EBOOK

MAXIMIZING BATTERY CIRCULARITY


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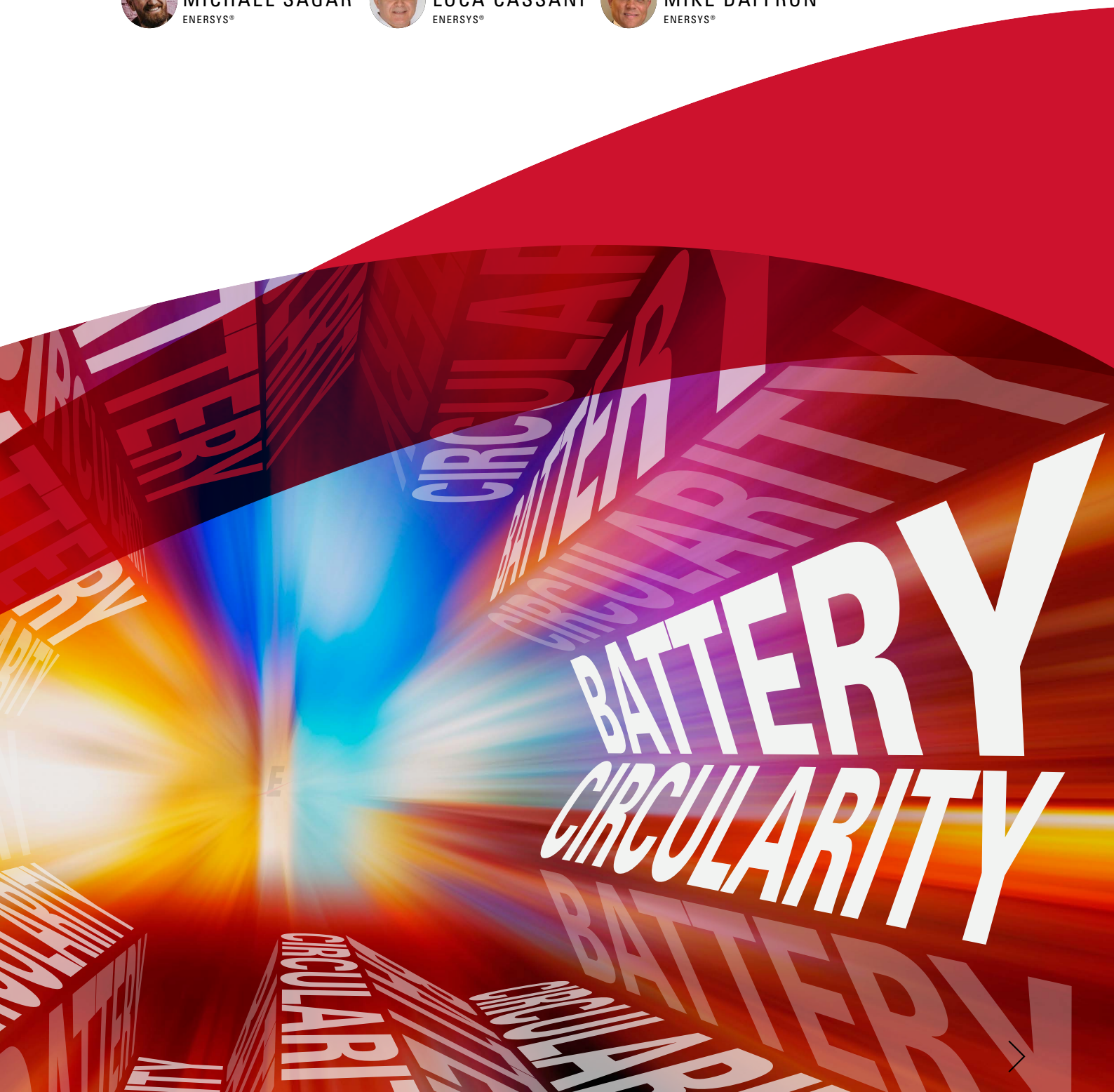

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INTRODUCTION

Batteries have a vital part to play in the continued running of data centers, providing the backup power needed for normal service to be upheld should an unforeseen electricity supply outage occur. As an important asset to data center operators, due consideration must be given to how these batteries will be managed throughout their entire lifespan. Clearly, batteries need to be maintained in good condition if they are to deliver the heightened performance levels expected of them. Likewise, when they come to their end-of-use, efforts must be made to dispose of them in the correct manner.

