Zinc Batteries Today

Not your Grandfather’s flashlight batteries!

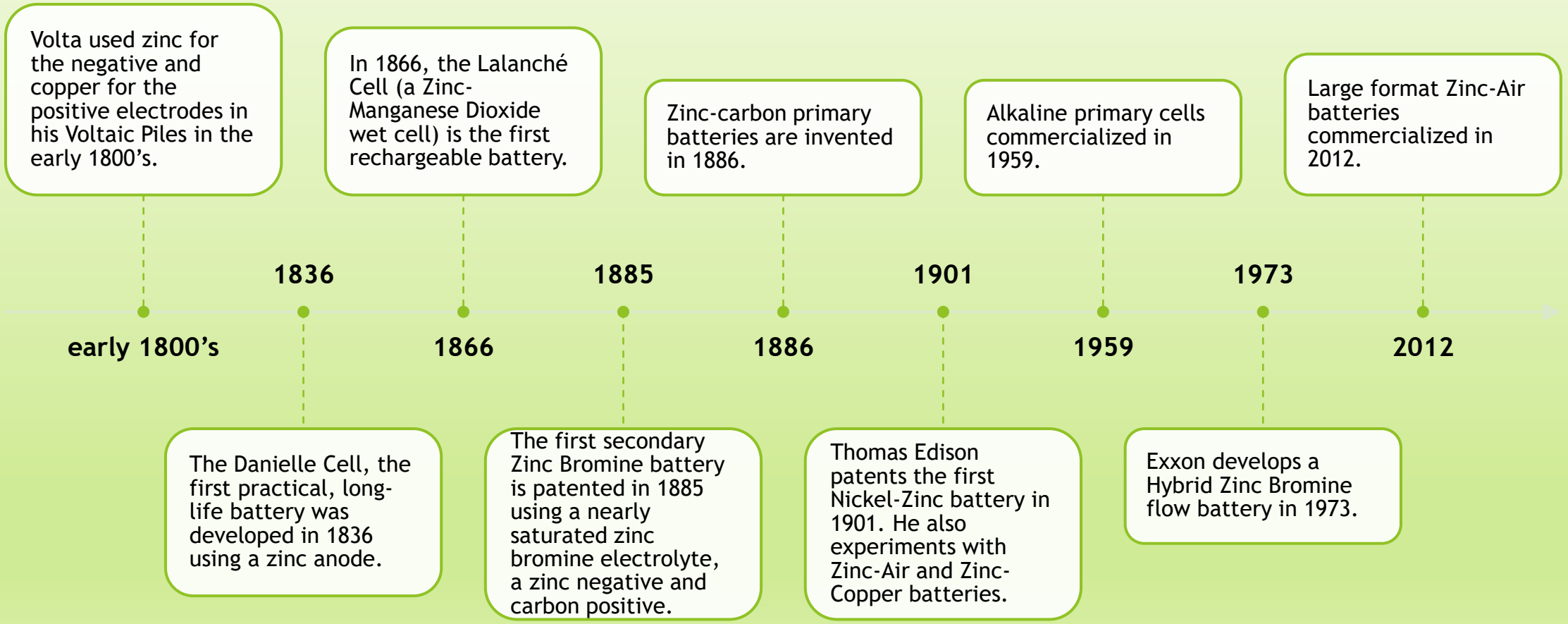
“Zinc Batteries are a Trending New Technology”

When was the first zinc battery developed?

"Alessandro Volta invented the voltaic pile in 1799, and reported the results of his experiments in a two-part letter to the president of the Royal Society in London, which was published in 1800." His voltaic pile used copper for the positive electrode and zinc for the negative electrode.

So much for the "new technology" label!!

Quick History of Zinc Usage in Batteries



Zinc in Today's ESS

Zinc is used today in many technologies and applications.

Zinc Manganese Dioxide ($ZnMnO_2$) secondary batteries are being used in grid stabilization applications and other large-scale energy storage applications, both in front of and behind the meter. They are also used in backup (UPS) and other energy storage applications.

Zinc Bromine (ZnBr) is being used in both static and flow battery configurations. The ZnBr flow technologies are offer the potential for extended discharge durations due to the ability to increase discharge time by increasing electrolyte storage volumes.

Nickel-Zinc (NiZn) batteries are being utilized extensively in Data Centers and other facilities where they provide the energy storage to support UPS systems and start the large diesel generators that provide ride-through during utility disturbances.

Zinc-Air batteries are being used for grid storage, behind the meter energy storage, and microgrid applications.

Why all the Interest In Zinc Technologies?

- Zinc is an abundant mineral that doesn't require extreme extraction techniques
- Zinc is a commodity mineral, available on the open market in several forms
- Zinc can be used in a variety of electrochemical technologies using both acidic and alkaline electrolytes.
- Zinc technologies are available that fit into many applications

Why all the Interest In Zinc Technologies? (cont'd.)

- Zinc is a highly recyclable mineral that has a great reuse story.
- Zinc technologies typically don't use any toxic heavy metals
- Zinc technologies don't typically use Volatile Organic Compounds (VOC)
- Most Zinc technologies utilize an aqueous electrolyte

Zinc is SAFE!

Both acidic and alkaline aqueous Zinc batteries use a water-based electrolyte in ~35% concentration. This electrolyte will not burn!

Aqueous chemistries do not experience Thermal Runaway. They may experience a slow heating if overcharged, which can be stopped by removing the charge current.

In the 2026 edition of NFPA 855, 9.7.2.2, 9.7.3.2, and 9.7.5.2, there are specific exclusions for aqueous chemistries used in UL 1778 UPS systems or listed to UL 1973. These exclusions all have to do with the fact that aqueous chemistries do not burn.

Conclusion

- Zinc batteries offer a variety of solutions for many different applications.
- Zinc technologies offer options with minimal potential risks.
- Aqueous Zinc technologies are Safe!
- Aqueous Zinc technologies will NOT experience Thermal Runaway!

Questions?

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Thank you!!

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