



SNS COLLEGE OF TECHNOLOGY

**Coimbatore-35
An Autonomous Institution**

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai



DEPARTMENT OF AUTOMOBILE ENGINEERING

19AUT202 – HYBRID ELECTRIC AND FUEL CELL VEHICLE

II YEAR / III SEM

UNIT - 2 – ENERGY STORAGE SYSTEM

TOPIC – Battery Management System, Ultra Capacitor



PRESENTATION OUTLINE



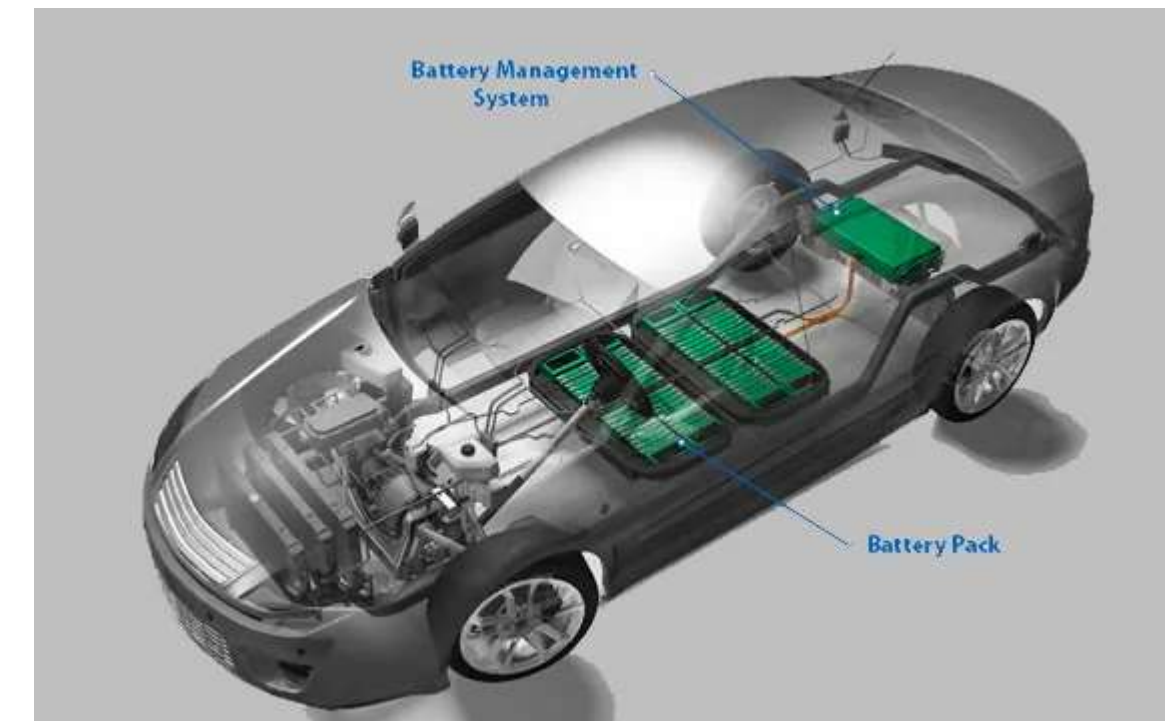
- Introduction
- Definition BMS
- Objective of BMS
- Function of BMS
- Topology of BMS
- Ultra capacitor - Definition
- Construction
- Working
- Types
- Advantages
- Disadvantages
- Application
- Reference





INTRODUCTION

- The most common type is a battery monitoring system that records the key operational parameters such as voltage, current and the internal temperature of the battery along with the ambient temperature during charging and discharging.
- The system provides inputs to the protection devices so that the monitoring circuits could generate alarms and even disconnect the battery from the load or charger if any of the parameters exceed the values set by the safety zone.





