THE NEXT ERA FOR STANDBY FLOAT

- LONGER LIFE & HIGH CHARGE DENSITY BATTERIES ENABLE BACK-UP POWER ENHANCEMENTS IN CRITICAL INFRASTRUCTURE


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CONTENTS

INTRODUCTION

The demands of customers involved in standby float (often referred to as stable grid) applications are ramping up dramatically. Here a float charge is used to constantly maintain the batteries in a full state of charge (SoC) condition – so that they are ready to respond to any interruptions in the mains supply, should that occur, and the connected load can still be supported. In the past, it was mainly the lifespan of batteries that mattered for such applications. Now, expectations are being raised in relation to other properties.

Until now, most of these applications have been dependent on either conventional Valve-Regulated Lead-Acid (VRLA) or Vented Lead-Acid (VLA) batteries. Though these batteries have appeal in terms of their longevity, there are drawbacks that are becoming more and more apparent. Firstly, the energy density they can attain is not enough for increasingly space-constrained customer implementations. Secondly, extensive ventilation is required for flooded battery types, which can have layout implications. Flooded batteries also require a lot of maintenance, with the sulfuric acid electrolyte needing to be topped up at regular intervals. The safety issues that acid spillages could cause must also be considered. Finally, these batteries cannot really recharge quickly enough, so if further outages occur in close succession, they will not be able to cope.

It is the need for better stable float battery solutions that has driven development of the EnerSys® PowerSafe® SBS XL 2V battery series. These batteries will provide customers with a compelling combination of expanded Ampere-hour (Ah) capacity, reduced footprint, convenience and longevity, as well as the ability to repeat the duty due to fast charge capabilities.

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A CHANGING CUSTOMER LANDSCAPE

There are a multitude of application scenarios now calling for more effective standby float energy storage technology. Among the most prominent of these is the industrial sector. Manufacturing and processing facilities need access to uninterruptible power supply (UPS) resources, to keep the operation of critical equipment (such as industrial drives, presses, conveyors, etc.) from being impacted by potential power outages. If an outage happens, and there is not an adequate back-up supply, then serious consequences can arise – with downtime issues potentially having a detrimental effect on productivity or profitability.

Having responsive and reliable back-up power is more important to utilities companies than ever before. The demands being placed on electricity distribution grids are steadily increasing, yet the proportion of electricity generation coming from renewable sources (like wind solar, hydroelectric, and thermal) is growing all the time. The output from these renewable sites is very hard to predict (due to constantly changing weather conditions) - and this heightens the threat of power outages. It is essential that utilities have reliable batteries to keep their distribution infrastructure (transformers, switchgear, etc.) running regardless of the circumstances. In some countries, regulations are now being updated becoming more stringent and requiring that longer back-up times are supported. This means that distributors of electricity are having to update their older VLA (flooded) batteries with more modern solutions.

Telecommunications is one of the other sectors where next-generation battery solutions are now being mandated. With the public's ever-increasing consumption of data, telecom operators need to keep on investing in additional wireless and wireline network infrastructure. Greater functionality must be incorporated and performance boosted wherever possible, but without adding to equipment size.

As well as centralized back-up at large base stations, it will be necessary for electricity supply reliability to be ensured at small cell implementations too (nanocells, picocells, etc.). To be effective in this context, the batteries used will need to be high density - so that the space constraints involved can be addressed. It is, likewise, vital that the frequency with which battery change-outs have to be done is kept to an absolute minimum, to avoid unwanted capital and operational costs. On top of this, the extra heat being generated by such equipment will add to thermal management concerns, with the prospect of more financial outlay on cooling mechanisms. By selecting back-up batteries that have higher energy densities, power requirements can be met without too much space being taken up. Furthermore, operating batteries at elevated temperatures will result in investment in cooling mechanisms being reduced substantially.

Oil/gas drilling platforms are a further location where back-up batteries must be installed so that there is a rapid response if the mains supply fails. It should also be noted that once batteries are deployed in remote locations of this kind, change-outs will be difficult. For this reason, battery longevity and reliability are a priority.

There is a need for better secondary power sources in nuclear plants too. They must also have the ability to withstand high temperatures and will have very little ventilation (meaning flooded batteries are simply not an option).

In all these applications, customers are looking for batteries designed to deliver up to 20 years of life. They want high-density solutions that will enable more energy storage capacity within the available space. In addition, they are looking to keep the weight per Amp-hour (Ah) down as much as possible, as this will ease the installation process (making it more straightforward for their installers to do the work). Change-outs that are simple to execute, without there being the risk of hazardous spillages, are also desirable.

