Battery Management

By Socomec Sicon UPS

Reducing battery costs

One of the most delicate components of a UPS, which certainly plays a crucial role in its overall reliability, is the accumulator battery. Today, the technology available enables its life to be prolonged and thus the total cost of ownership of a UPS to be reduced.

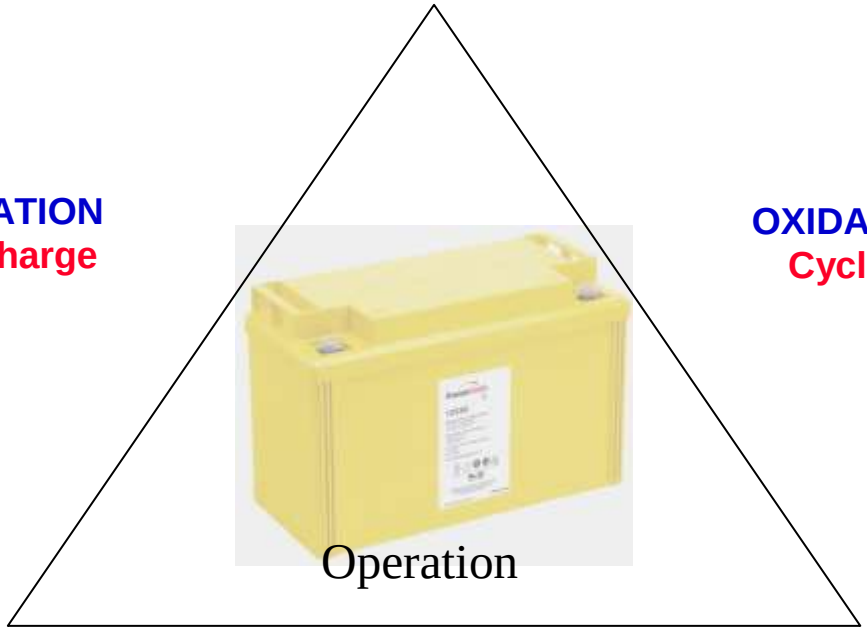
The battery is the most troublesome of the components of a UPS in that its operation depends on a set of variables, often difficult to control, such as the method of use, the working temperature, the installation site and the number of charge and discharge cycles executed.
On a regulatory level, the standard currently in force is the EN 50272-2 standard (for open and sealed valve regulated lead acid (VRLA) stationary batteries), which gives useful indications on the use of sealed batteries. This standard includes indications on safety and the protective measures to be adopted, and lays down that the rooms/cabinets in which the batteries are to be installed must conform to specific requirements which define, for example, their ventilation, a fundamentally important factor to be considered when determining their size.

Critical factors for batteries

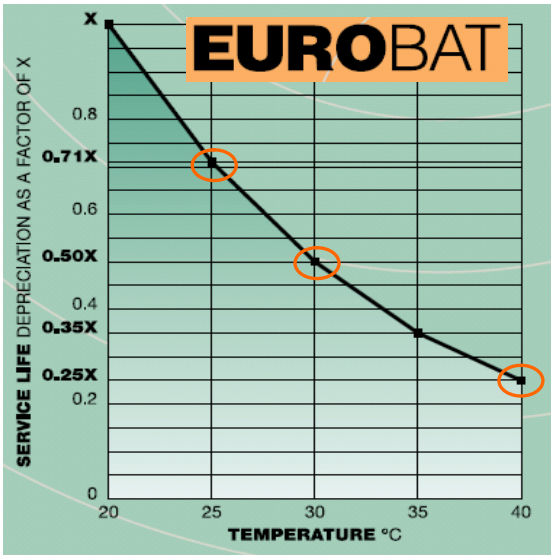
As accumulator batteries have a significant impact on the overall reliability of the UPS, the user must be able to count on their availability, the prevention of failures and, as a final but major aspect, a reduction in their cost of ownership by limiting all factors that may cause the battery to deteriorate prematurely with the result that it has to be replaced before the end of its declared life.

