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Jacob Smiley, president of Badger Paperboard

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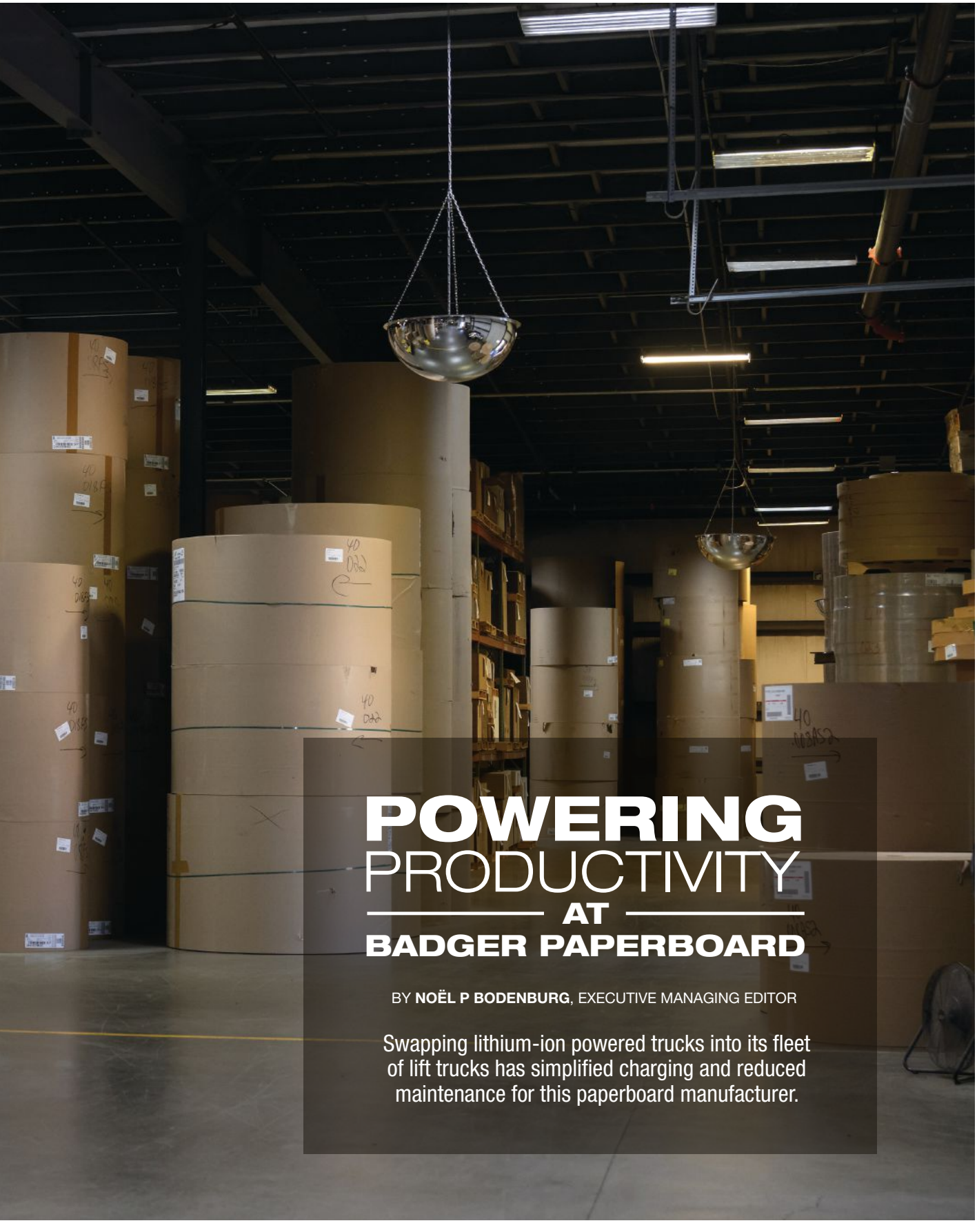
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# POWERING PRODUCTIVITY AT BADGER PAPERBOARD

BY **NOËL P BODENBURG**, EXECUTIVE MANAGING EDITOR

Swapping lithium-ion powered trucks into its fleet of lift trucks has simplified charging and reduced maintenance for this paperboard manufacturer.




Jacob Smiley, president, Badger Paperboard.

Change doesn't have to be dramatic to make a difference. Incremental change can still make a big impact. When Badger Paperboard swapped out some of its internal combustion and lead-acid powered forklifts for integrated lithium-ion lift trucks, they reduced fuel costs, downtime and charging requirements in their manufacturing operation.

The manufacturing operation had been using this mix of internal combustion and lead-acid electric trucks for about 15 years to move raw material and finished paper products around their plants.

Badger operates four facilities nationwide, a total of 225,000 square feet of production space. They use lift trucks to keep everything moving from unloading trailers at the docks, moving raw and finished materials inside the facilities, and moving materials back onto trucks to shipping.