DEFINITION

INDUSTRY 4.0
MOBILITY

ISO 9001
2015
CERTIFIED

BATTERY MANAGEMENT SYSTEM (BMS)

ELECTRIC VEHICLE

CERTIFICATION
COURSE
DG
DIYGURU.ORG

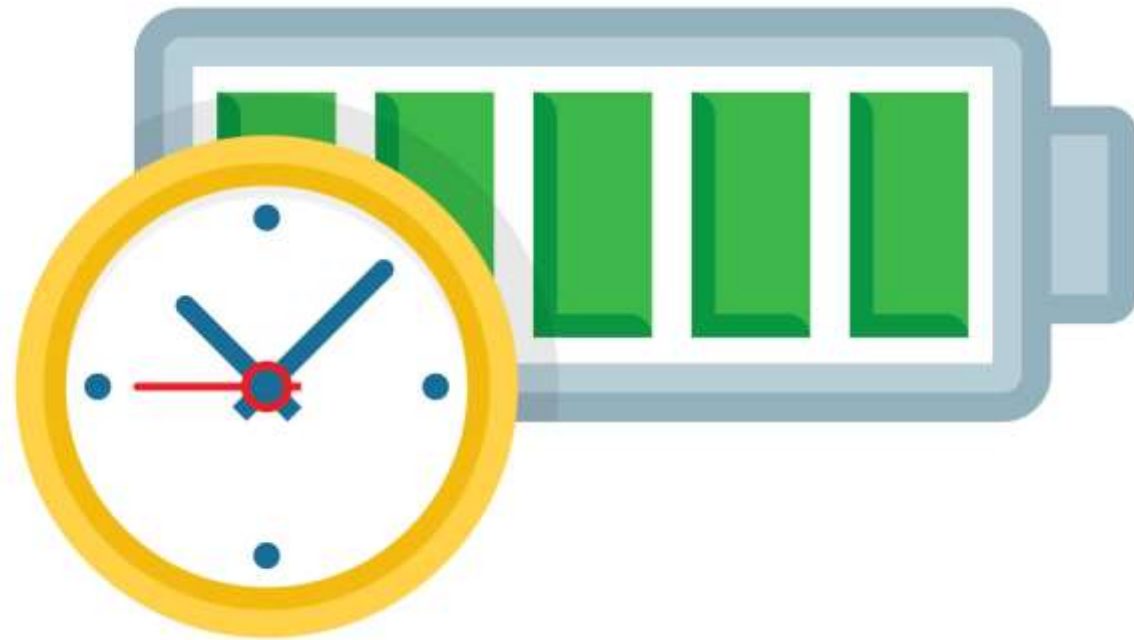
While the definition of a BMS could differ depending on the application, the basic task of the BMS could be defined in the following manner:

- It should ensure that the energy of the battery is optimized to power the product.
- It should ensure that the risk of damaging the battery is minimal.
- It should monitor and control the charging and discharging process of the battery.



