



ADOPTING HYDROGEN FUEL CELL-POWERED LIFT TRUCKS MAKES FINANCIAL AND OPERATIONAL SENSE

What if your materials handling operation could achieve higher operational productivity, eliminate cumbersome battery charging infrastructure and deliver consistently high performance? It may be possible with lift trucks powered by hydrogen fuel cells.

There are four major benefits to adopting hydrogen-fueled lift trucks:

// INCREASED UPTIME

Currently, most electric lift trucks use lead-acid batteries. Once the battery charge expires, the battery must be removed and taken to a charging room, and a freshly charged battery must be installed. This equates to 20 minutes of lost productivity every four to eight hours.

Hydrogen fuel cells can be rapidly refueled in as quickly as three minutes—similar to an internal combustion powered lift truck. In multi-shift operations with two or more battery replacements per day, the quick-refueling fuel cells save time and increase operator efficiency. Furthermore, since lift truck operators can refuel hydrogen themselves, operations can keep business moving and make more efficient use of labor resources.

// SMALLER FOOTPRINT

Hydrogen equipment consists of an indoor hydrogen fuel dispenser and indoor or outdoor hydrogen storage in the form of a trailer delivered by a hydrogen provider or an on-site hydrogen generator. This eliminates the significant floor space required for battery charging and storage. The existing space can be used for more productive purposes to further grow throughput capacity and productivity. This is especially beneficial for operations located close to urban centers with higher real-estate costs, helping them to avoid investing in an expansion or a larger facility.

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// CONSTANT POWER

Hydrogen fuel cells deliver constant voltage until fuel tanks are fully depleted. This means that in normal operating conditions, fuel cell-powered lift trucks experience no performance degradation during the shift, running at full speed and reducing wear on truck motor controllers. Compared to lead-acid battery-powered lift trucks that suffer performance degradation over the last half of the battery charge, hydrogen fuel cells offer sustained performance and improved component longevity.

// LOWER EMISSIONS, LIGHTER IMPACT

With only water vapor and heat as byproducts, hydrogen fuel cells produce zero harmful emissions. On average, companies that use hydrogen fuel cell-powered lift trucks can expect a 33 percent average reduction in greenhouse gas emissions compared to lead-acid battery systems charged from the electrical grid – a critical reduction for companies that prioritize green initiatives and strive to reduce their carbon footprint.

The disposal of batteries affords further financial and environmental advantages for hydrogen fuel cell-powered systems. Lead-acid batteries typically require replacement every three to five years, accumulating replacement costs and burdening operations with the disposal of depleted units. However, on average, fuel cells only need replacement approximately every ten years, resulting in a lower life cycle cost, reduced disruption to operations and minimal environmental impact.

// OPERATIONS BEST SUITED FOR FUEL CELLS

A variety of factors make an application well suited for hydrogen fuel cell lift trucks. Some of the best opportunities include:

- Multi-shift operations that want to reduce battery replacement downtime and increase efficiency
- Growing operations that need additional indoor space to increase capacity
- Operations that need to meet emission limits and reduce their carbon footprint
- Confined settings in which air quality is an important consideration to protect employee health

Lift trucks powered by hydrogen fuel cells are effective materials handling solutions to address evolving industry trends in distribution and fulfillment. The financial and operational benefits can be a real game changer.

ABOUT HYDROGEN FUEL CELLS

A fuel cell is an energy conversion device used to capture and use the power of hydrogen. It produces electricity from hydrogen and oxygen, with water vapor and heat as the only byproducts. Since these byproducts don't produce any emissions or pollutants, hydrogen fuel cells serve as an ideal choice for warehouse, manufacturing, retail and food applications. A steady, cost-effective supply of hydrogen is critical to the success of any hydrogen dependent operation and is an important requirement for any decision maker considering the implementation of hydrogen fuel cell-powered lift trucks. Hydrogen delivery and on-site hydrogen production are two of the major methods used in today's market.