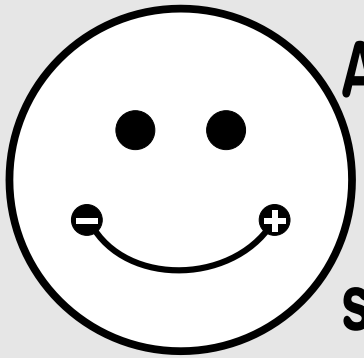

Amaron Quanta™. Worry Free UPS backup solutions.

Amara Raja
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AMARA RAJA BATTERIES LIMITED
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AUTHORIZED QUANTA ALLIANCE (AQuAs):

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LIFE LINE

AMARON
QUANTA
UNINTERRUPTED LIFE

UPS Battery - *A critical link in the* ***IT Infrastructure.***

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Introduction

CIOs have traditionally been more involved in the right selection of the " visible" and the so called "backbone" of the IT infrastructure in their companies. However, not much introspection goes towards selecting the right solution for back up power storage, which can lead to a situation that the complete operation comes to a standstill for as simple a reason as the unavailability of power!

The unawareness of the right back up power storage (battery) solution for the enterprise results in "living on hope" of everything being fine (surely not a very reliable way of operation) and often results in high cost of ownership (again, for lack of proper knowledge, this expense is never correctly known).

This booklet deals with simple yet effective ways to know the facts on the back up power storage including the never discussed, TCO on batteries!

Criticality of Back up Power Storage in the IT infrastructure

The world's increasing reliance on computers and servers for computation and communication needs leads to the dependence on power supplies that continue uninterrupted. The list of companies that have lost valuable information and time due to a power outage is rising by the day. As per a recent research, it is estimated that the annual cost of power outage related problems exceed Rs 300 Million in India.

Much has been written and discussed on the need for the Uninterrupted Power Supply (UPS) but sadly little on the part that makes it uninterrupted: the battery. In fact, without the battery (which is the heart of the UPS), the UPS becomes an IPS: Interrupted Power Supply.

The UPS is a critical component in the IT chain, the battery needs similar lookout.

Consider this true story. A loud explosion greeted the Office supervisor of a leading IT software company at their makeshift power room on switching on the light in the room after the weekend off.

The power room was the center for power back up for the company's main server and various other computer nodes.

The explosion was a result of the type of unawareness described above and had devastating results. The error was of neglecting a critical link in the IT hardware chain: the back up power storage device called the battery.

Investigations revealed that the makeshift room was no room at all- at best a dingy place, with the batteries and the UPS " stuffed" in. The UPS charging parameters were never checked for compatibility with the battery, leading to overcharge(even the physical deformation of the battery was not noticed) and subsequent accumulation of hydrogen in the room, which lead to the explosion.

The company's lack of knowledge on the right type of back up power storage solution (including installation) cost them dear. Not only did it interrupt operations (and hence cost money), the enterprise realized the fact that they were running on a highly unreliable process where critical links were not considered so.

Is this how your systems operate as well? We hope not.

Some of the reasons thrown up by research points to the fact that unlike other IT hardware, battery is not an electronic device, thereby reducing the comfort factor of the IT in-charge. The batteries invariably have been stereotyped and perceived as black, leaky, unreliable and have no technology association. The result is that the user is uninterested in getting to know about them and they are invariably dealt as any other office consumable (the average office electrician is its custodian).

The facts are exactly the reverse. The modern day battery are sealed, maintenance free (no chance of acid leakage) , are made at plants employing state-of-the-art manufacturing process (and thus ensuring its reliability) and are no longer black (in fact, batteries like Amaron Quanta™ have a metallic silver finish to them thereby complimenting other IT hardware). Additionally, the batteries cost anything between 30% to 80% of the UPS cost, thereby making economics a compelling g reason to know more about them. The fact that they are not electronics does not take away the critical role they have in ensuring uninterrupted operations.

The time has now come to ensure that back up power storage is considered an extension of the IT hardware platform and thereby ensure optimum utilization and return on the battery investment.