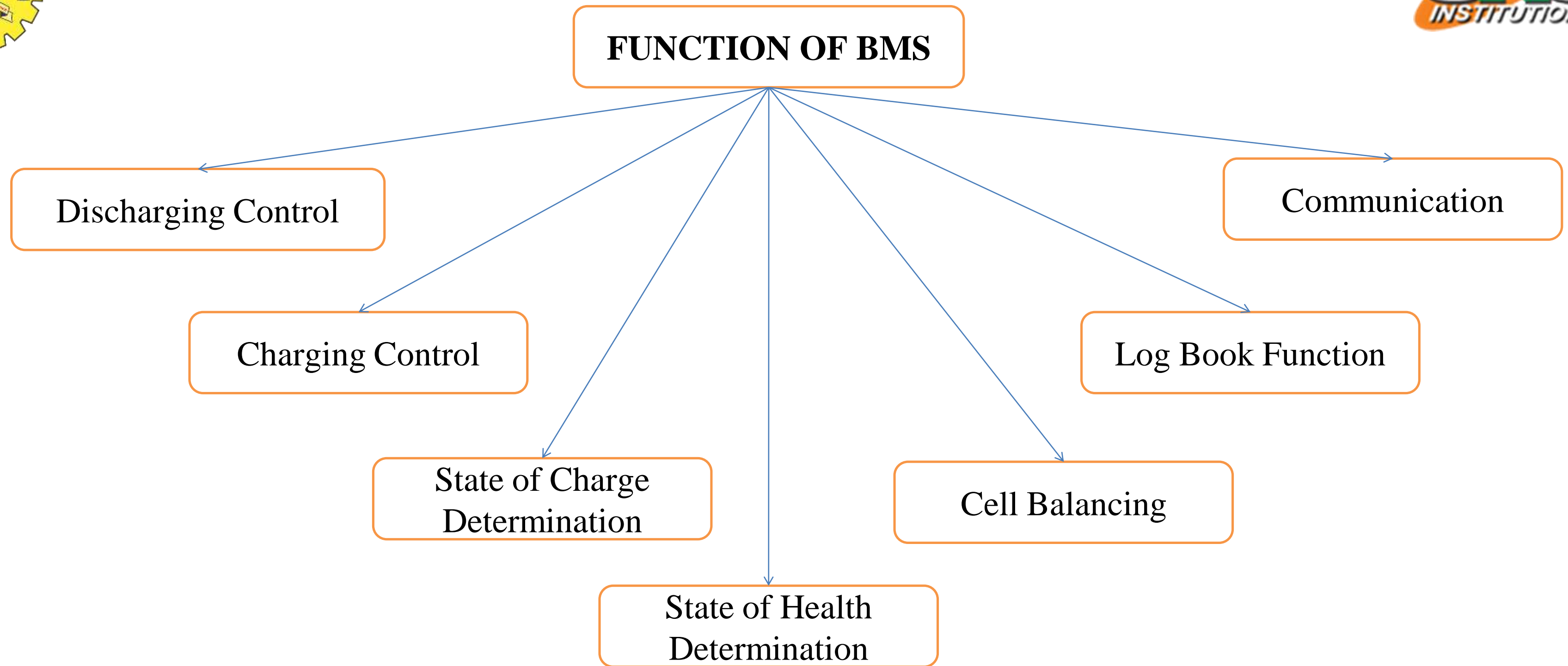
OBJECTIVE OF BMS

- It protects the battery cells from abuse and damage.
- It extends the battery life as long as possible.
- It makes sure the battery is always ready to be used.





FUNCTIONS OF BMS





BMS TOPOLOGY

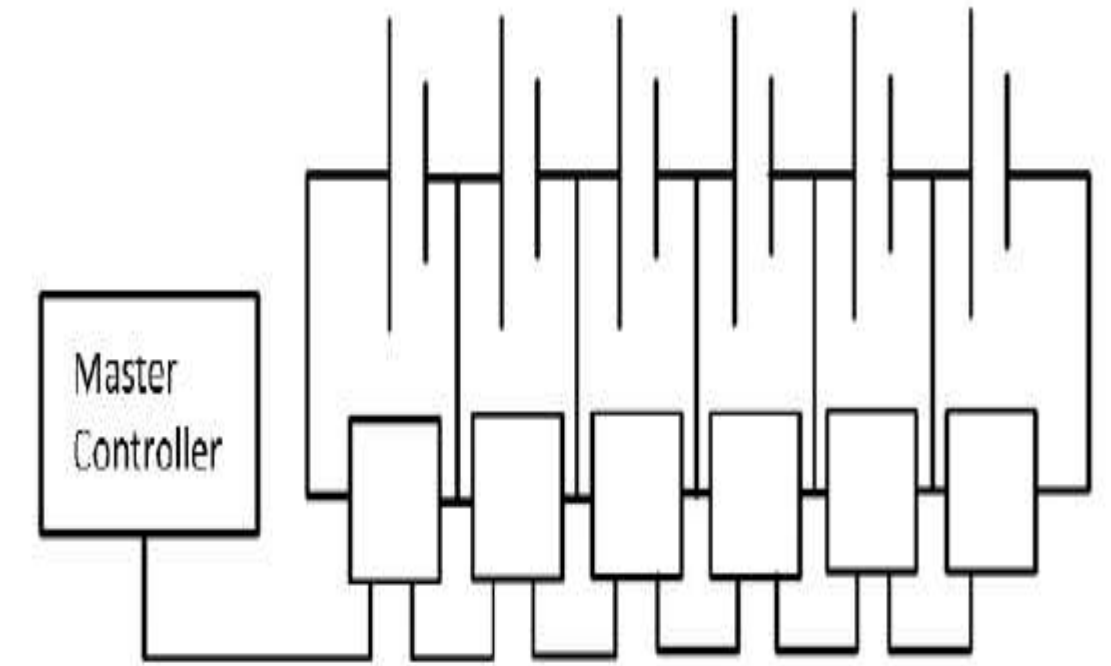
- In distributed topology, voltage monitors and discharge balancers with digital communications that can cut off the charger and report its status are placed on each cell.

