



HYSTER
360-48

BRINGING BIG TRUCKS INTO THE ELECTRIC AGE

As the world collectively pursues reduced greenhouse gas emissions, supply chains have a critical role to play. According to research, an organization's supply chain often accounts for more than 90% of their greenhouse gas emissions.

Green-focused targets have been embraced by governments worldwide, such as the U.S. government aiming to cut greenhouse gas emissions in half from 2005 levels by 2030, and the European Union setting rules to achieve at least 32% renewable energy by the same deadline. For intensive operations such as lumber, agriculture and steel, the number of suitable electric options for material handling equipment continues to grow.

Before deciding whether to electrify, it's important to consider what options are available and which considerations are priorities for your operation. This white paper surveys the landscape of industrial truck electrification and explores what other factors may come into play when considering electric.

// GOING ELECTRIC WITHOUT COMPROMISING OPERATIONAL REQUIREMENTS

Leaving behind internal combustion engine (ICE) power in favor of electrification does not mean sacrificing productivity:

- **Performance** – Electric power can deliver the performance you expect from a diesel, with charging capability to work effectively in heavy-duty applications.
- **Reliability** – Electric drivetrains have fewer components and less complexity than ICE, offering similar or better reliability with reduced maintenance.
- **Infrastructure** – Governments and businesses are embracing electrification as a means to reduce emissions and are investing in the infrastructure necessary to support it.
- **Cost** – Electric options can help reduce costs related to fuel consumption and engine maintenance. Currently there are incentives, grants and offset credit programs, such as the Diesel Emissions Reduction Act (DERA) program in the U.S. and various tax subsidies in many European countries that make the business case even more attractive.



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Of course, electric lift trucks may not make sense for every operation. Not only must operations find an electric solution with the necessary performance to get the job done, factors like local utility grid capacity and run time requirements come into play. For example, more developed areas with weak electric grids can experience brownouts that slow down operations and time spent charging equipment must not compromise operational schedules.

// TECHNOLOGIES

What are the electrification options for high-capacity applications?

Equipment powered by hydrogen fuel cells, such as those from Nuvera, combine the simplicity and sustained performance of internal combustion engines with the zero harmful emissions and maintenance-friendly attributes of electric technologies. An added benefit is the speed with which they can be refueled — as quickly as three minutes, with no downtime for battery changing and charging, and no need to remember to plug in during breaks to opportunity charge.



Lithium-ion batteries are also capable of delivering the ICE-like performance that high-intensity operations count on – a major step forward from lead-acid battery technology. This capability is possible because lithium-ion batteries can tolerate a high energy draw without overheating or dropping in efficiency. Lithium-ion technology also provides far greater energy density, power transfer and service life than lead-acid batteries.

Lithium-ion batteries are powering lift trucks of increasingly high capacity. For example, Hyster introduced a 15,500- to 19,000-pound capacity lift truck with factory integrated lithium-ion power in 2020, and expanded integrated lithium-ion power to even heavier duty applications, with 23,000- to 36,000-pound capacity models in 2021.

Now, electrification is taking on even higher-capacity equipment, with hydrogen fuel cell and lithium-ion battery powered solutions in development for container handlers and ReachStackers used in port settings:



Large lithium-ion battery offering choice between conventional and opportunity charging, designed for a medium-duty cycle



Hydrogen fuel cell working in combination with lithium-ion battery, offering a choice between conventional and opportunity charging, and standing up to a heavy-duty cycle – enabling operators to work a full day without refilling



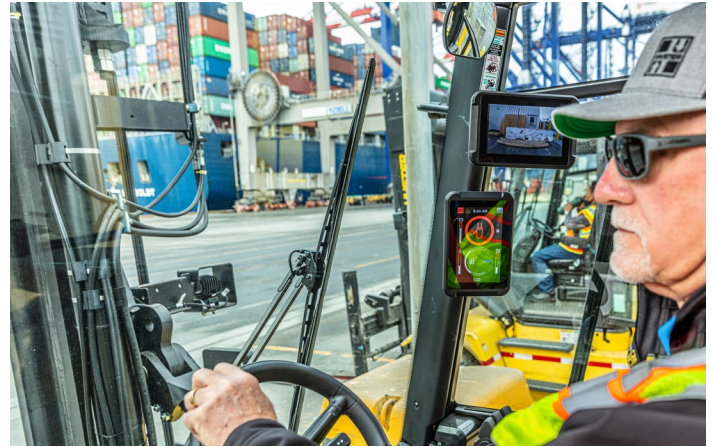
// WHAT DOES ELECTRIC MEAN FOR ERGONOMICS?

Of course, emissions reduction and strong, sustained performance are not the only benefits for intense applications exploring electrification.

Many operations are struggling to recruit, train and retain sufficient labor. In fact, according to the [MHI Annual Industry Report](#), respondents continue to identify hiring and retaining talent as their greatest challenge, with a majority rating it as extremely or very challenging. And with demanding duty cycles and inhospitable environments pushing both equipment and operators to their limits, businesses need to find equipment tough enough to depend on, with the ergonomics to help operators perform at their best. Ergonomic, electric equipment can be part of the answer to maximizing the efficiency and productivity of operators and their time.

Reduced charging or refueling time, fewer maintenance requirements and easier serviceability can all add up to operators spending more time working and less time waiting. The reduced maintenance workload associated with electric trucks can also be an important aid for businesses struggling to source technicians from a tight skilled labor pool.

Electric trucks can also support a work environment that can offer greater operator comfort and performance. With no internal combustion engine running, truck noise levels and vibration are reduced, and there are no tailpipe emissions. The smaller, lighter form factor of a lithium-ion battery pack can also enable strategic design decisions that provide more space in the operator compartment for greater comfort and convenience.



In addition to unique design possibilities, ergonomic fundamentals like visibility and operating position remain primary factors for electric lift trucks. Whether electric or ICE-powered, features like these indicate equipment designed to help support operator comfort and efficiency:

- **Visibility** – Scratch-resistant glass all around cabin, including an armored glass top window, curved front and rear windows and steel doors with tempered glass for visibility without straining
- **Easy entry and exit** – Spacious, cockpit-style cabins with ample space for operators to enter and exit easily and more comfortably
- **Comfortable, adjustable seats** – A variety of seat configurations, such as mechanical or air suspension, cloth or vinyl covers, lumbar support and ventilated or heated seats, allow operators to choose their positioning based on their preference and comfort. As a bonus, lateral seat sliders allow for easy positioning and even make room to accommodate an extra seat for trainers to supervise performance
- **Access to information** – Full color displays present truck performance data in one clear screen and can be customized based on the operator's skill level



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// CHARTING AN ELECTRIC FUTURE

As government regulations and corporate initiatives are looking to reduce emissions, electrification is emerging as a realistic option to satisfy the business requirements for heavy-duty applications. And beyond supporting green initiatives, electric equipment can help address other operational needs, including labor utilization and efficiency.

So, what does the future hold for electrification? According to data from the Industrial Truck Association, electrification is on the rise, with shipments of electric rider trucks outpacing those of their ICE counterparts for the first time in 2019.

To learn more about the operational advantages of electric power for your heavy duty application, contact Hyster at (800) 497-8371 or bigtrucks@hyster.com.

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