EBOOK

SELECTING BATTERIES THAT SUPPORT DATA CENTERS' ENVIRONMENTAL GOALS


MICHAEL SAGAR
ENERSYS®


LUCA CASSANI
ENERSYS®


MIKE DAFFRON
ENERSYS®

CONTENTS

INTRODUCTION

Various battery chemistries are currently available for data center operators to implement into Uninterruptible Power Supply (UPS) systems. Each has its distinct properties, and through these certain operational benefits can potentially be derived. But, likewise, each will have its intrinsic limitations that need to be understood. There are growing concerns about the global data center sector's effect on the environment, with the International Energy Agency (IEA) stating that it is responsible for 1% of the world's final electricity demand[1]. Operators must therefore make environmental aspects an extremely high priority when specifying UPS battery units. The following article looks at the key attributes for operators to consider.

Through the energy stored in their batteries, data center facilities provide the vital standby time needed for the auxiliary power supply to kick in should a mains power outage occur. Lead-acid batteries are continuing to see large-scale deployment for this application worldwide, thanks to their mix of cost-effectiveness and high performance.

THROUGH THE ENERGY STORED IN THEIR BATTERIES, DATA CENTER FACILITIES PROVIDE THE VITAL STANDBY TIME NEEDED FOR THE AUXILIARY POWER SUPPLY TO KICK IN SHOULD A MAINS POWER OUTAGE OCCUR.

The annual worth of the global lead-acid battery market is expected to pass $30.7 billion by 2027, according to a study conducted by analyst firm Markets-and-Markets[2]. The data center sector is identified in this study as one of the key drivers for continued growth in lead-acid battery shipments.

Technological progression over the decades has kept lead-acid batteries competitive - with flooded-type batteries being surpassed by more convenient valve-regulated solutions that required less maintenance and were safer for staff to handle. In addition, leading manufacturers, such as EnerSys®, have constantly been pushing the battery performance envelope - enabling data center operators to install superior UPS solutions.

Other vendors that produce batteries with alternative chemistries will often try to make comparisons based on conventional lead-acid technology. This can be misleading, as it does not truly represent what the most advanced lead-acid batteries can now achieve.

Figure 1:
Making data center facilities more environmentally sustainable is now upmost on the agenda for most operators

ELECTRICAL PARAMETERS

Electricity consumption is the first item that will need to be considered when making data center UPS installations more environmentally friendly. The quicker and more efficiently charging can be completed, the less power the battery string will need to draw from the mains supply, combined with the reduced floating current that is needed to keep the batteries charged. Certain lead-acid data center battery units have designs that mean their associated electricity usage is kept to a minimal level.

Accelerated charge rates are also important from an operational standpoint. With the prospect of outages occurring in close succession, the backup power system will need to build up its State of Charge (SoC) quickly to fully prepare should there be another interruption in service, Batteries that can support this must therefore be chosen.

ACCELERATED CHARGE RATES ARE ALSO IMPORTANT FROM AN OPERATIONAL STANDPOINT.

OPERATIONAL LONGEVITY

The onset of corrosion due to acid exposure is another factor, and this will have implications in terms of both environmental impact and operational costs. Corrosion will mean that there is a smaller amount of active area available on each plate over which the chemical reactions needed for charging and discharging may be undertaken.

The number of charge cycles, the speed of charge, and the depth of discharge will all be affected by this. As outlined later in this article, grid integrity will limit the operational lifespan of a battery. The shorter the lifespan, the greater the wastage will be. The regularity with which battery replacement is carried out, and the amount of maintenance required will result in heightened labor costs.

THE ONSET OF CORROSION DUE TO ACID EXPOSURE IS ANOTHER FACTOR, AND THIS WILL HAVE IMPLICATIONS IN TERMS OF BOTH ENVIRONMENTAL IMPACT AND OPERATIONAL COSTS.

BATTERY RECYCLING

Decommissioning batteries at the end of their usable life is another environmental concern. Consequently, the recyclability of the different battery types should be investigated. With close to 99% of a lead-acid battery's constituent material being recyclable[3], these units will be an important part of establishing a truly circular economy.

Data compiled by the Battery Council International (BCI) has shown that over 130 million lead batteries[4] are recycled each year in the United States alone. It should also be noted that the longer the typical operational lifespan of the selected lead-acid batteries proves to be, the less frequently they will need to be replaced - with less waste thereby being produced and recycling processes needing to be undertaken less frequently.

DATA COMPILED BY THE BATTERY COUNCIL INTERNATIONAL (BCI) HAS SHOWN THAT OVER

130 MILLION

LEAD BATTERIES[4] ARE RECYCLED EACH YEAR IN THE UNITED STATES ALONE.

USE IN A RENEWABLE CONTEXT

As part of their efforts to make their facilities more environmentally sustainable, data center operators are looking to raise their Power Usage Effectiveness (PUE) - the indicator for measuring data center energy efficiency.

The battery backup reserves that the data center facility has available can potentially be assigned for storing renewable energy from on-site solar panels or wind turbines. This would mean that some (or even all) of a data center's power budget could be covered (pushing up its PUE). Data center facilities would no longer contribute as heavily to greenhouse gas emissions, enabling operators to move towards becoming fully carbon neutral.

THE BATTERY BACKUP RESERVES THAT THE DATA CENTER FACILITY HAS AVAILABLE CAN POTENTIALLY BE ASSIGNED FOR STORING RENEWABLE ENERGY FROM ON-SITE SOLAR PANELS OR WIND TURBINES.