ADVANTAGES:

- The design include its simplicity and high reliability.

DISADVANTAGES:

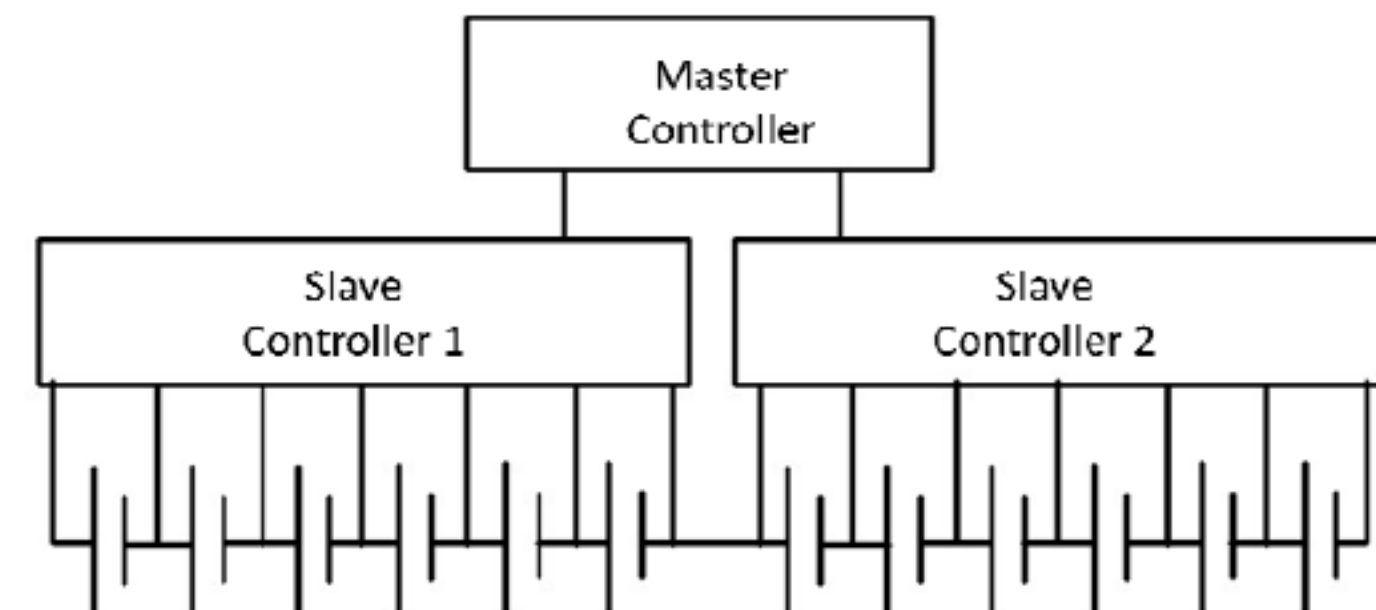
- It include the requirement of a large number of mini-slave printed circuit boards.
- The difficulty of mounting the boards on certain types of cells.





MODULAR TOPOLOGY

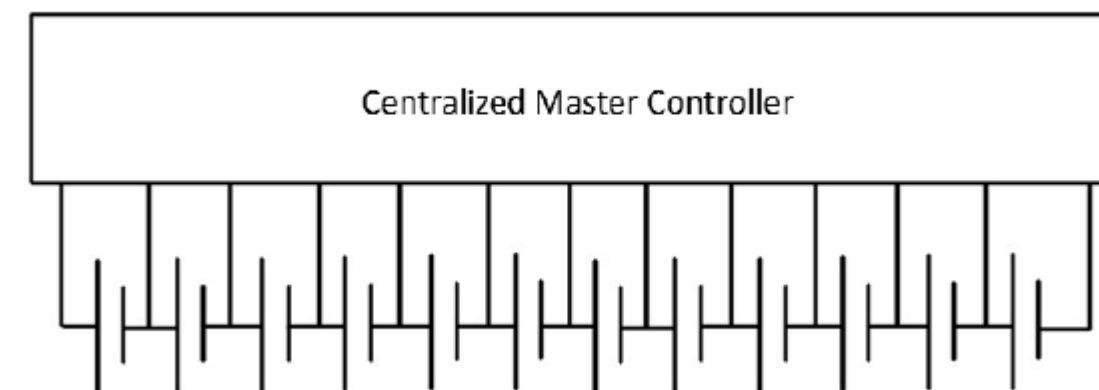
- In the modular structure, several slave controllers are used to consolidate the data to a master controller.
- No printed circuit boards are necessary to connect the individual cells. However, isolated master-slave communications are difficult to achieve when this structure is used in electric vehicles.