Concerned by the build-up of electronic waste, international environmental initiatives are now encouraging the more widespread collection and recycling of defunct batteries. They are also pushing for enhancements to recycling efficiency rates.

CLEARLY, BATTERIES NEED TO BE MAINTAINED IN GOOD CONDITION IF THEY ARE TO DELIVER THE HEIGHTENED PERFORMANCE LEVELS EXPECTED OF THEM

RECYCLING OF THE MAIN DATA CENTER BATTERY CHEMISTRIES

Lead is acknowledged as the world's most recycled metal[1]. The material has the ability to be recycled continuously while not seeing any significant deterioration in its properties. Consequently, there is already considerable appeal to the use of lead-acid batteries from a sustainability perspective.

According to a report[2] published by the International Lead Association (ILA), around 85% of the world's lead consumption goes into the production of lead-acid batteries. Furthermore, the lead recycled from batteries is the largest source of secondary lead - so the material can feed into the production of other products and equipment. A Battery Council International (BCI) study[3] concluded that approximately 99% of the material in a lead battery is recyclable, which is considerably more than what can currently be attained by other battery chemistries.

99%

OF THE MATERIAL IN A LEAD BATTERY IS RECYCLABLE.

THERE IS ALREADY CONSIDERABLE APPEAL TO THE USE OF LEAD-ACID BATTERIES FROM A SUSTAINABILITY PERSPECTIVE.

COMPARISON OF RECYCLING ROUTES

Recycling lead-acid batteries is a longstanding and well-understood process. Mechanisms are already in place to assist data center operators in disposing of their end-of-use batteries with a minimal environmental impact. Moreover, operators may be able to get money back from their initial investment due to the value retained in battery units, which could provide possible financial incentives, as well as ecological ones.

Li-Ion battery recycling has not yet achieved the circularity of lead but is improving. Reusing more of the material found in lithium-ion batteries should be possible once the associated recycling methods have reached full maturity. Extensive studies conducted by technology market consultancy Avicenne[4] concluded that Nickel Manganese Cobalt (NMC) has by far the most potential here, with scope for much larger margins to be generated than Lithium Iron Phosphate (LFC) batteries (at least 4x greater). Concurrently, EnerSys® recognizes the human rights and environmental concerns around cobalt mining – especially in the Democratic Republic of Congo (DRC), where nearly two-thirds of cobalt is currently mined. For the energy storage solutions sold by EnerSys® that contain lithium-ion batteries with cobalt anodes, the cells we receive are sourced from suppliers committed to adopting the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas (Third Edition) [5].

The complexity of recycling processes for different battery chemistries means that the costs involved have a high degree of uncertainty, although the rates associated with lead are more consistent. These end-of-use economic factors should be considered in the equation when data center operators are selecting battery chemistries.

Having been a key player in the data center industry for many years, EnerSys® has a strong understanding of the multiple pressures that operators are under - from an operational, end-of-use, and safety standpoint. The company's proprietary Thin Plate Pure Lead (TPPL) improves performance while still offering the full recyclability attributes that have been achieved with traditional lead-acid batteries.

The longer lifespan of TPPL battery units from EnerSys® compared to conventional lead-acid batteries can be ecologically advantageous too. TPPL batteries can last up to 25% longer and offer greatly improved energy density figures. Energy consumption is reduced, as the batteries require lower overcharging. In addition, their elevated energy densities mean that fewer units can be installed to cover the capacity requirements that have been set. Data center operators thereby have fewer battery units to responsibly dispose of each year.