Backing It Up

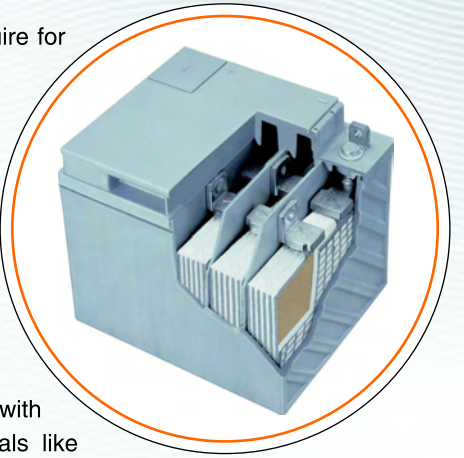
Having a battery back up for an office network environment is a necessity, as seen in most parts of India where power can go off without a warning. Power conditioners supply the much-needed power in times of need from batteries, connected to them. A battery is an electric storage device, which can be found in different shapes, sizes, voltages and capacities. Volta demonstrated the world's first battery in 1880. 1983 saw the birth of the modern day SMF Battery which was brought to India by Amara Raja in 1991. The battery is the most vital component of any UPS, or any other power conditioning equipment. Only the batteries back power supply in case of any power outage. If not for this, all the critical data will be lost forever.

Choosing the right battery

Batteries come in all shapes and sizes, from types no larger than a shirt button, to a battery system filling the entire room

To select the right size of the battery you require for your UPS, you will need the following information:

- Total connected load to the UPS in VA
- UPS DC bus voltage
- UPS inverter efficiency and power factor
- Minimum dc bus voltage permitted for UPS operation
- Back up time required
- Battery wattage table



Consider the following example to understand this better.

The normal loads in an IT set up are PC nodes (with CRT/TFT monitors), Servers, Routers, peripherals like printers and some power points. Consider a set up having 5 computers with 14inch monitors and one laser printer. This translates to an approx load of 200 VA per computer and 150VA for the printer, thereby totaling up to 1150 VA. Considering future expansion etc, a UPS of 1500 VA (1.5 KVA) capacity is selected. This On Line UPS operates at 85% inverter efficiency and the load power factor is considered as 0.8. The UPS DC bus voltage is 24 Volts and the back up time required is 30 minutes. The lowest operational DC Bus voltage is 20.4 Volts.

Armed with this information, the battery can be sized as below

$$\text{Battery Wattage (Per 12 V battery Module)} = \frac{\text{(UPS Rating X Power Factor)/(UPS Inverter Efficiency)}}{\text{(UPS DC Bus voltage)/(12)}}$$

$$= \frac{\text{(1500 X 0.8)/(0.85)}}{\text{(24/12)}}$$

$$= 706 \text{ Watts}$$

A sample look up table appended below assists in selecting the right size of the Amaron Quanta™ battery.

From the look up table, a 65AH battery can deliver 825 Watts (more than the minimum 706 Watts required) and as such is the right size for 30 minutes back up for a 1500 VA UPS.

AMARON QUANTA UNINTERRUPTED LIFE

Battery Storage, Care and Monitoring

Being such a critical component of the IT infrastructure, one must always use the battery of the size and type as specified by the manufacturer/suitable for the application.

The storage or shelf life of a SMF battery is usually between 3 and 6 months at 27 deg C. While storing the battery, disconnect it from the ups/charger and store it at a dry location with low ambient temperature (5 to 27 Deg C is the ideal range). If stored for more than 6 months, a supplementary charge of 24 hours or more is required before putting the batteries to service.

Some of the most critical parameters to ensure reliable back up power are:

Charging Voltage

In the lifetime of the battery, the battery remains on charge for more than 80% of the time, thereby making charging a very critical factor for determining the performance and life of the battery.

Under normal situation of charging, also known as Float charge, the charging voltage should be fixed to 13.5 V DC per 12 V Battery module. This is perhaps the most abused parameter largely resulting from lack of understanding of the effect of improper charging on battery performance.

Most UPS in the sub 10 KVA capacities have only one mode of charging i.e the Float charge mode. As such, it is imperative that the float voltage is set to 13.5 V DC only. Any increase, even by 1%, leads to an overcharge that results in an inherent water loss in the SMF battery thereby leading to reduction in life and performance.

Boost charge is used for faster charging in special or during periodic monitoring schedules. However, regular or frequent boost charging damages the battery and reduces battery life dramatically. The voltage window between Float and Boost is only 0.3 V per 12V module, reason enough to ensure strict compliance to the 13.5 V DC Float voltage guideline.

Incase the battery is undercharged either by applying lower than recommended charging voltage or not allowing sufficient recharge time (time required for 100% charge form a 20% charged battery is 12-14 hours), sulphation occurs. When a battery is left in a discharged state , lead sulphate crystals begin to form, acting as a barrier to recharge and will prevent normal battery operation.

Wherever, ambient temperatures are in excess of 27 deg C, reduce the float voltage by 18mv per 12 V battery module.

