

Course Material

Name of the Course : ENERGY STORAGE SYSTEM AND
MANAGEMENT SYSTEM

Name of the Unit : Introduction - ENERGY STORAGE SYSTEM

Name of the Topic : Introduction of battery and various types battery

- Objectives: • To understand the different types of energy storage system
- 1. Outcomes: **Discuss about the Introduction and different types of energy storage system.**
- 2. Pre-requisites: **To have a basic knowledge of E Vehicles and Batteries**
- 1. A fuel cells convertsenergy into electrical energy
- a) Mechanical b) Magnetic c) Solar d) Chemical
- Answer: d**
- 2. Batteries are charged by
- a) Rectifiers b) Engine generator sets c) Motor generator sets d) Any one of the above methods
- Answer: d**
- 3. Who invented the battery?
- a) Alessandro Volta b) Alexander Bell c) Alessandro Bell d) Tim Southee
- Answer: c**
- 4. Secondary's cells are
- a) lead acid cell b) alkaline cell c) both (a) and (b) d) none of these

Answer: c

5. Which of the following battery is used for aircraft?

- a) Lead acid battery b) Nickel-iron battery c) Dry cell battery d) Silver oxide battery

Answer: b

6. Storage batteries are rated according to ——

- a) Ambient Temperature b) Discharge Rate c) A and b d) None of the above

Answer: c

7. What is the other term of the secondary cells considering its capability to accept recharging?

- A. Reaction cell
B. Primary cell
C. Storage cell
D. Dry cell

Answer: c

8. Nominal cell voltage of zinc battery

- a) 2 V b) 5V C) 1.2 V d) 3V

Answer: c

9. Which of the following is primary cell?

- a) Nickel Cadmium Cell b) Silver Zinc Cell c) Carbon-Zinc cell d) Lead Acid Cell

Answer: c

10. Secondary's cells are

- a) lead acid cell b) alkaline cell c) both (a) and (b) d) none of these

Answer: c

3. Overview of Batteries

From the electric vehicle designer's point of view the battery can be treated as a 'black box' which has a range of performance criteria. These criteria will include:

- specific energy
- energy density
- specific power
- typical voltages
- amp hour efficiency
- energy efficiency
- commercial availability
- cost, operating temperatures
- self-discharge rates
- number of life cycles
- recharge rates

