Superior battery pack solutions

In an age when the demands on lithium-ion battery systems are increasing, the need for flexibility, speed and cost effectiveness cannot be underestimated

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1. Voltabox nickel manganese cobalt oxide (NMC) and lithium titanate oxide (LTO) modules

2. A Hess trolley bus equipped with a high-performance Voltabox battery system

Offering high-performance battery systems for local public transport and commercial vehicles, Voltabox Deutschland and Voltabox of Texas are new, wholly owned subsidiaries of Paragon AG, which has developed and manufactured automotive electronic solutions since 1988.

Formally run under the banner of Paragon's Electromobilty business unit, new brand Voltabox supplies safe, high-performance Li-ion batteries for all types of vehicle-based applications – in particular hybrid, trolley, and electrical buses. And, with its most recent modular battery system for prismatic cells, the company has added the material handling market as well as stationary applications to its portfolio.

Voltabox, which was launched this year, uses only cells sourced direct from premium, well-known suppliers such as Samsung, Toshiba, K2 Energy and A123. This means the company has the direct support of the original equipment supplier, providing cost savings while enabling direct access to the newest technology to enhance technical data that won't be found in common data sheets.

The German company focuses on Li-ion battery technology, the advantages of which are explained by Paragon CEO Klaus Dieter Frers: "In vehicles, in comparison with lead acid battery systems, lifetime, load time, and usability in combination with low temperatures, are superior.

"With trolley buses, for example, a requirement could be to operate purely battery-driven for 10 or 15 miles on a small hill. If you consider battery weight, this is only possible technically and cost-wise regarding lifetime costs with Li-ion battery systems. In addition, there's a weight saving of 50-60%, plus space savings. As a vehicle, a bus offers lots of physical space, but with Li-ion, they have more space to transport people rather than batteries."

"We've developed battery systems that will live for nearly as long as the whole bus – 10 years or longer"

Klaus Dieter Frers, CEO, Paragon AG

Branching out

Design, development and production of Voltabox's high-performance battery systems for its European customers takes place in its headquarters in Delbrück, Germany, where a team of over 30 is based in a recently opened 2,000m² production facility.

Frers adds, "Research, development and design of our battery modules will be done in Germany. I am keen to be hands-on with the R&D, especially in the case of the BMS, the electronics, and the software behind the architecture, and we provide these for our American colleagues. So Texas will be dedicated to sales and production."

Indeed, for its North American, Canadian and South American clients, Voltabox will

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1. An example Voltabox $LiFePO_4$ module, based on cylindrical cell type 26650

2. A Voltabox battery pack, with $LiFePO_4$ modules inside, fully integrated active climate system and CAN communications interface

open a 2,140m² production facility in Cedar Park, a suburb of Austin, Texas, in September. This facility will turn out mass-produced Voltabox batteries on assembly lines identical to those found in Germany, with the same maximized degree of automation and end-to-end process monitoring to guarantee optimum quality.

Reputed to be the birthplace of lithium phosphate technology, Austin offers Voltabox an impressive potential employment base. "Various groundbreaking discoveries in the field of Li-ion technology originated at universities in the region, including the University of Texas and Park University, and the Southwest Research Institute," comments Frers, "which led to the growth of organizations that have developed and contributed to some outstanding infrastructure.

"In the environment of Austin, therefore, there are a lot of very highly skilled people, both from universities as well as rival companies. This means well-qualified employees are always within reach, which we intend to take full advantage of."

Production on projects in Cedar Park will begin in September, with series battery systems expected to be delivered from the end of the month onward. In production will be the company's new modular systems for prismatic cells. Frers states, "On the one hand, we integrate NMC (nickel manganese cobalt oxide) cells in new 24V Li-ion modules. Weighing only 18kg, they are very reliable for up to 6,000 cycles, while having a good energy density (135Wh/kg or 316Wh/l) with regard to their size and weight."

For certain applications, such as its next US project, which will be for the city of Dayton, Ohio, batteries are required to have very long possible lifetimes, "so we've developed battery systems that will live for nearly as long as the whole bus – 10 years or longer, assuming wise use" adds Frers. "For these applications, LTO (lithium titanate oxide) cells are the optimal solution. LTO cells are stable for more than 10,000 cycles and, in the right usage, even 20,000 cycles." The LTO cell's energy density is 89Wh/kg or 172Wh/l.

As part of the Ohio project, Voltabox will provide a dual-mode trolley bus battery system. Its nominal voltage level will be 600V, with a total capacity of 61kW/h. Comprising 1,512 LTO cells per system (42 modules, each with 36 cells), the configuration will enable up to 24km battery-driven distance with a 12m bus, with all 43 seats taken. Impressively, in this application, there will be up to six load cycles per day, in up to 18 operating hours per day.

A further application for which Voltabox's modular system for prismatic cells is ideal is vehicles used in material handling, such as forklifts. Both 24V and 48V Li-ion batteries, traditionally the standard in these applications with the lead acid batteries that have been favored until recently, are employed. Frers says, "Two, four, six, eight and, in some cases, 10 of these modules will be packed in special containers, combined with an external master BMS unit that we produce, and a display unit will be added to show the parameters of the battery. Our maintenance-free, high-performance battery systems will ensure the robustness and quality of the vehicles, which are key components of any modern, smooth-running logistics operation."

Frers is also keen to point out that Voltabox is not limited to the industries on which it has already made its mark. "With these new modules based on prismatic cells," he concludes, "we have a ready solution for car and motorcycle batteries. In fact, we're working on exciting projects in these areas that, for now, will remain confidential."

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