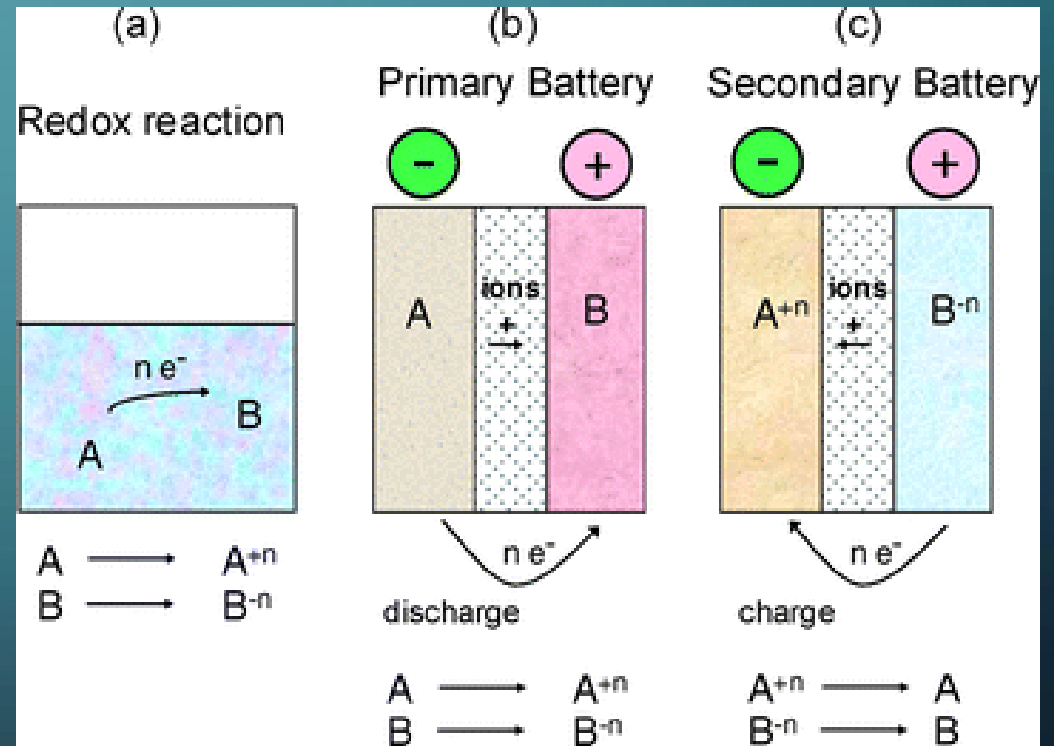


POWER SYSTEM MANAGEMENT

HASSAN EL MEHDI BOUFARES

PRIMARY & SECONDARY BATTERIES

- There are many types and shapes of batteries, which are made to fulfill a specific requirement to be therefore used in a portable system.
- Primary batteries are a single use battery. Which drains only and never recharges, as its chemical reaction cannot be reversed.
- Secondary batteries are a rechargeable, which can be used repeatedly. This is due to the ability of reversing the chemical reaction in the battery.



TYPES OF PRIMARY BATTERIES

<i>Battery Type</i>	<i>Characteristics</i>	<i>Applications</i>
Alkaline (Zn/Alkaline/MnO ₂)	Very popular, moderate cost, high performance	Most popular primary batteries
Magnesium (Mg/MnO ₂)	High capacity, long shelf life	Military and aircraft Radios
Mercury (Zn/HgO)	Very high capacity, long shelf life	Medical (hearing aids, pacemakers), photography
Lithium/Solid Cathode	High energy density, low temp performance, long shelf life	Replacement for button and cylindrical cells
Lithium/Soluble Cathode	High energy density, good performance, wide temp range	Wide range of applications with a capacity between 1 – 10,000 Ah
Lithium/Solid Electrolyte	Low power, extremely long shelf life	Memory circuits, medical electronics
Silver/Zinc (Zn/Ag ₂ O)	Highest capacity, costly, flat discharge	Hearing aids, photography, pagers
Zinc – Carbon	Common, low cost, variety of sizes	Radios, toys, instruments

