

Supercapacitors give energy storage new impulse

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Reliable, safe and sustainable alternative for batteries

Storing renewable energy in a sustainable way remains a challenge for a lot of companies. In this search for alternative storage options, supercapacitors are gaining ground. That these systems are a viable solution for reliable and more efficient energy storage has been proven by a recent collaboration between CE+T and 247 Energy.

A Dutch logistics company recently wanted to integrate solar energy with a reliable and efficient energy storage system. Although traditional lithium-ion batteries were being considered, the company was looking for an innovative, safe and sustainable solution. The main goal was to effectively manage peak energy demands while reducing dependency on the power grid, all while maintaining the highest possible reliability and safety.

Integration of supercapacitors

Power generation equipment and solutions suppliers, 247 Energy and CE+T, embarked on a project to explore innovative energy storage solutions. They successfully integrated supercapacitors as an alternative to traditional batteries, offering improved safety, longevity, and rapid energy transfer capabilities.

Although capacitors store less energy than batteries, they deliver greater power and have a significantly longer lifespan. Supercapacitors, or 'supercaps', are capacitors that exhibit extremely high energy density. They maintain an operational voltage between 1 and 3 V at the cell level, enabling substantial energy storage with relatively quick charging times. This makes them an interesting alternative to batteries.

247 Energy seamlessly integrated these supercapacitors into a customised 20-ft container, tailored to meet the specific energy requirements of the logistics company. They set out to find an innovative approach that led to the integration of supercapacitors as an alternative to conventional batteries, also offering better safety, long life and fast energy transfer.

Integrating the supercapacitors alongside CE+T Power's converters provided significant benefits for the logistics company. This solution significantly improved energy efficiency and enabled fast charging and discharging, which is essential for managing peak loads. This is how supercapacitors could provide a safer and more reliable alternative to conventional batteries, with longer life and fewer maintenance requirements. Moreover, this innovation aligned with the customer's sustainability goals by providing a more sustainable, environmentally friendly energy storage solution.

This advanced energy system not only met the logistics company's immediate requirements, but also set a precedent for future sustainability practices in the industry. The project marks an important step towards large-scale application of supercapacitors in the field of energy storage and management.

Application possibilities with supercapacitors

Supercapacitors can be found almost everywhere, but often have the reputation of being 'only' passive components. Yet, their potential is great.

Supercapacitors have advantages in applications demanding a large amount of current over a brief period, or where numerous charge/discharge cycles and extended service life are necessary. Their applications vary widely, from providing just milliamps or milliwatts of power for a few minutes to delivering several amps of current or hundreds of kilowatts of power during brief peak loads. Commonly used in electronic devices and power electronics, supercapacitors are also employed in (hybrid) vehicles, either in conjunction with batteries or as standalone systems. As they can operate effectively between ?50 °C and 80 °C, they can be used in many environments.

Besides applications in **consumer electronics** (laptops, PDAs, mobile devices, solar panels, etc.) and wireless tools, supercapacitors can be used for all kinds of **industrial applications**. Supercapacitors are essential for powering electrical devices that require protection during brief power outages, such as maintaining data integrity in storage systems. When used with parallel-connected batteries, supercapacitors serve as a buffer for fluctuating loads, thereby smoothing out the peaks and enhancing battery longevity. They are also applicable in logistics systems, including automated guided vehicles (AGVs) and forklifts.

Due to their high tolerance for high charge and discharge cycles, supercapacitors are particularly suitable for both private and public electric **vehicles**, as well as machinery like harbour cranes, where they can store and recycle energy, including that generated during braking.

In the **(renewable) energy generation and distribution** sector, supercapacitors can be used in wind turbines, instead of batteries, for continuous power supply. This ensures that even if there is

an interruption in power from the grid, there is enough reserve energy to adjust the blade pitch of the rotor blades. The main advantage over batteries here is mainly the lower maintenance requirement.

Wind and photovoltaic systems experience variable output due to factors like wind gusts, cloud cover, or shading, leading to voltage fluctuations. Supercapacitors can quickly buffer and stabilise these voltage shifts within milliseconds, aiding in the stabilisation of mains voltage and frequency. Additionally, supercapacitors can mitigate other undesirable power fluctuations on the grid, caused by temporary spikes in consumption, by acting as a buffer between the grid and the high pulse power demands.

Supercapacitors are suitable as temporary energy storage devices for energy harvesting systems, where energy is collected from the environment or renewable sources, e.g. mechanical movements, light or electromagnetic fields, and converted into electrical energy in an energy storage device.

Keeping a pulse on energy supply and storage

Sirris is involved in two projects that address some of the challenges currently faced by the energy sector.

Power fluctuations from offshore wind farms have a significant impact on grid stability. The FOOS - GeFOrceived OScillations - project investigates the causes and impact of these power fluctuations, focusing on risks for safe operation, potential system-wide consequences and measures to contain them.

The inland shipping sector needs to become more sustainable through electrification, but currently there is too little power supply available. Through the Floating Battery project, Sirris and VIL are working to create a flexible and sustainable power solution for inland navigation. They plan to use battery containers to provide power during mooring and to serve as charging infrastructure for battery-electric vessels at berths with no permanent facilities.

Interested in one of these projects?

Feel free to contact us!

Revolutionizing Energy Storage with Supercapacitors - CE+T Power (cet-power.com)

Authors