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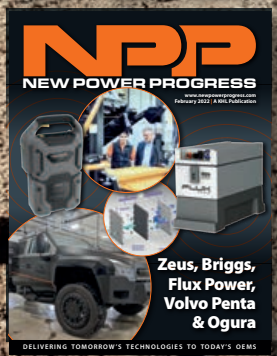

Engineering

FLUX POWER KEEPS BATTERY PACK ENGINEERING, INTEGRATION AS ITS CORE.

BY **CHAD ELMORE**

Flux Power's M24 lithium-ion battery pack, designed to power end-and center-riders used in warehouses and distribution centers, uses lithium iron phosphate chemistry.

Lithium-ion battery packs can meet the power requirements of mobile and stationary applications, and that fact has helped Flux Power branch out from its material handling roots and enter new markets. It said one of the keys to its success has been the collaborative engineering it considers a core competency.

"We have the engineering talent to modify our modular products for a wide range of equipment, each of which require different package sizes, interfaces or power ranges," said Ron Dutt, chief executive officer, Flux Power Holdings Inc., Vista, Calif. "Early on we learned that one of our core competencies had to be our engineering capability."

EARLY ADOPTION

The strategy has been paying off, and it has for years. The battery supplier has recorded 13 consecutive quarters of year-over-year revenue growth and has sold more than 11,000 lithium-ion battery packs into commercial and industrial applications.

When the company was founded in 2009, its goal was to reach the passenger car market. When Dutt joined in 2013 the team reinvented itself, shifting to the material handling equipment market. Its lithium-ion battery technology can now also be found in airport ground support equipment.

Many of its customers in material handling are Fortune 500 companies with massive warehouses and fleets comprised of thousands of pieces of equipment. Dutt's resume includes time at Ford Motor Co. and DHL, experience he said has been useful at Flux Power.

"When we looked for ways to reinvent Flux Power, we came to the conclusion that there was a rare opportunity in material handling to have 'first mover' leverage where we could supply huge fleets with a solution that was really going to resonate," said Dutt. That equipment, such as forklift trucks, was historically powered by lead-acid batteries or spark-ignited engines fueled with propane, and Flux Power placed its targets on those systems. "The material handling space is big – if you look around your room, everything's touched a forklift a number of times. So, while it might not be as sexy as cars, it's sexy from a business standpoint. It's a huge sector."

"We knew what those big customers were looking for. They wanted to move more pallets. They wanted to do it less expensively – the initial cost of our solution was more, but the big fleets understand product life cycle cost. Our solution was also transformative for the environment, and there was no lead acid spillage or smell. We looked at all of the strengths of our solution and saw we had a value proposition that was a bell ringer."

Today, Flux Power designs and manufacturers lithium-ion battery packs in 24, 36, 48 and 80 V configurations with various capacities and it recently developed a high-voltage 400 V battery pack for a customer that planned to use them in an autonomous shuttle. The company said the batteries can be fast-charged completely and handle ultra-fast charging up to 1C (a full charge in one hour). The battery packs maintain their performance levels under discharge rates as high as 3C continuous (full discharge in a third of an hour).

Its catalog includes the M24 lithium-ion battery pack, designed to power end-and center-riders used in warehouses and distribution centers. It uses lithium iron phosphate (LFP) chemistry to deliver 24 V, 420 Ah (10 kWh) and rated for 3500 cycles. It's UL Listed and is available with the company's own SkyBMS telematics option.

Each battery pack gets an integrated UL Listed BMS (battery management system), developed in-house to be optimized for each application.

collaborator

SERVICE AND SUPPORT

"Identifying our market back then was only the first step," said Dutt. "The second thing we had to consider was, can we actually be a supplier to these large companies? I know they're very demanding. You don't get many chances after you get it wrong. We needed to be sure we would be very responsive and deliver quality on time.

"That's what we bring to the table, and my experience at Ford really provided the understanding of what it takes to be a supplier to these big companies – and especially the financial requirements to make that happen. Really understanding what the customer needs means more than just shipping something off the shelf. You've got to be able to engineer complete solutions."

Flux Power's first big fleet win was PepsiCo, which Dutt said required three years of work behind the scenes. During that time the battery supplier improved its own infrastructure – its facility in southern California achieved ISO 9000 certification and today covers 64,000 sq. ft. – and it also redesigned its packs to be UL Listed.

"We needed to be certified for quality in everything we did," said Dutt. "Customers weren't going to put up with anything less than that. That required investment on our end and the time to achieve those goals."

The company also realized, early on, that its future success rested on the caliber of its engineers. They needed to work closely with engineers at forklift makers and other OEMs to "ensure our battery packs were good enough to be part of their forklifts," said Dutt. "And then, finally, we demonstrated that we could service the battery packs once they were in use."

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>
> **RON DUTT, CEO, Flux Power**

ENERGY RESILIENCY

The company's newer stationary power storage opportunities can be illustrated by the EV ARC electric vehicle charging system developed by Beam Global. The system collects energy from the sun which it stores in Flux Power C-Series battery packs so that it is ready to power-up battery-electric vehicles 24 hours a day, even during power outages caused by severe storms.

As electric vehicles of all types become more prevalent, San Diego-based Beam said its solution will help ensure energy resiliency. As its flagship product is deployed throughout the country – recent installations range from a municipality in California to an airport in West Virginia – customers have found it requires no disruptive construction and generates no utility bill.

"We've shipped packs for the solar mobile vehicle charging stations for the past year and a half," said Dutt. "We think it's a natural extension of our material handling business. Another of the lessons I've learned is that you don't want to become overly concentrated with one customer, industry, sector, or even a specific product. The vehicle charging systems fit nicely with our strategy."

Flux Power battery packs have been proven in material handling, and can now be found in a wide range of applications.

TO THE CLOUD

Last summer, Flux Power added the optional SkyBMS to its battery offering, a cloud-based telematics and asset management system that "records and communicates information on pack health and discharge rates and provides live reports to the warehouse or fleet managers," said Dutt.

The system was developed in-house and is based on software that Flux Power's engineers have used for several years.

Dutt said there is more to come, too. "We're continuing to develop that even more. There is an endless journey of features and things you can do with telematics." NPP

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