

The Advantages of Aqueous Hybrid Ion Batteries Over Lead Acid Batteries



		Aqueous Hybrid Ion (AHI™)	Lead Acid
Safety	Toxicity	AHI batteries are made from non-toxic materials. They are safe to install in a home or business, and in close proximity to people.	Lead metal, which composes over 70% of the weight of a lead acid battery, is a known carcinogen.
	Caustic	AHI batteries use a saltwater-based, neutral-pH electrolyte. There are no issues with touching or cleaning up spilled electrolyte.	Sulfuric acid electrolyte is caustic and causes severe skin burns. Acid residue from manufacturing can be found on the outside of batteries.
	Spill prevention	AHI batteries are completely sealed and filled with a non-caustic, neutral-pH, saltwater electrolyte.	Flooded lead acid batteries have the risk of jar leakage and will spill if tipped.
Robustness	Failure	AHI batteries have a linear degradation and do not experience lead acid's rapid failure at end of life.	Lead acid batteries "fall off a cliff" when they fail. This requires spares to be kept and rapid change outs when failures do occur.
	Redundancy	AHI batteries are built at 48V nominal. To increase energy of a system more batteries are put in parallel. If a single battery fails, the system still functions because the other units are in parallel.	Lead acid batteries are typically installed in either 2V or 12V increments, which means they must be connected in series to reach inverter voltages. A single failure in a series string will bring down the entire string.
	Charging and discharging	AHI chemistry can be operated and held at any state of charge without accelerated degradation.	Lead acid batteries rapidly fail when operated in a partial state of charge. Sulfation failures of the negative plate are irreversible and occur if the batteries are not brought up to 100% state of charge regularly.
	Temperature	AHI batteries can operate from -5°C to +40°C. Operating at elevated temperatures does not negatively impact the life of the batteries.	The corrosion rate of positive plates doubles for every 10°C rise in temperature. This failure mode is independent of cycling, which means that batteries in warm climates will always have limited life.
	Deep discharge cycle life	AHI batteries are designed for daily deep discharge up to 100%.	Discharging up to 100% leads to rapid wear-out and the need for battery replacement.
Ease of Use	Maintenance	AHI batteries are fully sealed and do not require maintenance.	Flooded lead acid batteries require frequent watering, and all types require maintenance cycles and charging to 100% state of charge to avoid sulfation. All lead acid batteries need terminal cleaning and connection testing.
	System sizing	AHI batteries can be fully discharged. System oversizing is not required to protect the batteries.	In order to maximize cycle life, lead acid battery systems are sized for 50% depth of discharge maximum and must be routinely charged to 100%. This means that installations are oversized by at least 2x.
	Storage	Since AHI batteries can operate at any state of charge, they can be stored without any need for boost or trickle charging.	Because lead acid batteries fail quickly when left at a partial state of charge, they must be kept on a trickle charge or frequently boosted when left in storage – either in distribution, on the shelf at a store, or as backup units in storage.

DISCLAIMER: This document reflects the general attributes of lithium ion batteries as compared to AHI batteries. Actual attributes of specific batteries and chemistries may vary.