White Paper

Deep-Cycle Battery Storage

Introduction

In the renewable energy sector, batteries usually mean deep cycle batteries. Deep cycle batteries are an energy storage unit in which a chemical reaction occurs that develops voltage and results in electricity. These batteries are designed to cycle (discharge and recharge) multiple times. Due to the electrochemical system, temperature is the principal component which affects the battery traits like life & electrical performance. Proper storage of batteries ensure to achieve desirable performance & extended life, while also helps develop its value & reliability

This whitepaper will help you in understanding how a deep cycle battery storage works and how proper storage of a battery can help in increasing its life as well as performance.

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EASTMAN AUTO & POWER LTD.
572, Udyog Vihar Phase 5, Gurgaon - 122016, Haryana, India | +91 124 4627900 | support@eastmanglobal.com
www.eaplworld.com

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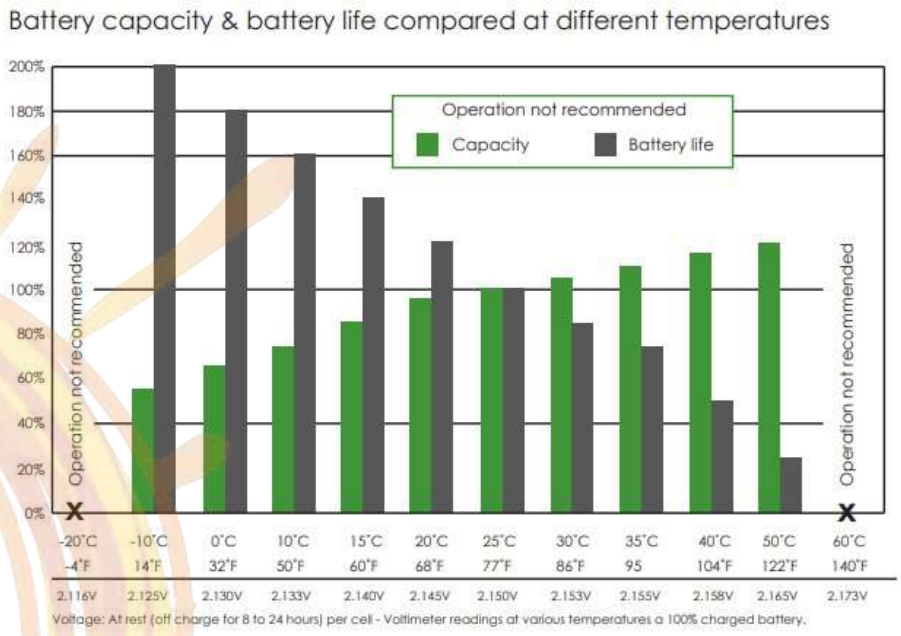
Product Design Effects on Battery Storage

Despite the chemical changes, all batteries undergo a process called self-discharge. The chemical ingredient used to make the battery's composition decides the rate of change and the speed at which this process occurs. The chemical reactants in a lead-acid battery consist of lead dioxide or lead peroxide in the positive electrode, sponge lead in the negative electrode and sulfuric acid in a dilute solution, called electrolyte. One fundamental thing according to the electrochemical technology is that as the chemical ingredient or reactant quantity increase or decrease the rate of reaction also changes. If the quantity of chemical ingredient increases, it increases the rate of reaction too. The number of plates in each cell, the density of the active material and the concentration of pure sulfuric acid in the electrolyte solution all play a part in the self-discharge rate of the battery during storage.

Effects of Temperature

Temperature plays a critical role in the performance of a battery. As the temperature decreases, the chemical reaction slows down and a smaller current is produced. However, the battery lasts longer, the rate of reaction decreases, slowing the self-discharge characteristic. As the temperature increases, the chemical reaction becomes faster and more current is produced which in turn shortens the battery life.



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Therefore, storing batteries in a hot environment accelerates the self-discharge characteristic. The voltage output of a battery decreases with higher temperature because temperature has a greater effect on resistance and band gap than on the rate of chemical actions. This will therefore increase battery life in warmer conditions.

Recommended Storage Practices:

1) Batteries should be stored in a cool and dry location away from sunlight. Do not place them nearby any heat source that helps ignition. Minimize temperature variations between the cells. (To avoid temperature variation between the batteries, do not place the battery near HVAC ducts or exhausts, heats sources (i.e., equipment that generates heat) or direct sunlight.

Provide a minimum free space of 1-meter on all sides of the battery string for free air circulation, easy assembly, and periodic checks during its operation.

2) According to Eastman battery technology, a freshening charge or uplift is necessary for the battery when the specific gravity of the same goes less than 1.100 or you can also check the status of your battery by following the S.O.C table provide by Eastman.

The table guides you about the voltage and gravity of the healthy battery or if your battery goes down to given specifications then you have to charge the battery according to given specifications only.

3) If the batteries have been in use before storage, they should be given a boost charge before being placed in storage and immediately preceding return to service.

Proper storage of Eastman deep-cycle, lead-acid batteries will help achieve better performance and longer life, while increasing reliability and value to the end user.

Freshening Charge Details :

Charging voltage: 15.8 V (CC Charging).
Charging current: limited to a maximum 10% of the C10 capacity.
Charging duration: As per the battery state of charge (SOC)

E. Charging Methods (Constant Voltage Charging @ 27°C)

- Stand By Use
  Charging Voltage - 14.4 V / battery
  Maximum Charge Current - 10% of the AH Capacity
- Cyclic Use
  Charging Voltage - 14.2 V / battery
  Maximum Charge Current - 10% of the AH Capacity
- Temperature Compensation - 5 milli volts/ battery/ C°

State of Charge Measure of Open-circuit Voltage @ 27°C

State of Charge	Specific Gravity	Voltage
100%	1.245-1.270	12.55V-12.75V
75%	≤ 1.225	≤ 12.4V
50%	≤ 1.190	≤ 12.1V
25%	≤ 1.155	≤ 12.0V
0%	1.120	11.8V