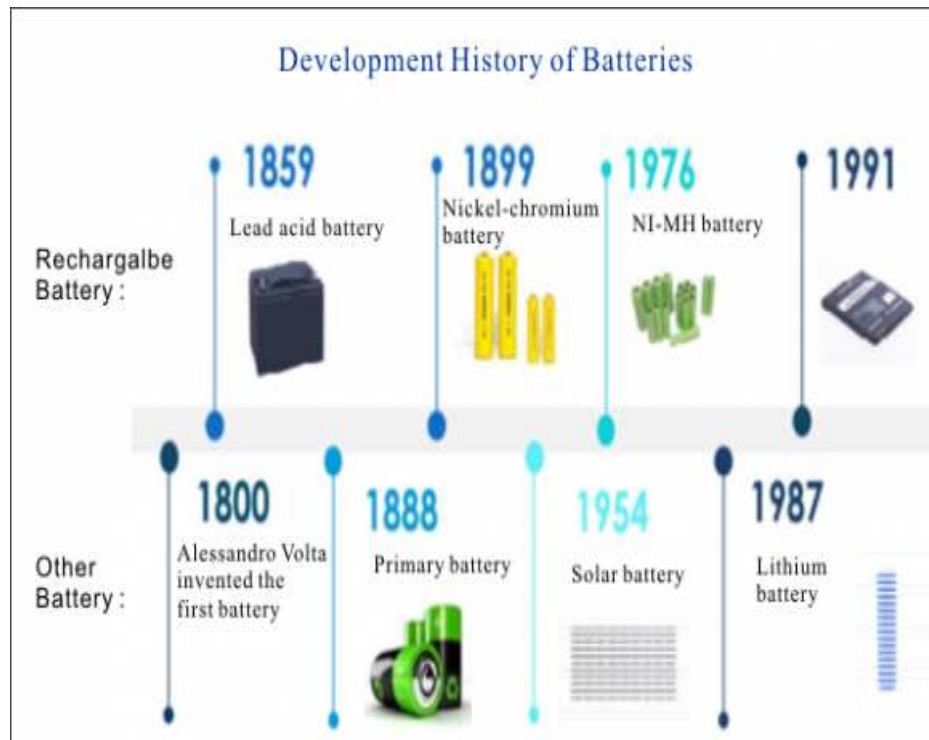
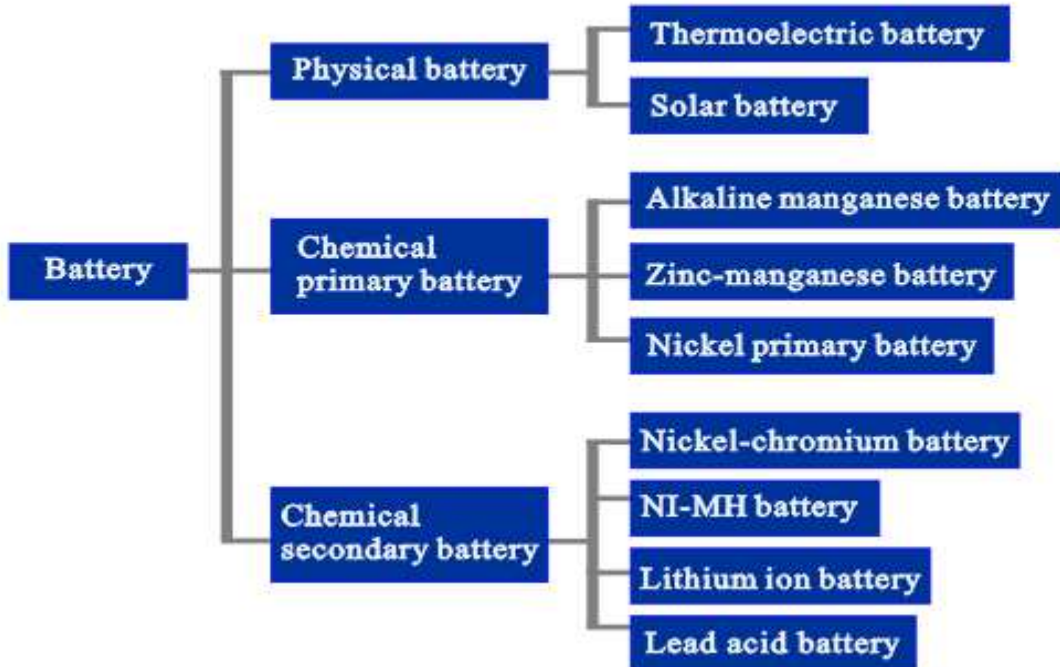
The designer also needs to understand how energy availability varies with regard to:

- ambient temperature
- charge and discharge rates
- battery geometry
- optimum temperature
- charging methods
- cooling needs

4. Classification of batteries

Battery is the primary power source for any electronics wireless gadget, be it a smartphone, laptop, watch or remote. Can you imagine the situation without these energy sources? We wouldn't be able to build any wireless electronic device and have to rely on wired power source only, even electric cars and space missions would not be possible without Batteries.

Battery classification



Mechanism involved

The chemistry of a battery

A battery is a device that stores chemical energy, and converts it to electricity. This is known as electrochemistry and the system that underpins a battery is called an electrochemical cell. A battery can be made up of one or several (like in Volta's original pile) electrochemical cells. Each electrochemical cell consists of two electrodes separated by an electrolyte.

