

Comparative Review of UPS Batteries For High Power Backup Applications

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Abstract- Power failure is a common fault that occurs in most of all areas, so the UPS system is largely used for giving backup power to the running system without any interruption. This backup power is stored in batteries which are the main part of the UPS system. Various types of batteries are available in the market and all types have different characteristics and specifications. In this paper, we present a comparison of three batteries which is used in the UPS system.

Keywords- UPS, Battery, Power source, performance

I. INTRODUCTION

An uninterrupted power supply is an essential device that requires to keep the system running when the main incoming power source gets interrupted. UPS switches the main power source to the battery power source in a fraction of the time without interrupting the power supply and provides a continuous power supply to the system.

UPS also protects equipment like computers, servers, telecommunication equipment, and other electrical equipment, etc. where unexpected power interruption can cause injuries, data loss, cyber-attacks, etc. There UPS system is widely used in most sectors like industries, commercial, power stations, hospitals, etc. This System plays an important role. The uninterruptible power supply is a very effective way of reliable operation in your data and also its equipment. This system provides clean backup power for the equipment. In addition, work also ensures the remaining operation if there are power factors power surges and other fluctuations occur in the power system it is a protected device or safeguard system which protects against unexpected power failure this is reliable because the UPS batteries support them. The main part of the UPS system is its batteries which provide the backup power source. Most in UPS systems there are mainly three types of ups batteries are used. In this, there are three primary types of UPS batteries according to their life expectancy, different price, and maintenance requirements. So balancing these three factors which are helping to determine the best and most effective UPS battery type for specific requirements.

II. TYPES OF UPS BATTERIES

- A. Lead Acid UPS Battery
- B. Nickel-Cadmium UPS Battery
- C. Lithium-Ion UPS Battery

A. Lead Acid Battery

This type of UPS battery has most commonly used to check proven track records for reliability. The lead acid battery is designed to check high performance. This battery has a typical cycle life of between 300 and 600 discharges. It is also depending on its depth of discharge. It is used in the UPS battery because it is not only cost-effective but also it has performance quality. Such as it is low internal impedance and high tolerance. Also lead acid battery low battery management requirements. It is mostly used in standby power applications. Battery has the special consideration which is boost charging and gravity. It has two different types:

i. Valve Regulated Lead Acid Battery (VRLA)

This type of lead acid battery is also known as seal lead acid battery. It is the very common type in modern UPS system. It is a one type of rechargeable battery. VRLA batteries are sealed and mounted on vertically or horizontally so this as suitable within the various battery compartments. The valve is placed to release the gas in case of redundant internal pressure. There are including mostly main types of electrolyte composition which is used in the Valve regulated lead acid battery and absorb glass mat (AGM). This technology is the very important part of UPS batteries because it has lower cost and lower internal resistance and also higher charge and discharge rates.

ii. Open vented Lead Acid Battery (VLA)

This type is also known as a flooded open-vented lead acid battery. The open-vented lead acid battery has plates that are flooded by electrolyte acid. It is having a long design and lifespan is up to 20 years and this are typically used in large installations for high ampere-hour rating (Ah). These

types of batteries are a negative and positive terminal on top or site which along with the vent caps on this top.

iii. Advantages of lead acid battery

- Low cost per watt hour and simple manufacture.
- Capable of high discharge currents.
- Performance is good at both low and high temperatures.
- No cell wise BMS required.

B. Nickel-Cadmium Battery

Nickel cadmium batteries are used to very efficient option for installations of telecoms. It used in UPS application at locations where a very high and ambient temperature. Ni-Cd batteries are sealed and maintenance free and charged at float mode. It has the popular advantage of 20 years to 30 years' life span. It has deep discharge characteristics and also has the ability of handle wide ambient temperature which is range from -20 degree Celsius to +40 degree Celsius. but on the other side nickel cadmium batteries are some disadvantages such as it is more extensive than traditional VRLA because of toxic materials which complicates the recycling and disposal process. It has the particularly strict environmental policies and regulations. Also the number of cell for particular voltage is more than the lead acid battery

i. Advantage of Ni-Cd battery

- Long life span
- Internal resistance is low
- High output current
- Low weight and small size for given capacity

C. Lithium-Ion Battery

A lithium-ion (Li-ion) battery is a type of rechargeable battery that is an advanced battery technology that uses lithium ions. During a discharge cycle, lithium atoms in the anode are ionized and split from their electrons. The lithium ions are small enough to be suitable to move through a micro-permeable separation between the anode and cathode. In part because of lithium's small size. Li-ion batteries are suitable for having a truly high voltage and charge storage per unit mass and unit volume.

Li-ion batteries can use some distinct materials as electrodes. The most common composite is that of lithium cobalt oxide (cathode) and graphite (anode), which is most generally set up in movable electronic devices analogous to

cell phones and laptops. Another cathode material contains lithium manganese oxide which is used in hybrid electric vehicles and lithium iron phosphate. Li-ion batteries typically use ether as an electrolyte. It is used as the core element which helps in the growth of electric vehicles. But in recent systems, this is become an increased option for UPS systems and also other energy storage systems. It has higher reliability than traditional VRLA which is built-in battery management as well as a monitoring system that has to check every individual cell for any type of changes in its performance. Lithium-ion has also some drawbacks it requires protection in a circuit to maintain safe operation.

i. Advantage of Li-ion battery

- less maintenance and Long lasting
- No performance degradation at higher temperature
- Light in weight and small in size
- More flexible and fast recharge

III. CONCLUSION

In the UPS system valve regulated lead acid battery is most commonly used because of environment friendly, safer, cost-effective, and 98% recyclable. Also valve regulated lead acid battery used in mission critical environments in today's time and they not need direct maintenance. It is also providing long term protection, minimum maintenance required and cost is also less as compared to other types of UPS batteries. The Li-ion batteries are lighter and smaller, so required less space and more power. Also has longer battery life than UPS.

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