THE ADOPTION OF HYDROGEN FUEL CELL-POWERED LIFT TRUCKS

Maturing technology makes financial and operational sense
ABSTRACT

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.

Large, successful organizations are integrating fuel cell technology into their lift truck fleets, looking to benefit from the lower operational costs, reduced emissions and improved reliability. Now, major lift truck brands are bringing fuel cell technology in-house, with ultimate plans to offer hydrogen lift truck solutions with factory warranty coverage.

This white paper examines the adoption of hydrogen fuel cell-powered lift trucks, the availability of hydrogen and best-suited applications for this impressive technology.
IT STARTS WITH THE BASICS

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.

BUILDING THE BUSINESS CASE: THE MAJOR BENEFITS

What can operations expect with a fleet of hydrogen fuel cell lift trucks? Four major benefits drive the case for adoption.

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 quick 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 of hydrogen fuel cells saves time and increases operator efficiency. Furthermore, since lift truck operators can refuel hydrogen themselves, operations can keep business moving and make more efficient use of labor resources.

SMALL FOOTPRINT
On-site hydrogen generation and fueling equipment consists of a compact hydrogen generator and auxiliary equipment located outside of the building, eliminating the significant indoor space required for battery charging and storage rooms. This enables more efficient use of existing space, while growing 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 a larger facility.
OPERATIONS BEST SUITED FOR ADOPTION

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 want to reduce their carbon footprint
• Confined settings in which air quality is an important consideration to protect employee health

CONSTANT POWER

Hydrogen fuel cells deliver constant voltage until fuel tanks are 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 emissions. On average, companies that generate hydrogen on-site 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 four years, accumulating replacement costs and burdening operations with the disposal of depleted units. However, fuel cells only need replacement every ten years, resulting in a lower life cycle cost, reduced disruption to operations and minimal environmental impact.
ADAPT TO EVOLVING TRENDS

Lift trucks powered by hydrogen fuel cells are an effective materials handling solution to address evolving industry trends in distribution and fulfillment, with several developments paving the way for greater commercial adoption.

MAKING OPERATIONAL, ENVIRONMENTAL AND BUSINESS SENSE

In general, deploying hydrogen fuel cells can offer a clean, safe workplace and may provide productivity and financial advantages over other electric lift truck options. Fuel cell-powered lift trucks offer a realistic, long-term solution that addresses the challenges facing material handling operations to reduce total cost of operation and increase efficiency.

More consolidation among lift truck customers means bigger fleets with increased opportunity for hydrogen fuel cell adoption

Compliant with state and national regulations

More providers and greater competition along entire fuel cell supply chain

Cost-effective hydrogen sources

More than 16,000 hydrogen fuel cell lift trucks are currently used in North America