HAVING BEEN A KEY PLAYER IN THE DATA CENTER INDUSTRY FOR MANY YEARS, ENERSYS® HAS A STRONG UNDERSTANDING OF THE MULTIPLE PRESSURES THAT OPERATORS ARE UNDER - FROM AN OPERATIONAL, END-OF-USE, AND SAFETY STANDPOINT.

MAXIMIZING RECYCLING EFFICIENCY

EnerSys® provides its data center customers with a comprehensive battery recycling program for dealing with lead-acid batteries that have come to their end-of-use. With more than 20 years of experience in some countries, the program is now operating on a global scale.

Though implemented worldwide, the battery recycling program is flexible enough to be able to respond to a country's local legislative requirements. The experienced staff at EnerSys® can work directly with individual customers to decide on the optimal solution for them.

The highly-optimized recycling process employed by EnerSys® and authorized partners in many of its key markets consists of the following key steps:

1. The collection of batteries from the customer's site - Managed directly through EnerSys®, rather than relying on a third party to undertake the work. Customers may be offered credits for the batteries that are collected. Battery models can be ones that were originally manufactured by EnerSys® or ones from different suppliers.
2. Separation of all the different component parts - Conducted by authorized EnerSys® partners, this work covers the extraction of the lead itself, as well as the plastic from the battery casings, the electrolytes, paste, and several other smaller components. Each recyclable element then passes through its own specific recycling procedure.
3. The smelting of all the extracted lead – Temperatures reaching above 1200°C/2190°F are applied to the lead that has been recovered from the disposed of batteries. The process takes around 2 hours to complete.
4. The refining of the lead - Removes unwanted contaminants so that the recycled metal will exhibit the high degree of purity required for it to be utilized in further battery production.
5. Recycling of plastic elements - Ensures that new casings can be produced, or the recovered plastic can be extruded into other forms so that it can be used in various products.
6. Electrolyte purification - Where the batteries' sulfuric acid electrolytes are treated to get them ready for reuse.
7. Certification and documentation - Once the process has been completed, a certificate is provided, so customers can keep details on file. This means they are prepared for any environmental auditing that they may be subject to later.

THE EXPERIENCED STAFF AT ENERSYS® CAN WORK DIRECTLY WITH INDIVIDUAL CUSTOMERS TO DECIDE ON THE OPTIMAL SOLUTION FOR THEM.

