

## INFORMATION BRIEF



# Electric Forklift Transition: Battery Power Eliminates Lift Truck Emissions

Almost every industry depends on forklifts. A wide variety of lift trucks are critical to daily operations and supply chain logistics across a host of industries. The central role of forklifts, lift trucks, and other powered "motive" devices means their reliable operation is paramount to the global economy as well as offering environmental benefits.

**Choosing battery-powered lift trucks can save money and reduce emissions**

### Different classes of forklifts and lift trucks

Lift trucks are categorized in Classes, with the most common warehouse classes as Class I – V. Class I – III are electric, while Class IV – V are Internal Combustion (IC). These lift truck uses can range from pallet jacks to standing and sit-down reach trucks.

The Industrial Truck Association reported the market share of electric lift trucks has risen to 67%, up from 65% in 2022. There are multiple reasons for this, including reduced maintenance and carbon footprint, along with an increased focus on sustainability and environmental impacts.

For these reasons, transitioning away from IC forklifts that use propane, gas, or diesel to battery-powered alternatives is increasingly attractive to warehouse and logistics companies.

### Zero-emission forklift regulation

California Air Resources Board's (CARB) proposed Zero-Emission Forklift Regulation aims to phase out IC forklifts with a transition to zero-emission technologies starting in 2026.

This regulation is expected to reduce statewide emissions from forklifts in California by approximately 18,700 tons of NO<sub>x</sub>, 2,100 tons of PM<sub>2.5</sub>, 5,000 tons of reactive organic gases, and 9.4 million metric tons of CO<sub>2</sub> cumulatively from 2026 to 2038.

California's proposed regulatory efforts are already under way, and the rest of the nation may soon follow. There are material cost-saving benefits as well as environmental benefits that businesses can realize today even if a transition away from IC forklifts is many years away.

According to California Air Resources Board (CARB), mobile sources including IC forklifts are the largest contributors to emissions of ozone precursors, fine particulate matter (PM<sub>2.5</sub>), diesel particulate matter, and greenhouse gasses in the state.

## Battery power eliminates lift truck emissions

Electric forklifts are a great opportunity for businesses to help in efforts to fight climate change without worrying about adverse impacts on their existing operations. Battery-powered forklifts can provide overall fleet cost savings in addition to reducing greenhouse gases.

Lead batteries have long been the mainstay of electric lift truck fleets and will remain the technology of choice for most operators. They are a proven and embedded technology across North America, widely available and supported by

sales and maintenance experts. In addition, lead batteries are nearly 100% recyclable at their end of life to provide further sustainability benefits.

However, lithium-ion batteries are also gaining attention for applications where their characteristics are needed. The recyclability of lithium-ion batteries are still in development, but this battery chemistry offers the same end result as lead batteries – moving away from IC forklifts to save on fuel and reduce carbon emissions.



## Choosing the right battery forklift for your fleet

[Battery Council International \(BCI\) members](#) offer a full suite of battery technology solutions for lift truck fleet operators. No single solution will be the right fit for every facility, and it's important for end-users to consider their unique business needs.

That's why BCI urges fleet operators seeking to transition to battery-powered forklifts to be proactive, and work with a reputable BCI-member battery provider, distributor, or dealer to analyze your facility operations before selecting a power source – and to do so on your own terms **before** a regulatory mandate forces you to make that shift later.

Dedicated battery specialists can work with facilities to track and monitor current fleet usage patterns to identify the best fit solution for electric forklifts.

A large number of factors will impact the right battery choice, such as:

- ⊕ Hours of operation (e.g., 8 hr vs 24 hr)
- ⊕ Operations environment (cold vs. hot)
- ⊕ Weight of pallets
- ⊕ Warehouse size, including the height and distance requirements
- ⊕ Charging infrastructure and power demands
- ⊕ Capital expenditure
- ⊕ End-of-life options
- ⊕ Overall Total Cost of Ownership (TCO)





## Lead electric forklift batteries

### Cost savings, proven tech, and recyclability advantages

Electric lift trucks, especially those using lead batteries, provide a reliable and cost-effective solution for many businesses looking to reduce their carbon footprint and save on up-front transition costs.

Lead batteries have been the primary power source for electric forklifts for decades, with approximately 70,000 lead battery-powered lift trucks currently in operation in California alone. These batteries offer several advantages:

- **Cost savings:** Lead batteries have a lower upfront cost compared to lithium-ion batteries, making them an attractive option for businesses looking to transition to zero-emission forklifts while managing costs. Estimates show that lead batteries can be up to 40% less expensive than lithium-ion batteries for the same capacity.
- **Technologies:** Next-generation lead-based battery designs introduced in recent years, and coming to market in the coming years (such as TPPL, Gel, AGM, and BiPolar), are significantly reducing the need for manual maintenance of batteries, increasing charging capacity, and extending the life of lead-based batteries.
- **Dependable and proven technology:** Lead batteries have a long history of reliable performance in forklifts, with well-established support systems and maintenance practices in place. This technology has been used in lift trucks for over 100 years, demonstrating their durability and reliability.
- **Charging:** Lead batteries perform well under multiple charging routines. With advancements in battery technology, lead batteries can be charged with a conventional 8 hour recharge, or much faster during lunches and breaks, called opportunity charging and fast charging. The two latter methods allow the battery to stay in the truck reducing the need for additional battery packs and minimizing downtime.
- **Sustainability:** Lead batteries are the most-recycled consumer product, with a recycling rate of 99% in the U.S. This closed-loop recycling process ensures that lead batteries are a sustainable choice, minimizing waste and reducing the need for new raw materials. The existing recycling infrastructure means that more than 160 million used batteries have a responsible end-of-life destination, and the manufacture of new batteries offers a [significantly lower carbon footprint](#).