CENTRALIZED TOPOLOGY

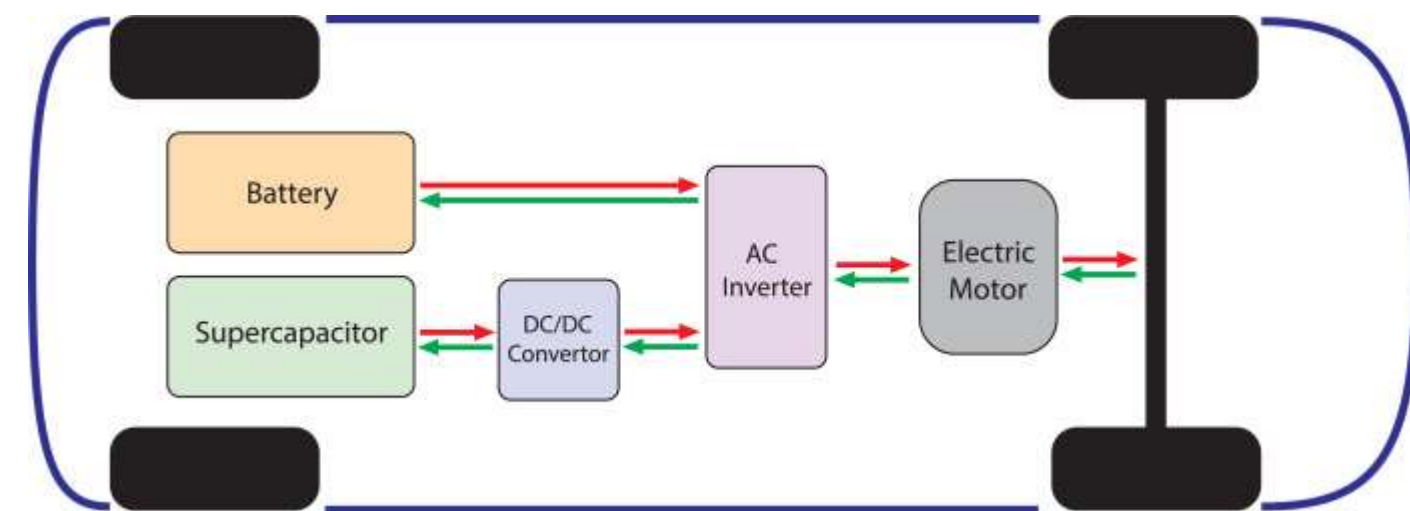
- In centralized topology, a centralized master control unit is **directly connected to each cell** of the battery pack.
- The **control unit protects and balances all cells** while providing various other functions.
- Using this topology only requires a **single installation point** and no complex inter-vehicle communications.
- However, **excess heat could be generated because the controller** is the only source for cell balancing.
- In addition, the cells are distributed within various locations of the vehicle, which requires **wiring to a central location.**





ULTRACAPACITORS

- Ultracapacitor is defines as energy storage device that stores energy electro statically by polarizing an electrolytic solution.
- Unlike Batteries no chemical Reactions takes places when energy is being stored or discharges.
- It can go through hundreds of thousands of charging cycles with no degradation.
- It is also called as **double layer capacitors and super capacitors**