Applications of battery

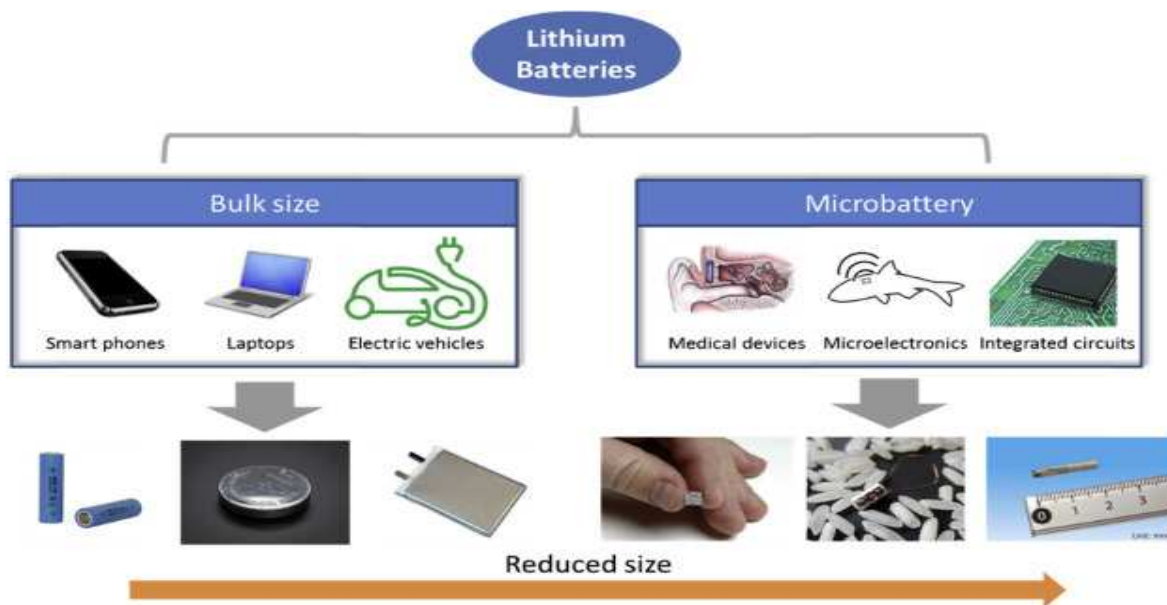
Alkaline Batteries: It can be used in torches, remotes, wall clocks, small portable gadgets etc.

Lead-acid Batteries: Used in cars, UPS (uninterrupted Power Supply), robotics, heavy machinery etc.

Ni-Cd Batteries: Used in RC toys, cordless phones, solar lights

Ni-MH Batteries: Used in all applications similar to the alkaline and Ni-Cad batteries.

Lithium Batteries: Can be used in all the portable devices which need rechargeable advantage like drones, robotics, RC toys.



Test after completion

1. The primary cell which has the longest life is
a) Lithium cell b) lead acid cell c) zinc cell d) mercury cell
Answer: a
2. Lithium cells operates ranging from
a) -25°C to 25°C b) -50°C to 25°C c) -50°C to 75°C d) -75°C to 75°C
Answer c
3. The lead-acid cell should never be discharged beyond
a) 1.8 V (B) 1.9 V (C) 2 V (D) 2.1 V
Answer a
4. The life cycle of lithium ion battery is
a) 5000 cycles b) 2000 cycles c) less than 1000 cycles d) 3000 cycles
Answer c
5. The capacity of lead acid cell depends upon its
a) Temperature b) voltage c) rate of charge d) rate of discharge
Answer: c

Conclusion

- Gained the knowledge and importance of E vehicles in current scenario
- Understood the knowledge about the batteries in E vehicles
- Discussed the details about different types batteries and its materials used in various applications.

Demo Videos

<https://youtu.be/DE3fazjYV-o>

<https://youtu.be/Lb9xSPWJg0o>

References

T R Crompton, "Battery Reference Book-3 rd. Edition", Newness- Reed Educational and Professional Publishing Ltd., 2000.