

## Battery Testing

### Introduction



**Batteries** play numerous **important** roles in everyday life, from providing the initial power needed to start the engines of cars to acting as a backup source of electricity in homes, telecommunications, public transportation, medical procedure and so on. Battery testing is the most important phenomenon to verify the state of battery and the battery cell condition which will provide you the glimpse of the battery life picture. By battery testing it will tell us that:

- Charge Acceptance of Battery
- How much charge is left in the battery?
- Does it meet the manufacturer's specification?
- What is the change in performance since it was new?
- What is the backup of battery?

### Importance of battery testing:

It is the procedure to check whether a Battery confirms to standards, and it give its full performance. Battery testing gives a clear picture of the 3 main parameters, **capacity** (means its ability to store power), **internal resistance** (means that ability to deliver current) and **self-discharge**. For proper function of the battery, the level of the charges must be maintained. Battery testing is done to estimate the state of health, cycle life, and actual capacity, state of charge of the battery or bank.

- **Capacity**

Battery capacity" is a measure in Amp-hour of the charge stored by the battery and is determined by the mass of active material contained in the battery. The battery capacity represents the maximum amount of energy that can be extracted from the battery under certain specified conditions. However, the actual energy storage capabilities of the battery can vary significantly from the "nominal" rated capacity, as the battery capacity depends strongly on the age and history of the battery, the charging or discharging regimes of the battery and the temperature. Units of Battery Capacity: Ampere Hours. The energy stored in a battery, called the battery capacity, is measured in either watt-hours (Wh), kilowatt-hours (kWh), or ampere-hours (Ah). The most common measure of battery capacity is Ah, defined as the number of hours for which a battery can provide a current equal to the discharge rate at the nominal voltage of the battery. The unit of Ah is commonly used when working with battery systems as the battery voltage will vary throughout the charging or discharging cycle. The Wh capacity can be approximated from the Ah capacity by multiplying the AH capacity by the nominal battery voltage.

- **Internal resistance testing:**

The internal resistance of a source of electrical energy is an important factor when considering how to get the source to deliver maximum power to an electrical appliance (the load) connected to it. ... Its low internal resistance allows it to provide these high currents without its terminal voltage falling significantly. It is very important to testing IR because it will detect any kind of internal fault into the battery. If in testing IR found high than we will reject that battery because battery did not give full capacity and run time during testing. So, IR is most important phenomenon.

- **Load Testing:**

Load testing is used to verify that the battery can deliver its specified power when needed. The load is usually designed to be representative of the expected conditions in which the battery may be used. It may be a constant load at the C rate or pulsed loads at higher current rates or in the case of automotive batteries, the load may be designed to simulate a typical driving pattern. Low power testing is usually carried out with resistive loads. For very high-power testing with variable loads other techniques may be required.

We verify from load test how our battery will perform into the given specification.

- **Open Circuit Voltage OCV testing:**

Measuring a battery's open circuit voltage is not a reliable measure of its ability to deliver current. As a battery ages, its internal resistance builds up. This will reduce the battery's ability to accept and to hold charge, but the open circuit voltage will still appear normal despite the reduced capacity of the battery. Comparing the actual internal resistance with the resistance of a new battery will provide an indication of any deterioration in battery performance.

- **Life Cycle Testing:**

These tests are needed to verify that the battery performance is in line with the product reliability and lifetime expectations and will not result in excessive guarantee or warranty claims. The cycle life of batteries is the number of charge and discharge cycles that a battery can complete before losing performance. To keep lead acid in good condition, apply a fully saturated charge lasting 14 to 16 hours. If the charge cycle does not allow this, give the battery a fully saturated charge once every few weeks. If possible, operate at moderate temperature and avoid deep discharges; charge as often as you can.

- **Water loss Test:**

Water loss in a valve regulated lead acid battery (VRLA) due to inefficient oxygen recombination, corrosion of the positive grid and water permeation through the battery housing were measured as a function of the electrolyte condition from a flooded state to a starved state. In starved electrolyte condition, the rate of measured water loss was found to be consistent with prediction based on weight loss. However, in flooded electrolyte conditions, the rate of water loss determined by weight loss is much higher than that calculated from vented gas measurements. The rate of water loss from the battery decreases as the battery transforms from flooded state to starved state

## Conclusion

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Battery testing is very important for measuring the life cycle and for deciding the warranty life of the lead acid battery. Through battery testing it will be easy to find out the battery performance and losses into the battery. Battery testing is nothing more than a measure of the energy the battery can store. Load testing is used to verify that the battery can deliver its specified power when needed. The load is usually designed to be representative of the expected conditions in which the battery may be used.