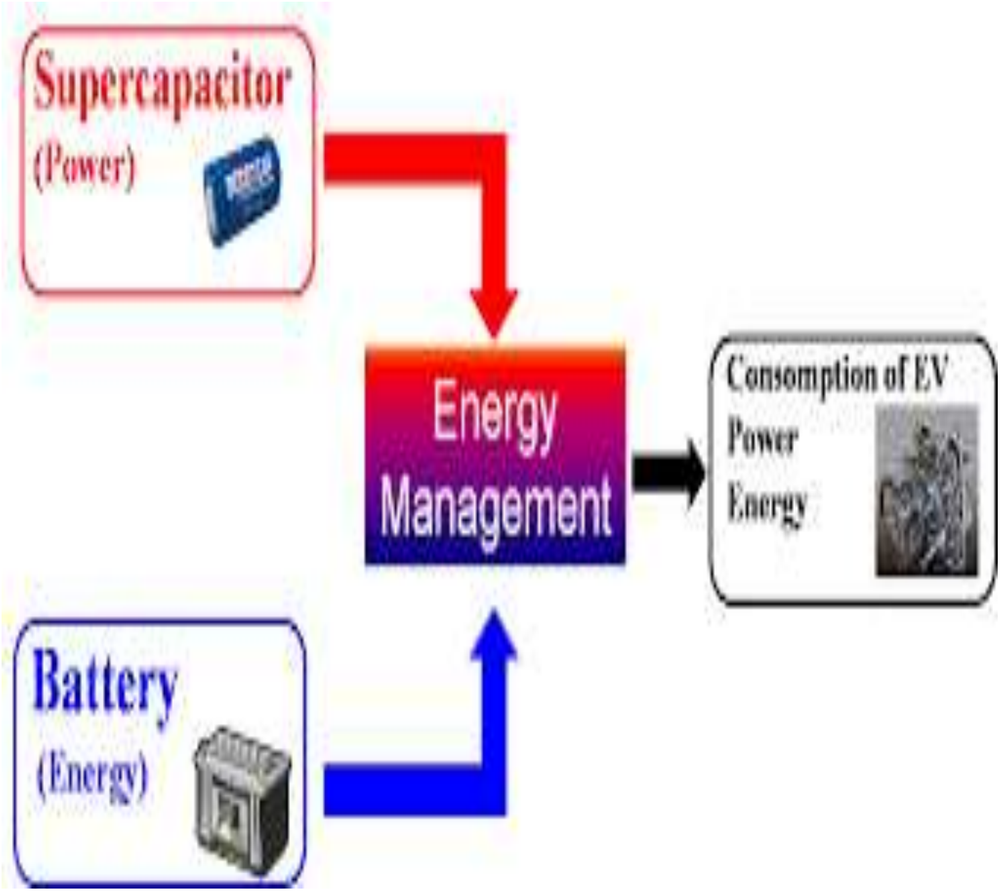
- A device that stores energy is generally called an accumulator or battery.

For Ex:

- Grid energy storage is a collection of methods used for energy storage on a large scale within an electrical power grid.



HYBRID ENERGY STORAGE SYSTEM



Hybrid energy storage systems (HESSs) characterized by coupling of two or more energy storage technologies are emerged as a solution to achieve the desired performance by combining the appropriate features of different technologies.

BATTERY TYPES

Types of Batteries

Non-rechargeable batteries (primary batteries)

- Alkaline Battery
- Coin Cell Battery

Rechargeable batteries (secondary batteries)

- Lead-acid batteries
- Ni-Cd batteries
- Ni-MH batteries
- Li-ion batteries
- Li-Po batteries

NON-RECHARGEABLE BATTERIES (PRIMARY BATTERIES)

Alkaline batteries:

- Chemical composition of Zinc (Zn) and Manganese dioxide (MnO_2),
- Electrolyte used is potassium hydroxide which is purely an alkaline substance the battery is named as alkaline battery
- Power density of 100 Wh/Kg.

- The chemical composition of coil cell batteries is also alkaline in nature.
- lithium and silver oxide chemicals will be used to manufacture these batteries.
- It providing steady and stable voltage in such a small sizes.
- It has Power density of 270 Wh/Kg.

