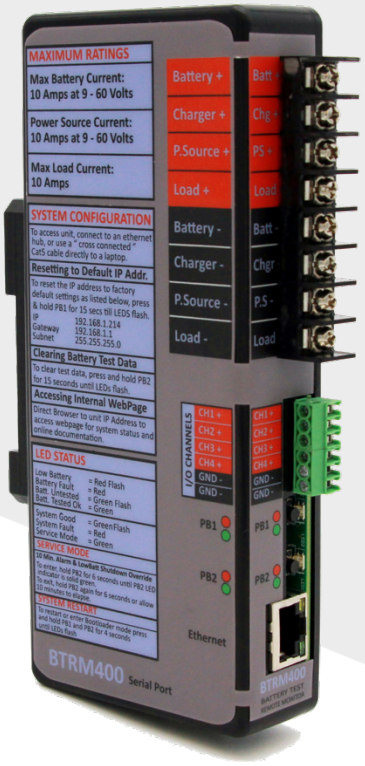
BTRM

Keeping Lead-Acid Batteries Healthy and Effective



Part Number: BTRM-300 and BTRM-400
Product Release Date: June 24, 2021
Software Version: BTRM400v4619-202106-23

Lead acid batteries are the most frequently used batteries in UPS systems. They are economical components that have proven to be effective over many years in use. Lead acid batteries do age and their capacity slowly deteriorates until they need replacement.

Why do they deteriorate?

The most common problem is sulfation of the battery plates. Sulfates are created and consumed as part of the normal charging and discharging battery process. However, a residual amount of sulfate can be left on the battery plates each cycle. This sulfate coating builds up over time and reduces the useful area of the plates, which also reduces battery capacity. Additionally, the sulfation process is accelerated if the batteries are left in a discharged state.

What else impacts the life of a battery?

A variety of other factors, like high temperatures, will cause a decline in battery capacity. Battery temperature can rise significantly during high rates of discharge or high charge rates and overcharging. In Sealed Lead Acid batteries this can cause the battery to swell, subsequently warping the thin battery plates, and cause venting of hydrogen from the cells.

LONG PERIODS OF INACTIVITY

If the battery left is unused for an extended period, the electrolyte can experience stratification. In this situation, the acid and water components in the battery electrolyte will separate with the acid settling to the bottom of the cell leaving the water at the top. The higher acid concentration at the bottom of the cell will corrode away plate material, reducing battery capacity, eventually leading to battery failure. This situation can be avoided when the battery is in routine use because in the discharge and charge processes small gas bubbles form that promotes mixing of the electrolyte.

Most of these conditions are not observable by monitoring the battery terminal voltage while in standby mode. That results in an AC Line Down situation, where batteries are expected to back up critical applications. These conditions will result in shorter runtimes, or in worst case, an immediate system shutdown.

How do people typically test batteries in the field now?

The two most popular tests are Run and Ohmic Tests. In a Run Test, the battery is either partially discharged or fully discharged. From the runtime data collected, capacity can be determined directly. An Ohmic Test is used to determine the battery's internal impedance. In most cases there is a relationship between loss of capacity and increased battery impedance. This measured value can be compared to the impedance value, as specified by the manufacturer, to arrive at an estimate of the battery's health.

Are there more expensive battery testing devices that can be used?

Ohmic Tests need to be capable of measuring the sub milliohm variations in battery impedance with high precision. This requirement tends to make them quite expensive. Additionally, not all capacity issues can be resolved by this method. For example, an Ohmic Test on fully charged batteries may not be able to differentiate between a battery that is 100 percent good and one that is reduced to 80 percent. This applies to batteries that may have relatively few cycles with plates still in good condition but have been partially vented due to higher temperatures or overcharging.

What is the best way to truly test a battery's health?

The most accurate evaluation of a battery's health is to allow the batteries to power its respective load and time the test to low voltage cut-off. This measurement is then compared to the original design specification. However, this full discharge Run Test not only adds cycles to the battery, which can decrease its capacity, running the battery down to a low state of charge also carries a considerable risk of the system being unable to perform if a backup situation occurs.

How does the BTRM evaluate battery health? How does it know when to test the battery and when not to? Why is this method the most effective?

The BTRM utilizes the Run Test method but limits the Run Test to a partial discharge window, about 20 percent or less, and from the collected data estimates the full runtime capability. This minimal discharge limits any impact on battery health due to cycling and minimizes the risk of the batteries not being ready for a backup situation. Additionally, the Run Test's discharge and charge cycle helps offset the stratification issue caused by long-term inactivity.

THE BTRM PROACTIVELY SENDS EMAIL AND TEXT ALERTS TO A USER-SPECIFIED ACCOUNT.

When an alert is sent, does that mean my battery bank will fail? Or will it not meet the defined battery backup time? Do I need to replace the batteries immediately? How much time do I have to replace the batteries?

One of the primary advantages of having the BTRM monitor the capacity on a scheduled basis is that the BTRM can better assess the batteries health over time. For example, the BTRM allows you to differentiate between a battery that continues to consistently perform, even at some reduced capacity, but still beyond the standby requirement, or a battery that is showing a continual or rapid decline.

The battery industry recommends replacing batteries that have reached 85 percent of their capacity. However, having the information the BTRM provides allows you to potentially extend the lifetime of batteries that have declined in capacity but remain stable performers.