To start converting its fleet away from lead-acid batteries and propane, Badger replaced two forklifts in its 50,000-square-foot Fredonia, Wisc., facility, one in California, one in Texas and one in North Carolina.

The introduction of lithium-ion (Li-ion) powered lift trucks (Big Joe Forklifts) to the fleet has been a game changer both in terms of environmental benefits and a savings in maintenance costs and time. To start, Badger has rolled out five lithium-ion lift trucks across its network.

the trucks perform moving heavy raw material and paper rolls on a day-to-day basis, shift after shift.

"When we connected with the lithium-ion forklift supplier, we found the lithium-ion to be a huge burst of technology for the environmental reasons, but mainly for us on the maintenance side," Smiley says.

The benefits are clear. Smiley estimates that maintenance costs are down 50%, and as importantly, productivity is up with less time spent on maintenance. In addition, based on actual data from the Big Joe Pulse telemetry system, the 5,000-pound



The manufacturer needs the ability to move between 4,000- and 5,500-pound paper rolls, but also needs the ability to get into tight spaces.

"Long term, we would like to get a full lithium-ion fleet in each facility," says Jacob Smiley, president of Badger Paperboard. "We have an expansion coming in our Wisconsin facility of 50,000 square feet, and we are planning to equip it with all lithium-ion."

Badger is gradually rolling out new lithium-ion forklifts in its facilities as they need to be replaced versus scrapping the whole fleet of some very functional trucks. This is giving the manufacturer time to prove out the concept with its operators and see how

capacity truck is saving the operation $2,788 a year in fuel costs over the IC truck they were using.

## HISTORY OF SUSTAINABILITY

Badger Paperboard has been a leading custom paperboard converter and manufacturer of shipping and packaging materials for 25 years. Starting out by recycling and custom-cutting excess paperboard, the company has expanded from a single Wisconsin location to a nationwide

supplier with facilities across the United States, including Charlotte, North Carolina; Houston, Texas; and Los Angeles, California. The company invested heavily in automated, high-speed equipment and enterprise management systems to maintain uniform operational quality across all their plants.

Today, Badger Paperboard supplies commercial, industrial, retail, and food and beverage industries with custom chipboard sheets, solid fiber products and paperboard edge protectors.

The company has grown its workforce to 150 full-time manufacturing employees. The facilities run two-shifts Monday through Friday that cover the 24-hour period. Operations do take a two-hour gap between shifts and use that time to opportunity charge the trucks.

The benefits to lithium are many for Badger and include less maintenance, easier charging and better ergonomics for the drivers. In addition, Badger is saving on fuel costs, and it's reducing the amount of carbon dioxide it's putting into the air.

## TRUCKS FOR MANY JOBS

Badger uses a combination of forklifts in its operations for different applications across the network. The operation is currently using multiple classes of lift trucks. They were able to convert two of the classes to lithium, but the large heavy-duty forklift has had to remain propane until they can find a vehicle with enough power to convert it.

"We really need three to four different class levels of truck to cover our whole need," Smiley says.

For one, Badger uses a forklift rated for 3,500 to 4,500 pounds. These three-wheel trucks move 2,000-pound pallets of materials around the facility but can also navigate tight spaces. This truck is being used in the California facility to replace an older sit-down counterbalanced model that was using drop-in, lead-acid battery.

"These are used primarily for handling finished good pallets throughout the plant," Smiley says. "We use them for loading onto racking, picking off racking and then




**The benefits to lithium are many for Badger and include less maintenance, easier charging and better ergonomics for the drivers.**

loading on to shipping trailers."

Badger also uses larger trucks rated for 6,500 pounds that they use for moving products. These vehicles move pallets that are 20 feet long and weigh up to 4,000 pounds. The loads of raw materials are moved as large paperboard rolls onto machines where they are converted to material that can be used as protective packaging.

"These trucks are used to handle some heavier raw material pallets we receive," says Smiley. "We use it for both unloading and handling in the facility. We also have some extra-long [10- to 20-foot long] pallets that need at least a 6,500-pound truck to handle around the facility."





**Badger uses a combination of forklifts in its operations for different applications across the network.**

This truck is being used in the North Carolina facility and replaced an older Class IV internal combustion cushion tire forklift.

Smiley wanted to get away from internal combustion forklifts for a few reasons.

"We use our trucks indoors and this IC truck was giving off propane fumes; it created heat under the operator's legs; we found it difficult and dangerous to replace the propane tanks; the engines were always breaking down on us and needing maintenance; and the cost of propane was expensive," Smiley says.

Badger's operations also require a heavy-duty 12,000-pound truck that can pick up rolls of material that weigh 2,000 to 5,500 pounds and move them around the plant. These trucks are currently internal combustion propane in Badger's facilities, but it is his long-term goal to find a lithium-ion truck that can handle the requirements.

"Absolutely, long term we would like to find a lithium-ion truck that can handle these requirements," he says. "It's not available now by anyone, but with the pace of technology, it may be soon."