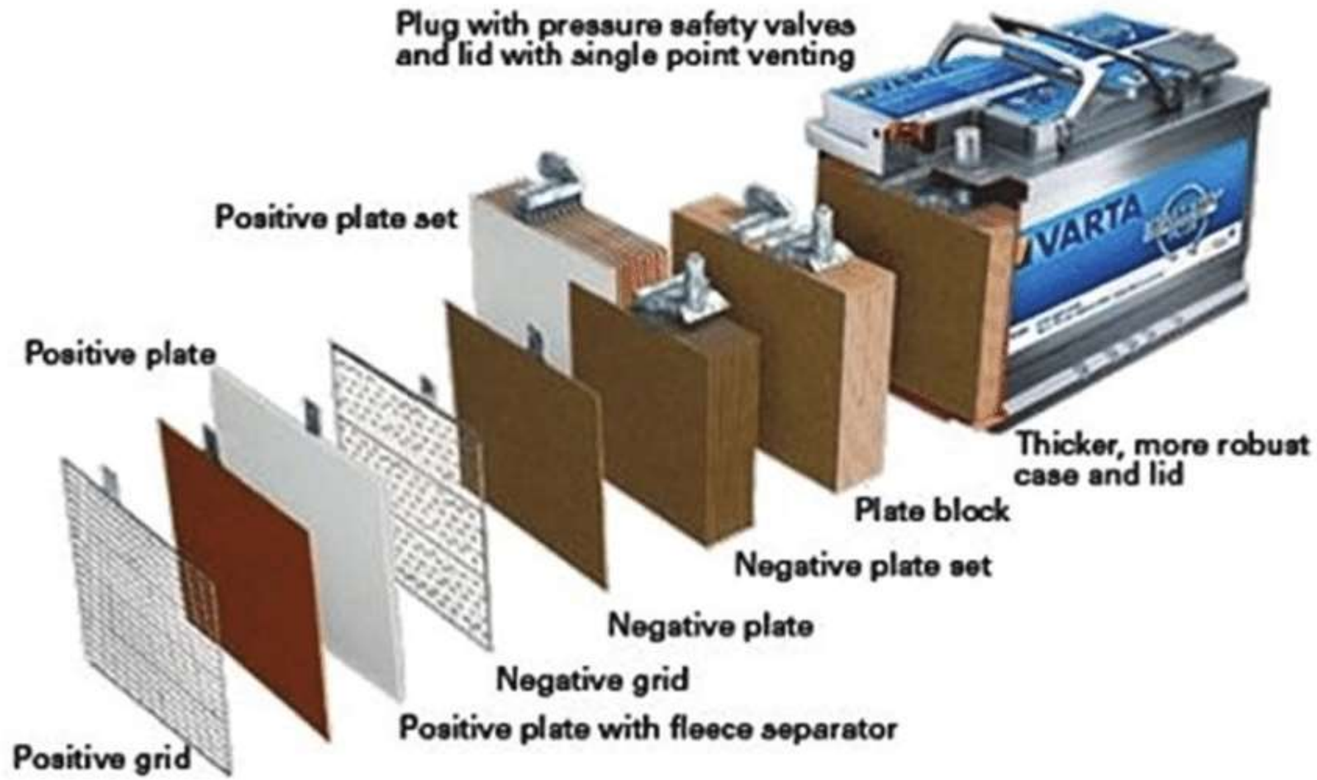
RECHARGEABLE BATTERIES (SECONDARY BATTERIES)

- These are generally called as **secondary batteries** which can be recharged and can be reused.
- Though the cost is high, but they can be recharged and reused.
- It can have a huge life span when properly used and safely charged.

LEAD ACID BATTERIES.

- The battery which uses sponge lead and lead peroxide for the conversion of the chemical energy into electrical power, such type of battery is called a lead acid battery.
- The lead acid battery is most commonly used in the power stations and substations because it has higher cell voltage and lower cost.
- It consists of lead-acid which is very cheap and seen mostly in cars and vehicles to power the lighting systems in it.
- Voltage varies – 2 to 24V
- Power density – 7Wh/Kg.

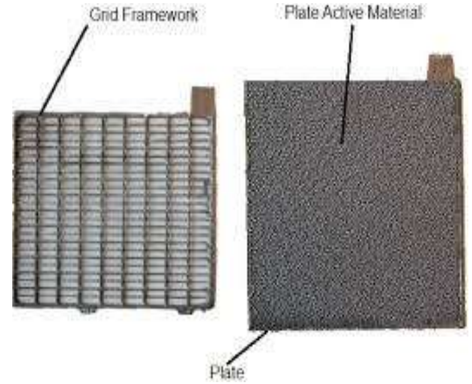
CONSTRUCTION



- Container.
- Plates.
- Active Material.
- Separator
- Battery Terminal.

MATERIAL

- The material in a cell which takes active participation in a chemical reaction (absorption or evolution of electrical energy) during charging or discharging is called the active material of the cell.
- The active elements of the lead acid are
- **Lead peroxide (PbO_2)** – It forms the positive active material. The PbO_2 are dark chocolate broom in colour.
- **Sponge lead** – Its form the negative active material. It is grey in colour.
- **Dilute Sulfuric Acid (H_2SO_4)** – It is used as an electrolyte. It contains 31% of sulfuric acid.



WORKING

Lead Acid Battery Cell

ADVANTAGES

- Cheap in cost
- Easily rechargeable
- High power output capability

DISADVANTAGES

- Very heavy
- Occupies much space
- Power density is very low

APPLICATIONS

REFERENCE

- Electric and Hybrid – Electric Vehicles” - Ronald K Jurgen,, SAE International, 2011.
- Electric and Hybrid Vehicles- Design Fundamentals” - Iqbal Husain, CRC Press, 2011.
- Electric Vehicle Technology Explained” - James Larminie, John Lowry, Wiley, 2012.

Thank You !!!!!!