Traditionally, the energy storage solutions specified for stable grid usage have tended to be VLA (flooded) batteries. Though such batteries can cover the lifespan, the other points raised here are beyond their scope. Therefore, the latest valve-regulated energy storage solutions are likely to provide significant value to the sectors described above.

THE EVOLUTION OF VRLA BATTERIES

Despite VLA (flooded) batteries proving to be a suitable approach for many years, technological progression within the energy storage industry has meant that products have become available that outperform them in various ways. VLA (flooded) batteries generate gas bubbles in the electrolyte (with oxygen coming from the positive electrode and the negative electrode emanating hydrogen). Over time, this reduces the amount of water contained within the battery – which then must be refilled periodically (adding to the operational costs, as staff are needed to carry out this work).

By incorporating absorbent mats between their electrodes, VRLA have been able to mitigate electrolyte water losses (and the maintenance effort that comes with that). These batteries also attain considerably higher energy densities than VLA (flooded) units, as well as having much lower ventilation requirements (meaning that batteries may be installed next to the equipment itself. Batteries no longer must be kept upright (but can be oriented as the application dictates). As the possibility of acid spillage is eliminated, they are easier to transport.

The initial batteries used lead-calcium grids (and these are still used in some applications today) - though here grid integrity deteriorated over time due to grid corrosion, thereby shortening the working lifespans supported. The arrival of thin plate pure lead (TPPL) technology successfully took VRLA to a whole new level, however, as the reduced thickness of the plates employed meant that they could be more closely packed together. The grid purity of EnerSys® TPPL technology has allowed the company to set itself apart from competing VRLA solutions. The 99.99% pure lead grid construction slows down grid corrosion, making batteries based on such grids much longer lasting than lead-calcium VRLA batteries.

Having worked on TPPL for more than two decades, EnerSys® is able to claim an unmatched understanding of this technology. The product development team is continuously striving to make improvements to the TPPL-based portfolio, and the PowerSafe® SBS XL 2V batteries are the culmination of those efforts.

Through detailed discussions with leading stakeholders in the utility, industrial and telecom sectors, the EnerSys® product development team has been able to work with them on identifying exactly what they needed to take on modern stable float applications - not just allowing these sectors' current demands to be met, but also making their installations fully prepared for future demands that are certain to emerge.

With the release of the EnerSys® PowerSafe® SBS XL 2V batteries, the market is now being given the company's longest design life VRLA TPPL solutions for stable grid float applications.

Figure 1:
The EnerSys® PowerSafe® SBS XL 2V battery cells are available in two, four, six, and eight-pillar configurations

REDEFINING STABLE GRID

TPPL technology clearly has numerous operational and logistical plus points that set it apart from flooded battery types – with customers in the industrial, telecom, and utilities sectors all appreciating how its characteristics can be advantageous to them. The objective of the EnerSys® PowerSafe® SBS XL 2V battery series is to bring TPPL to markets that are currently using increasingly outdated and poorly optimized flooded and conventional VRLA batteries.

Through its engineers' in-depth knowledge of TPPL, EnerSys® has already shown its ability to adapt this technology to fit the requirements of different applications. Firstly, the company did this through the introduction of product series like DataSafe® XE battery - which suited short-duration, high-rate discharge situations, such as those found in data centers. Next, it took on the high cycling caused by unreliable grid conditions and supply fluctuations, using the PowerSafe® SBS XC+ battery. Now long life, even in high temperature environments, is the next target, allowing stable grid float applications to be addressed.

By leveraging proprietary EnerSys® innovations, PowerSafe® SBS XL batteries extend the float life and strengthen the temperature capabilities of TPPL beyond what was previously possible. The initial offering here was comprised of 12V solutions - which have successfully gained widespread market traction - and to complement these, the company has now developed a series of 2V solutions.

The models in the EnerSys® PowerSafe® SBS XL 2V battery range are the next evolutionary step in TPPL technology. These products represent a new variety of energy storage solutions that are uniquely capable of dealing with the inherent challenges of stable grid applications.

These batteries deliver extended float life performance, while also offering the numerous beneficial attributes that come with TPPL technology. It means that industry sectors where legacy flooded batteries are still being used are provided with unquestionably valid reasons to switch over.

THE MODELS IN THE ENERSYS® **POWERSAFE® SBS XL 2V BATTERY RANGE** ARE THE NEXT EVOLUTIONARY STEP IN TPPL TECHNOLOGY.

The PowerSafe® SBS XL 2V batteries have an extensively higher Ah capacity (up by 51% for some models) than size-equivalent OPzV and OPzS units, reaching up to 3900Ah in a single unit. Because of their energy densities, less space may be allocated for energy storage. Conversely, greater storage capacity can be implemented within the same area.