There are several possible causes of the premature deterioration of a battery:

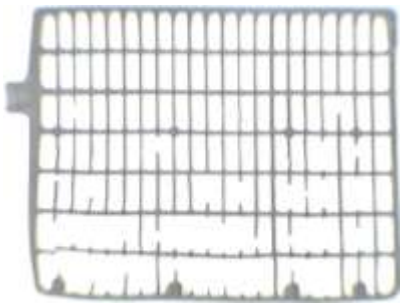
- **Corrosion**: due to overcharging of the battery or an incorrect working temperature,
- **Sulphation**: due to an excessively low state of charge or excessively long storage period,
- **Passivation:** due to an excessive number of discharge and charge cycles (cycling) with a consequent loss of capacity.



Another factor to be considered is the working temperature. An increase of 10 °C in the temperature, from 20 to 30 °C, will halve the life of the battery; a further increase of 10 °C will halve it again (thus reducing its expected life to one quarter).



Effect of temperature on battery life (Source Eurobat Guide)

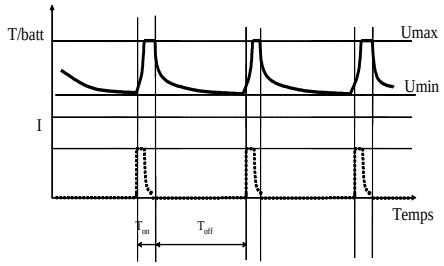


Effect of corrosion on the grids

With a view to converting the impact of efficient battery management into economic terms, the following considerations can be made with regard to UPS products.
A test carried out by Socomec Sicon UPS indicates that, for a UPS with a power of 15kVA, the incidence of the battery on the total purchase cost of the UPS is equivalent to about 20% for a typical back-up time of 15 minutes, while it rises to 35% for a UPS power of 80kVA with the same back-up time.
This incidence on the cost may even be greater according to the type of battery and its life time (3-5 years, 10-12 years, more than 12 years) chosen for the installation, so by paying particular attention to how the batteries are used, the user may obtain a considerable economic and management benefit.

Innovative charging systems

Careful battery management, with regard to the charging method and the working temperature, therefore serves to prolong the life of the battery and, as a result, to reduce the costs of the system. However, this problem cannot be left to the end user to solve.
Socomec Sicon UPS proposes an electronic system (EBS: Expert Battery System) which, by means of a battery charger control algorithm, handles two recharging methods: the traditional constant current-constant voltage method and an “intermittent” recharge according to the type of batteries and, above all, the working temperature.