TYPES OF SECONDARY BATTERY

Secondary Battery Types

	Silver zinc	Nickel cadmium	Nickel hydrogen
Energy density (W h/kg)	90	35	75
Energy density (W h/dm ³)	245	90	60
Oper Temp (deg C)	0 – 20	0 – 20	0 – 40
Storage Temp (C)	0 – 30	0 – 30	0 – 30
Dry Storage life	5 yr	5 yr	5 yr
Wet Storage life	30 – 90 days	2 yr	2 yr
Max cycle life	200	20,000	20,000
Open circuit (V/cell)	1.9	1.35	1.55
Discharge (V/cell)	1.8 – 1.5	1.25	1.25
Charge (V/cell)	2.0	1.45	1.50
Manufacturers	Eagle-Pitcher, Yardney Technical Prod	Eagle-Pitcher, Gates Aerospace Batteries	Eagle-Pitcher, Yardney, Gates, Hughes

IMPLEMENTATION

PRIMARY BATTERY

- Are used in low current consumption devices.
- E.g., remote-control garage door openers, remote automobile door locks, home smoke detectors

SECONDARY BATTERY

- Not limited on a specific use. More based on the chemical combustion and battery size.
- E.g., mobile telephone, or notebook computer as well as to cars.

CHOOSING THE SUITABLE BATTERY

- There are many ways to choose a specific battery. However, checking the system's power consumption and choosing the battery based on that is the most efficient.

- $Q = I * t$

where Q is the charge in coulombs, I is the current in amps and t is the time in seconds.

If the current drawn is x amps, the time is T hours then the capacity C in amp-hours is

$$C = xT$$

For example, if your pump is drawing 120 mA and you want it to run for 24 hours

$$C = 0.12 \text{ Amps} * 24 \text{ hours} = 2.88 \text{ amp hours}$$

Cycle life considerations

It isn't good to run a battery all the way down to zero during each charge cycle. For example, if you want to use a lead acid battery for many cycles you shouldn't run it past 80% of its charge, leaving 20% left in the battery. This not only extends the number of cycles you get, but lets the battery degrade by 20% before you start getting less run time than the design calls for




$$C' = C / 0.8$$

For the example above

$$C' = 2.88 \text{ AH} / 0.8 = 3.6 \text{ AH}$$

Then convert it to watts.

WIRELESS RECHARGEABLE BATTERY MANUFACTURERS

Manufacturer	Description	Available Power (W)
	<p>While many companies are new entrants to the development of wireless power supply technology, we have more than 30 years of experience in developing and manufacturing wireless power supply devices.</p> <p>Rising above the competition, B&PLUS JAPAN provides wireless power transfer (WPT) technologies with wide power range solutions and options for signal transmission.</p>	600 W
	<p>Through the combination between the electric energy specialists DAIHEN and the patented coil technology of Electricity, D-Broad allows for an charging area that is unchallenged in its width.</p> <p>It allows for wireless charging with a maximum gap of 40mm for power receiving & transmission, while the AGV can be stopped with a gap up to 10mm.</p> <p>D-Broad has a charging success rate of 100% (a charging failure = stoppage of the AGV). Until now, a charging failure complaint has not been registered from any of our customers.</p>	Up to 4 kW
	<p>Delta Energy Systems (Germany) GmbH is the world's leading producer of power supplies for the top names in industrial, medical and consumer electronics devices.</p> <p>We offer innovative wireless battery charging systems for AGV and Forklift applications. No more expensive connectors and cables to replace. Safe, highly reliable, programmable charging for any battery type with CANBus communication and over 93% efficiency.</p>	From 1 KW up to 30 KW

WIRELESS RECHARGEABLE BATTERY MANUFACTURERS

IN2POWER

In2Power specialises in maximizing the use of time. By optimizing charging opportunities with cutting-edge wireless technology, we are able to create more efficient movements, within the same time frame, compared to traditional charging systems.

1.5/2.5kW (M-SERIES) output
<40A

16kW (L-SERIES) in two versions:

<250A (18-60VDC)

<125A (60-120VDC)

It is possible to arrange parallel / multiple application to increase outputs.



WiBotic core technology was developed by co-founders, Ben Waters (CEO) and Professor Joshua Smith, at the University of Washington in Seattle. Now headquartered near the UW, the company continues to benefit from a rich pool of technical and managerial talent in one of the country's fastest growing markets.

Up to 300 W

Whether you're landing drones on rooftops, deploying mobile robots across wide areas, attempting to re-power AUVs at depth, or need to reliably power industrial automation equipment, WiBotic offers a wireless charging solution that keeps you moving forward.



Wiferion develops and sells energy systems for mobile robotics applications. Our inductive charging system in combination with standardized battery modules, the company offers scalable and modular energy systems.

3kW
12 kW

Wiferion's battery modules were optimized for use along with wireless etaLINK chargers. In the system network, Wiferion implements optimal charging processes and can thus ensure the best possible and economical use of the energy storage system.