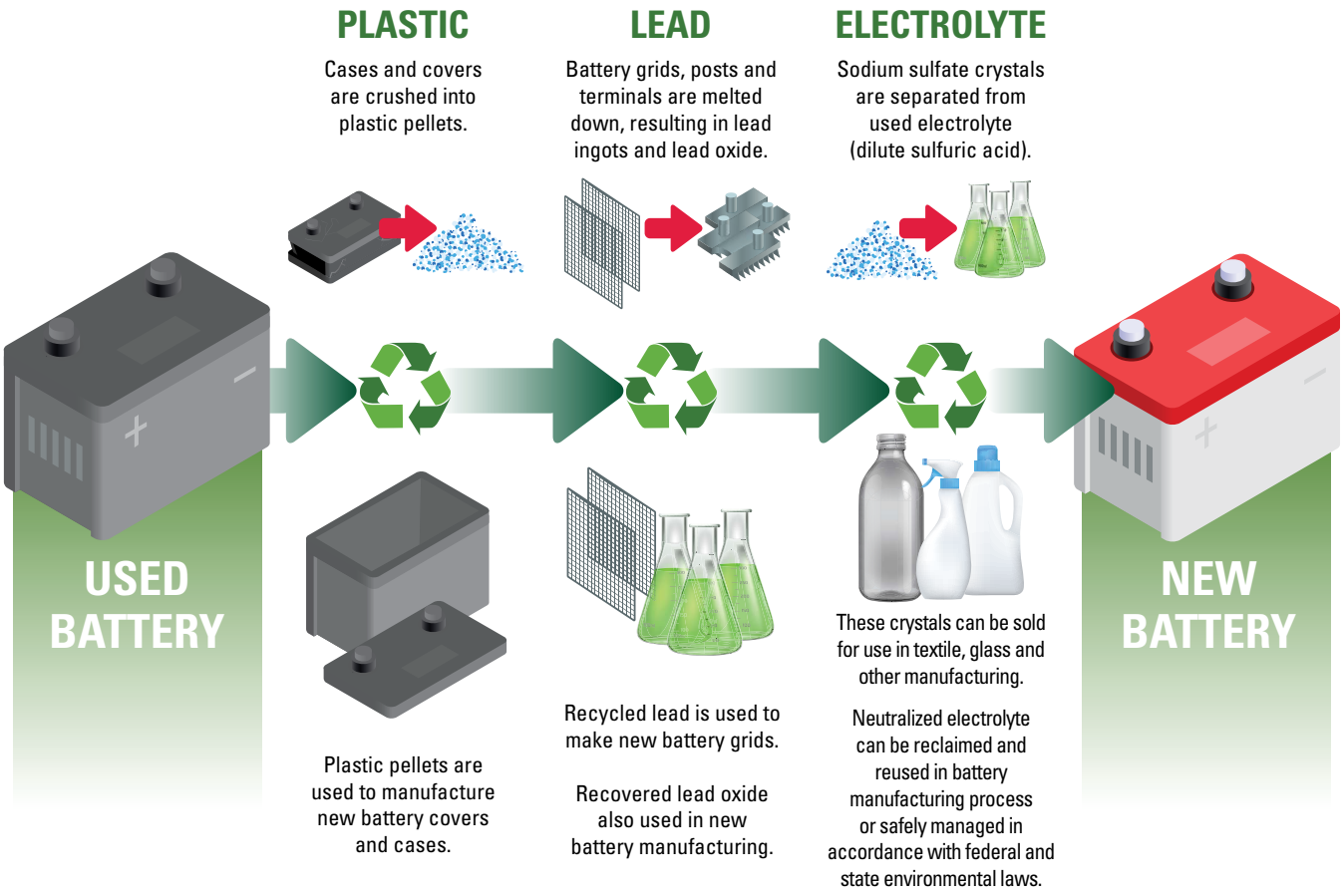

Figure 1:
Schematic describing the different aspects of the battery recycling process

ADDITIONAL ACTIVITIES

As well as the high throughput recycling activities that EnerSys® is already engaged in across different geographic regions, the company is also working with other organizations in efforts to extend the longevity of lead-acid batteries so that there is a greater period between their installation and subsequent disposal.

EnerSys® is currently collaborating with scientists at the US Department of Energy, the American Battery Research Group, and the University of Toledo on atomic-level investigation work. The research examines the interactions causing the formation of crystals within batteries - which can lead to restrictions in their operational lifespan. The objective of the project is to investigate how expander molecules could combat such formations, thereby increasing the cycling capabilities of these batteries markedly beyond what can already be achieved.

CONCLUSION

Data center operators must make certain that any harmful constituent elements found in the batteries incorporated into their battery backup power systems are decommissioned in a safe and ecologically responsible way. If the batteries that are employed within such systems are based on a chemistry that already has a well-established recycling path, then major benefits are likely to be derived. Firstly, these harmful elements will not end up back in the external environment - with there being a closed-loop (avoiding resource wastage and environmental impact). Secondly, the residual value that these batteries possess can be unlocked, with the operator able to use the funds created by recycling them for other purposes.

The decommissioning of batteries presents a significant challenge for data center operators, and they need to have a highly effective solution via which this can be accomplished. Selecting batteries that are well aligned with current recycling guidelines, and engaging with a battery supply that offers all the necessary support, are therefore paramount. This can be a notable contributor to the founding of a truly circular economy and a fully sustainable future.

For more information about the data center batteries available from EnerSys®, please visit: www.enersys.com

REFERENCES

[1] WHO - Recycling Used Lead-Acid Batteries (October 2017).
[2] ILA - Environmental and Social Responsibility for the 21st Century (November 2015).
[3] BCI - National Recycling Rate Study (November 2019).
[4] Avicenne - Study of Large Format EV Li-Ion Battery Recycling (December 2018).
[5] OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas, Third Edition (April 2016).

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

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