The long operational lifespan of these new batteries means that the number of change-outs needed is kept down to a minimum. Also, far lower charge currents than for either OPzV and OPzS batteries are needed. As a result, the total cost of ownership (TCO) of the energy storage systems they are featured in is markedly reduced.

These batteries offer heightened safety over flooded solutions. They also need less maintenance and have lower ventilation requirements. It is possible for them to be placed in vertical or horizontal orientations, resulting in greater installation flexibility.

Supplied in widely used form factors, with dimensions aligned to the DIN 40742 standard, the PowerSafe® SBS XL 2V batteries from EnerSys® have the same physical sizes as traditional units that are often being used currently. In many cases, this will allow customers to replace their existing solutions with ones that have elevated performance parameters, but without having to do any redesign work or changing racking configurations. As well as DIN format packages, horizontal rack options that are applicable to UBC, IBC, IEEE 693 and NEBS requirements will be available soon.

THE LONG OPERATIONAL LIFESPAN OF THESE NEW BATTERIES MEANS THAT THE NUMBER OF CHANGE-OUTS NEEDED IS KEPT DOWN TO A MINIMUM.

PowerSafe® OPzV		PowerSafe® SBS XL 2V		Capacity Advantage over OPzV (C_{10}/1.80Vpc/20°C)
Cell Type	Nominal Capacity (C_{10}/1.80Vpc/20°C)	Cell Type	Nominal Capacity (C_{10}/1.80Vpc/20°C)	
4 OPzV 200	215	SBS XL 320	320	49%
5 OPzV 250	265	SBS XL 400	400	51%
6 OPzV 300	320	SBS XL 480	480	50%
5 OPzV 350	385	SBS XL 580	580	51%
6 OPzV 420	465	SBS XL 680	680	46%
7 OPzV 490	540	SBS XL 780	780	44%
6 OPzV 600	705	SBS XL 900	900	28%
6 OPzV 600	705	SBS XL 970	970	38%
8 OPzV 800	940	SBS XL 1200	1260	34%
10 OPzV 1000	1170	SBS XL 1500	1560	33%
12 OPzV 1200	1410	SBS XL 1800	1870	33%
16 OPzV 2000	2110	SBS XL 2700	2700	28%
20 OPzV 2500	2640	SBS XL 3100	3100	17%
24 OPzV 3000	3170	SBS XL 3900	3900	23%

Table1:
Capacity increases achieved by EnerSys® PowerSafe® SBS XL 2V battery over equivalent-sized PowerSafe® OPzV batteries

The PowerSafe® SBS XL 2V battery portfolio consists of 320, 400, 480, 580, 680, 780, 900, 970, 1200, 1500, 1800, 2700, 3100 and 3900 cell versions. These batteries are designed to be compliant with IEC 60896-21/22 standards relating to VRLA lead-acid batteries. Under the EUROBAT classification[1], which applies to European deployed industrial batteries, they are categorized as being 'Very Long Life'.

A broad operating temperature range is supported, spanning from -40°C to +50°C (-40°F to +122°F). Thanks to their low self-discharge rate, they have a 24-month storage life (at 20°C, 68°F) - meaning that these batteries can be kept until ready for installation. In comparison, OPzV batteries may only be stored for up to 12 months while OPzS cells can only be stored for up to 3 months. The fact that these batteries can offer a 10-year design life when running at temperatures of 30°C (86°F) means that the capital outlay on implementing cooling systems, as well as these systems' ongoing running costs, can be brought down considerably.

THE ENGINEERING BEHIND POWERSAFE® SBS XL 2V BATTERIES

All the constituent elements of the new PowerSafe® SBS XL 2V range of batteries have been augmented to offer customers boosted operational parameters. This is true in terms of the mechanical design, the internal structure, and the electro-chemistry aspects.