## Lithium-ion electric forklift batteries

### Reducing downtimes: advantages of investment

Lithium-ion batteries require a significantly higher up-front investment than lead batteries but are gaining momentum due to some unique advantages. This is particularly true for businesses with intensive operations where the differentiation between the two battery chemistries comes into play.

If you only need a lift truck to move goods around for a few hours out of a given day, you don't need the high performance of lithium-ion batteries. But if your business is constantly moving multiple pallets around the clock, you may want to investigate if you need lithium-ion batteries. That's why BCI urges fleet operators to work with a reputable [BCI-member battery provider, distributor, or dealer](#) to analyze your facility operations **before** selecting a power source.

Lithium-ion batteries boast faster charging times, higher energy density versus lead batteries, as well as the elimination of watering - making them a compelling choice for 24-hour operations, also known as "three-shift" warehousing or "continuous operation".

The ability to charge lithium-ion batteries faster allows for opportunity charging during breaks or shift changes, reducing the need for additional battery packs and minimizing downtime. This can be especially beneficial for businesses



with high-volume, around-the-clock operations where maximizing lift truck availability is crucial. Additionally, the higher energy density of lithium-ion batteries enables lift trucks to operate for longer periods on a single charge, further enhancing productivity.

However, fire code restrictions may limit the implementation of lithium-ion charging stations in certain locations. Lithium-ion batteries have different safety considerations compared to lead batteries, and local fire codes may have specific requirements for the placement and installation of lithium-ion charging infrastructure. Businesses considering lithium-ion battery-powered lift trucks should consult with their local fire department and ensure compliance with all relevant regulations.

## Environmental and economic benefits of battery-powered forklifts

### Advantages for operators and employees

Transitioning to battery-powered lift trucks will help a business's bottom line by reducing fuel and maintenance costs. CARB estimates that an operator of a typical IC lift truck fleet that transitions to zero-emission lift trucks can expect cost savings of approximately \$30,000 per lift truck, primarily due to fuel and maintenance savings. These savings add up quickly for businesses with large lift truck fleets, providing a strong financial incentive to make the transition.

But beyond bottom-line concerns, a battery lift truck fleet can help reduce carbon emissions and provide an opportunity

to improve Environmental, Social, and Governance (ESG) reporting for businesses.

By adopting zero-emission lift trucks, companies can demonstrate a commitment to sustainability and attract environmentally conscious investors and customers. However, it also can help protect and attract workers, too.

In addition, battery-powered lift trucks offer improved indoor air quality and reduced noise levels compared to their IC counterparts. This can lead to a healthier and more pleasant working environment for employees, potentially increasing productivity and job satisfaction.

Transitioning to battery-powered lift trucks will help **reduce fuel and maintenance costs, improve indoor air quality, and reduce noise levels.**





## Long-term benefits of zero-emission forklifts: cost savings and sustainability

As government policies continue to drive the adoption of zero-emission technologies, businesses that proactively transition to battery-powered lift trucks will be well-positioned to comply with regulations, reduce their environmental impact, and realize long-term cost savings.

The choice between lead and lithium-ion batteries will depend on factors such as operational requirements, charging infrastructure, and budget considerations. Regardless of battery chemistry, it is clear that battery-powered technology will continue to be the future of lift trucks.

By embracing the transition to battery-powered lift trucks, businesses can ensure they are ready for the future. They can demonstrate their commitment to sustainability, improve their ESG performance, and contribute to the global effort to combat climate change – all in a cost-effective way.

The unique attributes of lead batteries are worth consideration thanks to this technology's proven record of safety, reliability, and low total cost of ownership when compared to other technologies.

## Conclusion

With the support of organizations like Battery Council International and the guidance of government policies such as CARB's proposed Zero-Emission Forklift Regulation, the shift towards a cleaner, more sustainable future for material handling equipment is well underway.

**BATTERY COUNCIL INTERNATIONAL** Recently celebrating its 100th anniversary, BCI was formed in 1924 and joins together battery manufacturers and recyclers, marketers and retailers, suppliers of raw materials and equipment, and battery distributors from across North America and around the world. BCI members are committed to responsible manufacturing and recycling processes, and serve as a unified voice for environmental, health and safety stewardship.

Learn more at [BatteryCouncil.org](https://www.BatteryCouncil.org)

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