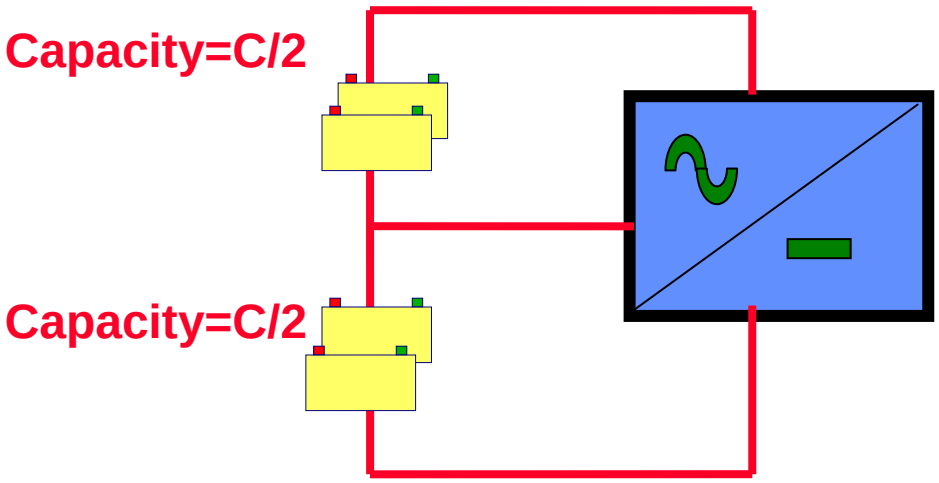


EBS: intermittent recharge operating principle

Using this method, unlike the traditional constant current-constant voltage method, constant voltage is not applied when the battery’s accumulators are already charged, so the internal overtemperature, the development of gas and the corrosion of the plates is reduced.
The system also provides protection against deep discharge and a periodic, automatic test on the efficiency of the batteries.
From accelerated aging tests carried out by Socomec Sicon UPS on several models of accumulators and almost ten years’ experience in using this method, it emerges that a battery managed in this way lasts 30% longer than a battery managed using the traditional method.
Within a period of five years, the application of the battery recharging method described above to a UPS in the 80kVA Masterys series (a UPS manufactured by Socomec Sicon UPS) reduces running costs by about 20% and increases the overall reliability of the system.

Redundant batteries

Another solution designed to improve the system's reliability is what is known as a "redundant battery" configuration (dual battery is the Socomec Sicon solution).
On a traditional UPS, a failure in a single battery makes the whole chain of batteries unavailable and causes the UPS not to work when a mains power failure occurs.



Wiring diagram with redundant batteries

By setting the batteries in two completely separate and redundant blocks (made up of accumulator battery, protections, battery charger), if either breaks down, the UPS can supply 100% of its rated power in any case, though for a reduced back-up time. This is Socomec Sicon UPS's standard solution.

The solution also gives a series of advantages in terms of maintenance; the arrangement of the batteries in two separate blocks enables maintenance work (whether scheduled or unscheduled) to be performed on one of them while the other remains available for the operation of the UPS in case of a power failure, thus ensuring a continuous load without any risk of interruptions of the power supply.

Insulation against electrolyte leakages

Not only must the batteries be easy to install and replace, they must also be protected against acid leaks.
There are now "battery units" available on the market and installed on typical Socomec Sicon UPS containers that enable the yearly rate of failures caused by acid leaks to be eliminated altogether, due to the presence of insulating material.

Battery unit

Reducing size to reduce costs

Finally, a few more considerations about UPS units, their installation and, again, their batteries.

When making the purchase, a careful evaluation of the space occupied by the UPS should be made (and the customer should be duly advised). For example, a 40 kVA UPS with external batteries may occupy up to 0,8 m^2 while a small-sized UPS such as Masterys, with the same power, 40 kVA, occupies just 0.35 m^2 (450x795 mm) and may be expanded vertically instead of horizontally so that, when a future expansion is to be made, its height can be increased without any increase in the space it occupies on the ground.

In short

To sum up, the system proposed must have devices capable of ensuring a long battery life, a redundant battery configuration (feature that enables a single block of batteries to be replaced), and must occupy a limited amount of space. Having made a careful evaluation of all these elements together with the customer, it will be possible for him to obtain a considerable reduction in the cost of ownership (a two-figure percentage value) throughout the system's working life.

This will also bring benefit to both the designer and the installation engineer: the respect and loyalty of their customer.

BOX

A company that guarantees a continuous power supply

Socomec Sicon, the long-standing leader in the production of uninterruptible power supplies (UPS), belongs to the Socomec industrial group, which has 2,000 employees and a turnover of 230 million euros.

Socomec Sicon UPS also produces emergency relays, load transfer systems, DC/AC and AC/DC converters for industry and telecommunications.

In addition to its top-quality products suitable for all applications, Socomec Sicon UPS distinguishes itself for its range of high-level consultancy, inspection and maintenance services. Its telephonic assistance service, managed by highly-skilled specialists, and the remote management service available for various types of UPS (via serial communication, the Internet or a dedicated telephone line) provide a prompt and effective response to any problems that may arise, thus guaranteeing maximum availability of power for the devices supplied.