- The ultra-high purity of the lead used in these batteries' grids proves to be a major differentiator. This allows the grids to retain their structural integrity over a prolonged period (whereas other manufacturers' grids will tend to deteriorate far sooner because of corrosion).
- Incorporation of a catalyst element in these batteries is another important attribute. This mechanism encourages the recombination of internal oxygen and hydrogen while the battery is in float. Consequently, water loss is reduced compared to competing battery solutions. Also, because of this, even less grid corrosion is witnessed - with longer operational float life thereby being realized.
- Each battery has a low-resistance microporous glass fiber mat separator with high absorption capabilities. Furthermore, the orientation of the positive and negative plates is such that optimal recombination efficiency is achieved.
- An additional factor is the high-grade (rather than standard commercial-grade) sulfuric acid. Used in dilute form, this is fully absorbed into the separator for extended float life, even when the battery is subject to high-temperature conditions.
- The overall enclosure (container and lid) in which each battery is housed exhibits industry-leading robustness. The ability of these enclosures to deal with heavy shocks and vibrations means that customers can be certain of their longevity.
- The battery packages and lids are made from a UL94 V-0 rated flame-retardant acrylonitrile butadiene styrene (ABS) plastic, which achieves strong resilience to extreme temperatures. In addition, there are built-in flame arrestors to further ensure safe operation.
- The quality of the surface finish on the pillar, along with a superior dual seal arrangement, protects against unwanted electrolyte leakage.
- Even in situations where plate growth is witnessed (which is incredibly unlikely) then the terminals can slide - without any stress being placed on the lid or worries about the seal being broken.

After extensive field use of TPPL technology over many years, PowerSafe® SBS XL 2V is the latest advancement for stable grid float applications. Key customers are already adopting the batteries into their networks. This has led to EnerSys® now bringing it into mass production.

EXCEPTIONAL SUPPORT

Offering full-life support to its batteries is core to the EnerSys® philosophy - with installation, servicing, maintenance, decommissioning and recycling all being covered here. Work is done either directly or via the company's trusted partner network, as well as certified technicians. EnerSys® has an unrivalled reputation in terms of the level of service it provides to its client base. The company's application engineering team can advise customers so that they always select the right solution for their particular requirements, and that this solution is correctly sized.

ENERSYS® HAS AN UNRIVALLED REPUTATION IN TERMS OF THE LEVEL OF SERVICE IT PROVIDES TO ITS CLIENT BASE.

CONCLUSION

As this white paper has underlined, thanks to the EnerSys® PowerSafe® SBS XL 2V battery series, customers now have a viable upgrade path for their stable grid installations - so they can replace batteries with high performance alternatives. It means they have access to solutions that deliver elevated Ah capacity batteries, plus extended working lifespans within a much smaller footprint. The size formats available means that customers can boost their storage capacity by a significant margin, while still retaining their legacy racking.

THE SIZE FORMATS AVAILABLE MEANS THAT CUSTOMERS CAN BOOST THEIR STORAGE CAPACITY BY A SIGNIFICANT MARGIN, WHILE STILL RETAINING THEIR LEGACY RACKING.

By choosing these batteries, customers will get a design life that matches OPzV and OPzS batteries, while simultaneously gaining the benefits derived from advanced TPPL technology. The catalysts integrated into these batteries enable grid integrity to be maintained and prevent dry-out by facilitating oxygen/hydrogen recombination. Additionally, the batteries need less maintenance compared to flooded battery types (with water top-ups no longer being necessary), which reduces operational expenses and keeps TCO down.

REFERENCES

[1] EUROBAT

https://www.eurobat.org/resource/eurobat-brochure-on-vrla-stationary-cells-and-batteries

CONTACT ENERSYS®

For more information about the high-performance, long-life batteries for commercial and industrial applications available from EnerSys®, please visit: enersys.com

OUR PRODUCTS FACILITATE POSITIVE ENVIRONMENTAL, SOCIAL, AND ECONOMIC IMPACTS AROUND THE WORLD

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EnerSys®, the global leader in stored energy solutions for industrial applications, manufactures and distributes energy systems solutions and motive power batteries, specialty batteries, battery chargers, power equipment, battery accessories and outdoor equipment enclosure solutions to customers worldwide. Energy Systems, which combine enclosures, power conversion, power distribution and energy storage, are used in the telecommunication, broadband and utility industries, uninterruptible power supplies, and numerous applications requiring stored energy solutions. Motive power batteries and chargers are utilized in electric forklift trucks and other industrial electric powered vehicles. Specialty batteries are used in aerospace and defense applications, large over-the-road trucks, premium automotive, medical and security systems applications. EnerSys® also provides aftermarket and customer support services to its customers in over 100 countries through its sales and manufacturing locations around the world. With the NorthStar acquisition, EnerSys® has solidified its position as the market leader for premium Thin Plate Pure Lead batteries which are sold across all three lines of business.

Sustainability

Sustainability at EnerSys is about more than just the benefits and impacts of our products. Our commitment to sustainability encompasses many important environmental, social and governance issues. Sustainability is a fundamental part of how we manage our own operations. Minimizing our environmental footprint is a priority. Sustainability is our commitment to our employees, our customers, and the communities we serve. Our products facilitate positive environmental, social, and economic impacts around the world. To learn more visit: https://www.enersys.com/en/about-us/sustainability.

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