THE VALUE OF TPPL

Through the integration of innovative technology, EnerSys® has enhanced lead-acid battery design. The patented Thin Plate Pure Lead Battery (TPPL) technology that EnerSys® lead-acid batteries feature has demonstrated itself to be very appealing to data center operators. TPPL enables elevated battery performance levels and extended working lifespans (with a 12+ year design life typical if operated at 25°C / 77°F).

DATA CENTER OPERATORS CAN MAKE USE OF THE BATTERY RECYCLING SERVICES THAT ENERSYS® OFFERS (BOTH DIRECTLY AND THROUGH THE THIRD PARTIES WITH WHICH IT PARTNERS).

The substantially higher charge acceptance that TPPL battery units are capable of, compared to conventional lead-acid, is one reason for their attractiveness to data center applications. Battery strings can replenish their SoC within a short timeframe, so they are ready for any subsequent outages. TPPL batteries are highly efficient when it comes to operating on float, with less electricity required than other lead-acid batteries. Furthermore, as TPPL plates are thinner than conventional lead-acid grids, 25% more of them can typically be packed into the same volumetric space - enabling greater energy densities to be achieved.

Although it is not possible to prevent grid corrosion completely, there are ways via which the rate that this happens can be slowed. For example, the grids utilized by conventional lead-acid batteries contain calcium – which increases grid corrosion and results in a more porous structure. By comparison, having grids made of pure lead, as EnerSys® does with many battery models, achieves a lower internal resistance and results in significantly better structural integrity, as well as higher efficiency. Furthermore, pure lead batteries can run for longer without needing regular replacement.

As TPPL batteries have greater charge cycle durability, they have the potential to address on-site renewable implementations. In contrast, other traditional lead-acid battery solutions would not cope with the constant charge/discharging pressures that this would require. This charge cycle durability will also allow data center operators to help with maintaining grid stability. Here, deployed batteries will store energy to mitigate any imbalance between electricity customers' demands and generation capacity. This seems certain to happen as electricity supply networks become increasingly dependent on less predictable renewable resources[5] (which will be prone to fluctuations).

Extending the working lifespan beyond conventional lead-acid units means tangible Total Cost of Ownership (TCO) benefits for data center operators using TPPL. TPPL batteries can be run at higher ambient temperatures than conventional lead-acid batteries while maintaining extensive working lifespans (with warranties of up to 5 years when run at 30°C / 86°F). This once again lowers the TCO, as cooling costs can be avoided.

Data center operators can make use of the battery recycling services that EnerSys® offers (both directly and through the third parties with which it partners). These allow operators to comply with the relevant legislative guidelines for their geographic location while also unlocking the remaining value in batteries at the end of their operational lifespan. This helps to further reduce the TCO while simultaneously helping to protect the environment.

CONCLUSION

With increasingly heavy workloads to address, data center operators have to increase the operational capacities of their facilities. At the same time, operators need to minimize these facilities' environmental bearing. Therefore, they must look at ways to operate data centers as sustainably as possible.

When all its distinct aspects are combined, TPPL presents data center operators with a compelling power supply solution that has low upfront capital costs, minimal ancillary costs, fast charging performance, prolonged lifespan, and the highest degrees of recyclability.

WITH INCREASINGLY HEAVY WORKLOADS TO ADDRESS, DATA CENTER OPERATORS HAVE TO INCREASE THE OPERATIONAL CAPACITIES OF THEIR FACILITIES.

REFERENCES

[1] IEA - Data Centers and Data Transmission Networks Tracking Report (November 2021).
[2] Markets-and-Markets - Lead Acid Battery Market - Global Forecast to 2027 (May 2022).
[3] BCI - National Recycling Study (December 2019).
[4] BCI - National Recycling Rate Study (December 2019).
[5] Renewable Energy World - Balancing a Renewable Grid (July 2021).

To find out more about how EnerSys® is helping data center operators to implement UPS solutions that possess industry-leading environmental characteristics, please go to: www.enersys.com

CONTACT ENERSYS®

About EnerSys®

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.

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

Caution Concerning Forward-Looking Statements

EnerSys is making this statement in order to satisfy the "Safe Harbor" provision contained in the Private Securities Litigation Reform Act of 1995. Any of the statements contained in this article that are not statements of historical fact may include forward-looking statements that involve a number of risks and uncertainties. A forward-looking statement predicts, projects, or uses future events as expectations or possibilities. Forward-looking statements may be based on expectations concerning future events and are subject to risks and uncertainties relating to operations and the economic environment, all of which are difficult to predict and many of which are beyond our control. For a discussion of such risks and uncertainties that could cause actual results to differ materially from those matters expressed in or implied by forward-looking statements, please see our risk factors as disclosed in the "Risk Factors" section of our annual report on Form 10-K for the most recently ended fiscal year. The statements in this article are made as of the date of this article, even if subsequently made available by EnerSys on its website or otherwise. EnerSys does not undertake any obligation to update or revise these statements to reflect events or circumstances occurring after the date of article.

FOLLOW OUR
DATA CENTERS
SOCIAL PAGE TO
STAY UP-TO-DATE
WITH ALL THE LATEST
INFORMATION ABOUT
THE **DATASAFE® XE**
BATTERY RANGE.

World Headquarters
2366 Bernville Road
Reading, PA 19605 USA
+1 610-208-1991 / +1 800-538-3627

EnerSys EMEA
EH Europe GmbH
Baarerstrasse 18
6300 Zug Switzerland

EnerSys Asia
152 Beach Road
Gateway East Building #11-08
Singapore 189721 / +65 6416 4800