Charging Current

Batteries need a minimum of 10% of their capacity as float charging current in order to achieve 100% charge within the recharge time specified by manufacturers. This means that for a 100AH battery, minimum-charging current should be 10A.

In Indian conditions of frequent power outages, a charging current range of 10-25% is recommended. A higher charging current ensures faster charging is situations where power outages are frequent and back up power is required regularly. However, a trade off between battery life and faster recharge must be considered in such situations.

Temperature

The recommended normal operating temperature is 27 deg C. High temperature will reduce battery service life, often quiet dramatically (Battery life reduces by half for very 10 deg rise in temperature). In extreme cases, this can lead to battery swelling or bulging. High temperature will give increased performance but reduced life.

Rating	EMV	TIME						
		5min	10min	15min	20min	30min	60min	2hrs
26AH	10.8	910	638	498	408	302	193	116
	10.2	1010	707	538	440	320	202	118
	9.6	1067	716	557	456	340	211	120
42AH	10.8	1395	1010	800	672	505	305	180
	10.2	1555	1092	842	693	520	320	185
	9.6	1639	1136	882	715	565	330	192
65AH	10.8	2270	1595	1250	1025	775	475	295
	10.2	2520	1763	1351	1095	825	504	302
	9.6	2645	1710	1400	1122	852	515	310
100AH	10.8	3310	2420	1950	1598	1198	685	430
	10.2	3670	2650	2155	1660	1240	730	446
	9.6	3900	2748	2258	1695	1323	755	459

It is recommended to install the batteries in an ac environment much the same way as other critical hardware is installed.

Maximize the Life
of your battery

- Maintain float charge for the batteries @ 13.5 V per 12 volt module
- Boost charge the batteries once in 6 months @ 13.8V per 12 volt module
- After a discharge, charge the batteries immediately
- Always install the batteries in a properly ventilated room
- Keep the batteries away from heat sources and sparks
- Ensure proper cabling and lug crimping between UPS and battery
- Check for proper torque at terminal bolt connections once in 6 months

Safety, Disposal
and Recycling of Batteries

- Batteries are electrically live at all times - take great care never to short circuit the battery terminals.
- High DC voltages are more dangerous than the mains
- Batteries are often heavy.
  Take care when lifting and transporting batteries.
- Do not attempt to remove the battery lid or tamper with the battery's internal working. SMF batteries are "maintenance free" requiring no electrolyte top-up or measurement of specific gravity
- When a battery has reached the end of its life, it must be returned to the point of sale or to a licensed battery dealer for recycling
- Do not throw used batteries in a bin. SMF batteries contain substances harmful to the environment. So, return it to your supplier or take to an authorised smelter for disposal
  Never bury batteries in the ground or incinerate at end of life
  They contain harmful substances making them unsafe
- Return the spent battery to your supplier or any licensed battery dealer for recycling

Investment and TCO

on Batteries: Some Startling facts!

The issue of investment for the back up power storage is mostly hidden under the cover of the cost of the entire UPS system during the first purchase. Thereafter battery replacements are left under the office maintenance budget, thereby making it extremely difficult for ascertaining the spend on batteries and the associated return.

In the life span of the UPS, a battery is bought on an average three times (with an average life span of 2.5 years). This makes the study of battery economics an interesting study. Consider the following case:

Cost parameter	UPS	Cost Parameter	Battery
Upfront cost for 10 KVA On Line UPS	Rs.1,60,000/-	Upfront cost for 30 minutes back up battery	Rs.1,20,000/-
UPS AMC for 2nd yr to 4th yr (AMC's are mostly given up-to the 4th year)	@ max 7.5% of UPS cost for 3 years Rs.36000/-	1st battery replacement (Considering inflation)	Rs.1,25,000/-
		2nd battery replacement (Considering inflation)	Rs.1,30,000/-
Total Lifetime Cost	**~Rs.2,00,000/-**	**Total Lifetime Cost**	**Rs.3,75,000/-**

As is outlined above, the total lifetime investment for batteries is nearly twice that for the UPS.

Given this scenario, it is surprising that the batteries are not attached significant critical importance, which say any other IT hardware gets for the same lifetime investment.

The return on investment on the back up power storage (batteries) is a little difficult to compute. Since batteries support other system like UPS and are dependent on them for their usage, an independent ROI on batteries is not feasible. However, for sure, one can work towards reducing the total lifetime cost by maximizing the life of the existing battery bank. On the other hand, using Power Outage Analysis test as well as statistical techniques, it is possible to determine the net contribution to uptime from the battery to the IT infrastructure.