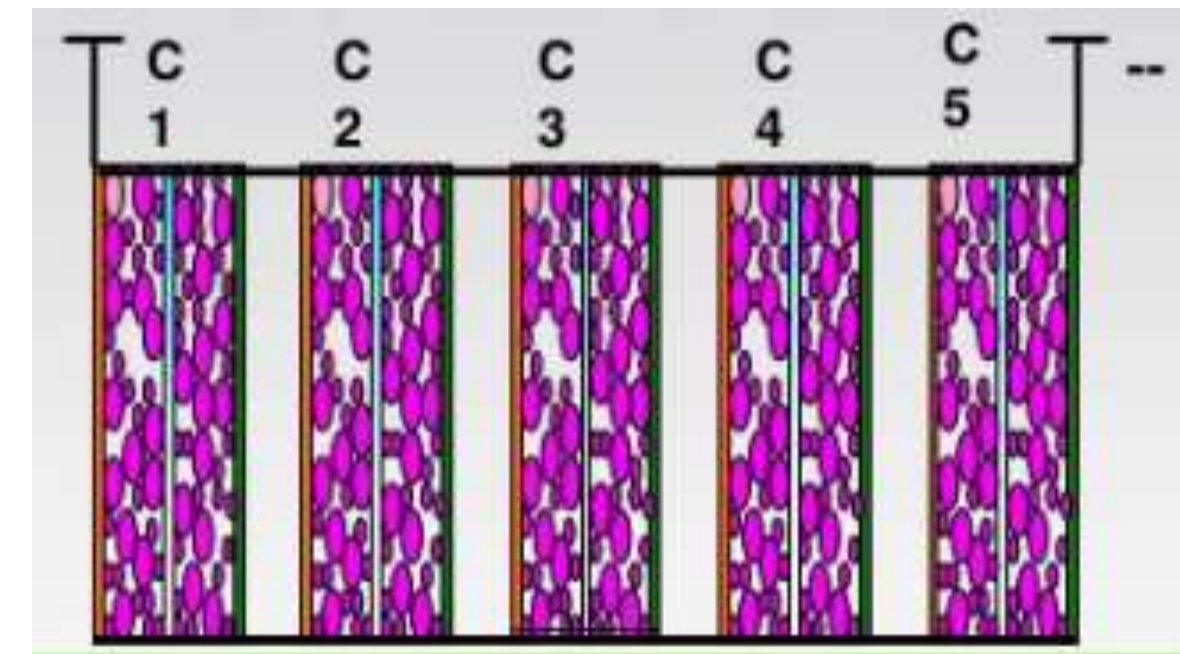
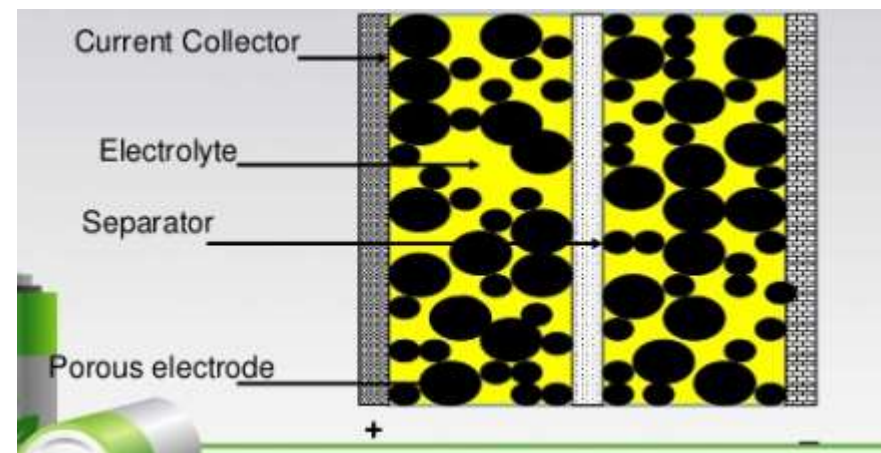




CONSTRUCTION OF ULTRACAPACITORS

It consists of porous electrode, electrolyte and a current collector

There is a membrane which separates positive and negative plates is called separator