Badger's fleet needs to handle a specific application for a product they manufacture called a push pull sheet. Instead of using standard forks, a special attachment on the lift truck replaces the pallet to help manipulate 2,000-pound loads of this product. The new lift trucks are able to handle these special attachments.

"This ability was really good for us and our customers," he says.

## ON-BOARD CHARGING

Industrial lithium technology has become a viable option as an upgrade from traditional lead-acid solutions and well as a solution that finally empowers customers to move from internal combustion (IC) engines to electric. And, according to research firm Interact Analysis, in 2025, lithium solutions accounted for 37% of the total market and is forecast to reach 80% by 2034. It's a technology on the rise.

Lithium batteries eliminate the need for battery-changing rooms and messy daily maintenance. By enabling "opportunity charging" during 15- to 30-minute breaks, they can drastically improve fleet uptime and productivity.



Big Joe Forklifts was an early adopter of lithium battery technology in the materials handling industry and has integrated their own lithium battery technology directly into the chassis of the truck, eliminating the need for battery exchange. Additionally, their trucks feature single-phase 120-volt and 240-volt onboard chargers as standard equipment, which is ideal for demos and applications like rentals, where the truck experiences considerable idle time.

Badger decided to go with Big Joe integrated lithium forklifts to replace their IC truck fleet as a solution over using traditional lead-acid or third-party lithium battery drop-ins. By integrating the lithium battery directly into the chassis, the truck's center of gravity is optimized while providing a more spacious and comfortable operator compartment. When paired with a disciplined opportunity charge practice, the truck batteries are compatible with high power three-phase fast chargers, providing a solution for two-shift and most three-shift applications. The batteries provide optimal performance throughout the shift and are virtually maintenance-free.

Lithium likes to be charged often and fast. Unlike lead acid batteries, it's not important to fully cycle lithium batteries from empty to full charge. To ensure truck performance and productivity is maintained throughout the shift, the driver simply plugs the truck in to the wall during any idle time to maximize the battery's state of charge.

At Badger Paperboard, the short idle time between breaks and the longer idle time between shifts, the battery state of charge is always optimized to allow for consistent, high-performance operation throughout their shifts.

## FLEXIBLE FLEET

The lift trucks Badger uses in its manufacturing operation need to be versatile. The manufacturer needs the ability to move between 4,000- and 5,500-pound paper rolls, but also needs the ability to get into tight spaces.

"Some of our trucks are versatile but some of our trucks are focused on specific tasks," says Smiley. "When our forklifts are down, it's a real issue for us."

"It was becoming so costly to perform maintenance on the older IC and lead-acid trucks. We would pull some of our other techs off of other equipment to try to get us up and running again, but then we wouldn't have anyone on machine repair or preventative maintenance," he says.

Badger now uses supported dealers for maintenance, and it saves time whenever an issue arises. Previously, they would have to have a technician come out to examine the forklift, diagnose the problem, see if it needs a part, leave and order the part, and then come back to fix the forklift. Now, the Big Joe dealer can log into a dashboard and see what the issue is and come out and fix it.

In terms of charging, the new forklifts fast charge on a 240-volt charger during operator downtime. Lithium-ion batteries don't run slow or lag when they are running low, they maintain a consistent level of power throughout a shift, and when fast charged on breaks can easily run an entire shift for Badger.

"We're very excited about the charging aspect on these trucks," Smiley says. "We're very big on opportunity charging and just plugging it in on breaks or between shifts or if there's other downtime. Especially as our other trucks were getting older, they started needing more and more time to charge. We would have to water them and the batteries were located under the seats. With these trucks, we just plug them into the charger on the side of the truck."

Part of the fleet rollout includes access to a dashboard called Big Joe Pulse from the supplier. This dashboard can be used to track and evaluate any maintenance needs, but it can also be used to determine charging habits.




**The new forklifts fast charge on a 240-volt charger during operator downtime.**

"We're so impressed by how advanced they are with this," Smiley says. "They have a lot of technology on the dashboard to track performance. When the forklift is dead, you can see if a driver missed an opportunity charge. If a driver comes with a complaint that the truck isn't charged or isn't charging, Big Joe can look in the dashboard and let us know why."

For now, it allows the production manager to look at the trucks functioning in each plant. Ultimately, this provides Badger with the opportunity down the line to take a consolidated look at operations across facilities.

"I love that we can get live data on what we are doing in each plant," he says. "If we had more of these trucks in all our facilities, we could narrow down what's going on and what we need."

In terms of ergonomics, the new forklifts bring a number of advantages over lead acid. Operator comfort is improved with no heat coming off the battery under the seat. The forklifts also run a quieter engine and offer more room in the operator compartment.

"With operators in the manufacturing environment, I have to make sure employees are happy and happy to come to work," Smiley adds. "These trucks are quieter, they have more cabin space and the seat is more comfortable. Making sure they're happy is a big thing."