

Benefits of Testing IR

Introduction



Battery system maintenance and monitoring are key elements in the reliability of any DC battery powered system. Mostly battery manufacturers require regular maintenance and maintenance records of purchased batteries for any warranty claims. The nature of construction of batteries prevents internal inspection of cell plates and elements that are normally done as part of standard maintenance of flooded lead acid batteries. This limits the ability to identify and record problems with batteries or their cells. However, there are still key elements of a cell's condition which can be identified and documented to show a battery or cell is operating normally or exhibiting a problem. These include cell voltage, internal resistance value and temperature. With the right equipment and measurement frequency, potential problematic cells can be identified and addressed before a failure occurs. In this, the internal resistance provides valuable information about battery life.

Theory:

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.

- In flooded lead-acid batteries there are many indicators available to determine the state of condition of any given cell: voltage, specific gravity, temperature, internal resistance, visual plate appearance, sediment levels, plate coloration, etc.
- Batteries are assembled in containers designed to prevent the escape of gases by recombination and sealed to the atmosphere. Doing so eliminates many of the indicators which could identify potential problems with a cell or battery.
- Over the past 30 years, internal resistance testing has become the standard for monitoring the characteristics of battery performance. Changes hidden within the batteries.
- As battery cells age, and the internal resistance values in the cells increase, indicating a departure from healthy battery readings. One under-performing battery in a string can significantly reduce the life of the other batteries in the string, causing the entire system to fail or need complete replacement.

What is IR?

A battery can be regarded as an ideal voltage source in series with impedance, which is called internal resistance. When the battery works, the voltage output is lower than the open-circuit voltage (abbreviated as OCV). The difference is the voltage drop caused by the internal resistance. The internal resistance is measured by ohm (Ω). The value of internal resistance varies depending on multiple factors, such as battery size, cathode electrode, anode electrode, separator, electrolyte, temperature, and state of charge (SOC) of the battery.

Why IR is important?

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.

Where can we use IR?

We are tested battery IR after assembly and before packing to detect the internal fault into the battery and the cell conditions. If battery IR found high, we rework the battery.

Factors that influence battery resistance are:

- Conductor resistance, both in the metal component of electrode plates and conveyer and interconnection wires, plates, and foils
- Electrolyte resistance
- Ionic mobility
- Separator efficiency
- Reaction rates at the electrodes
- Concentration polarization due to the transport of reactance and the removal and conductivity of reaction products.
- Temperature effects of the reaction and transport rates.

How Temperature Affects the IR?

Temperature also affects the resistance; heat lowers it and cold raises it. Heating the battery will momentarily lower the internal resistance to provide extra runtime. This, however, does not restore the battery and will add momentary stress. With all batteries, State of charge affects the internal resistance.