From weak link to the critical link:

Back Up Power Storage solution

in a leading advertising agency

One of Chennai's leading advertising agency decided in favour of a comprehensive back up power storage solution for its IT hardware operation. This decision came in the light of several uncalled for interruptions, resulting largely from a near indifference to then existing battery bank. The battery was installed near to a heat source, battery banks of different capacities were paralleled to provide higher back up packed tightly into a enclosure, charging parameters were never checked and the room was a virtual store room for all scrap generated in the office.

The results were devastating. Loss of data, frequently missed deadlines as the systems collapsed lead to a thorough introspection of the existing solution.

The solution adapted started from the basics

Right sizing the battery by employing the power outage analysis test to determine the exact capacity required. The analysis threw up the fact though the system was supposed to work at full load of 40 KVA, the actual consumption (measured over three weeks) was 22KVA with peak of 28KVA during evenings. The battery backup originally designed for 30 minutes was needed no less than 2 hours. Also, each break up in power caused an economic loss of Rs 8000/- per hour. Restart times were on an average 2 hours or more and this caused considerable heartburn among various user groups and the IT department.

An electrical fault analysis test was conducted at the site to test for earth leakage, proper sizing and length parameters of power cables from the battery to the UPS as well as the UPS to the main distribution board. The installation site was cleaned up and removed to next to the UPS and closer to the fresh air intake point. The closed enclosure was discarded and open type flexible mounting stand erected.

The batteries were connected in series using the right sized batteries interconnectors. These interconnectors were factory crimped and sized for the worst-case 15 minutes discharge. The battery output was terminated on a terminals plate and further connections to the UPS established using a battery isolator and junction box (a safety requirement).

The UPS charging parameters were set as required (13.5V DC per 12V module and 15% charging current). The bank was boost charged for 24 hours before being put to service.

Regular monitoring of the physical state of the batteries, tightening of the connectors, immediate recharge after a discharge is now being observed. Using Amara Raja's patented Beta Mini health checker, a quarterly health check ensures uninterrupted and reliable operation.

The UPS battery is now in the domain of the IT group and with the training imparted to them, they are confident of staying clear of heartburns!

AMARON QUANTA UNINTERRUPTED LIFE

Value Add: SMF UPS Batteries

A battery is a battery is a battery! That's how the battery, the critical link in ensuring backup power has been perceived by users across domains.

However, the perception is fast changing with the rapid product and reliability advancements made by the Rs.250 Crore strong battery industry, serving the UPS market. The SMF (Sealed maintenance free) Battery is the most popular technology used in host of applications from small "box" ups to large systems used by large enterprises/industries.

The conventional way of looking at the battery has meant that the CIO's have traditionally been more involved in the right selection of the " visible" and the so called "backbone" of the IT infrastructure in their companies. However, not much introspection goes towards selecting the right solution for back up power storage, which can lead to a situation that the complete operation comes to a standstill for as simple a reason as the unavailability of power!

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The battery is the "U' in the UPS.

The SMF battery is broadly divided into three categories:

Small SMF catering to Micro and Mini UPS range (4AH to 17AH batteries used with 0.5 to 2 KVA UPS for a back up of 5-20 minutes)

Medium SMF CATERING TO Mini and Midi range (26AH to 200AH batteries used with 1KVA to 80KVA UPS for a backup of 30 minutes to 6 hrs) and

Large SMF catering to systems above 100KVA

BIF continues to be the largest segment for battery usage, followed by IT /ITES and Telecom. Other important segments are SOHO and Industry.

The Indian market is characterized by two large domestic manufactures (Amara Raja and Exide) and a host of imported brands. The market is growing CAGR of 18% for the last three years and is expected to grow between 18 and 22% over the next five years.

Lack of customer knowledge on the product is one of the main reason for lack of standards on product, technology and service offered by various vendors. Battery is a consumable and has a definite service life, which can be maximized by the user, provided he is aware of the category, the right selection, proper installation and usage. The users ends up paying two times the cost of the UPS system in the lifetime of the UPS for the battery itself.

The removal of anti dumping duty has meant that a lot of unknown brands from China and the far east have entered the market and with no mechanism on ensuring product and service standards, the user may be taken for ride for his ignorance of the product category.

Vendors like Amara Raja Batteries, with its "Amaron Quanta™" brand of SMF batteries have been trying to promote " knowledgeable" use of the battery by introducing programs like Online Battery monitoring to check the health of an installed battery, providing tips on increasing the battery life, organizing user symposiums to select the right battery and technology.

As the user becomes more conscious of the product and its usage, the battery market will witness product / technology standardization and dramatic improvement in service standards.