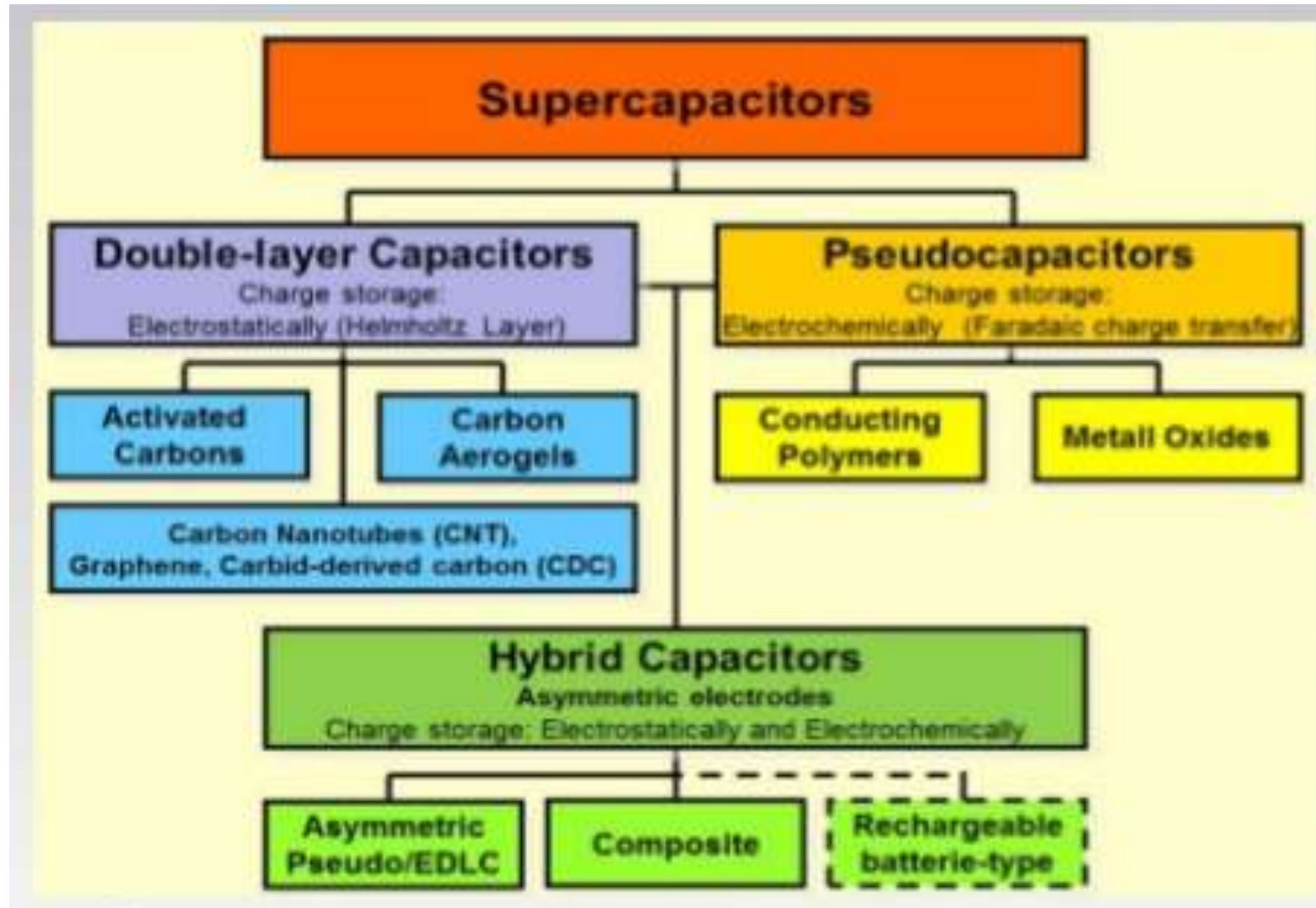


WORKING VIDEO

- [How Supercapacitors Work - A step by step guide](#)
- <https://www.youtube.com/watch?v=-7T-6XdiRTw>
- <https://www.youtube.com/watch?v=6FG6JRHGFyQ&t=22s>
- <https://www.youtube.com/watch?v=EHvi85r0bIA>



TYPES





ADVANTAGES



Long Life – works for large number of cycle without wear

Rapid Charging – It takes a second to charge completely

Low Cost – Less Expensive as compared to electrochemical battery

High Power Storages – It stores huge amount of energy in a small volume

Faster Release – Release the energy much faster than battery



DISADVANTAGES



- They have low specific energy
- Individual cell shows low voltage.
- Not all the energy can be utilized during discharging
- They have high self discharge as compared to battery



APPLICATIONS



Used in Industrial Laser, Medical Equipment's

Used in electric vehicle and for load leveling to extend the batteries life

Used in wireless communication system for uninterrupted services

Used in VCR's, CD players, Electronics toys, Security System, Computer, Scanners, Smoke Detectors coffee makers.



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 !!!!!