

Benefits of Fuel Cell Solutions for Material Handling

Fuel cell powered forklifts, having demonstrated a wide range of tangible economic, operational and environmental benefits, are at the heart of fuel cell solutions for the material handling market, and are the smart choice for distribution warehouse operations looking for productivity improvements and costs reductions.

SITUATION

In the material handling industry, productivity is a vital driver of profitability - every efficiency gain positively impacts the bottom line. Efficient operation of a forklift fleet is a significant factor in determining overall warehouse productivity. Traditionally, lead-acid batteries have been the best choice for forklifts operated indoors where emissions are restricted for health and safety reasons. However, battery-powered forklifts also have some serious drawbacks including:

- Vehicle and operator downtime for battery changes during shift
- Valuable warehouse floor space used for battery storage and recharging
- Decreased power as the battery discharges

These drawbacks reduce productivity of the distribution center, thereby increasing cost.



Ballard's FCvelocity® - 9SSL fuel cell product

SOLUTION

A fuel cell solution powered by Ballard improves productivity with:

A. Increased Uptime

Fuel cell power units eliminate the need for batteries and their associated care (changing, charging and maintaining). Additionally, fuel cells run longer than batteries and continue to run at constant power, as long as they have fuel.

B. Consistent Power

Fuel cell power solutions maintain constant full power output, ensuring forklifts operate at full speed and power at all times, increasing productivity while decreasing engine fatigue. In comparison, forklifts powered by batteries can lose 15% to 20% of their productivity due to "battery droop". This means the battery delivers declining voltage to the forklift over a shift, resulting in sluggish operation and decreasing productivity, translating to a more physically demanding job for forklift operators.

C. Fast Fueling

Fuel cell solutions allow forklift operators to fuel their trucks in one to three minutes and return to the warehouse floor more quickly than with batteries.

D. More Productive Warehouse Floor Space

Fuel cell solutions eliminate the need for onsite battery storage, freeing up valuable real estate for more profitable warehousing and commercial opportunities.

E. Zero Emissions

Fuel cell power units are clean and efficient, producing zero emissions, while eliminating the need to handle, store and dispose of lead and acid. They offer the performance of an internal combustion engine fuelled with propane, but can be operated indoors without noise or engine emissions.

"Ballard and Plug Power's technology has been integrated, tested and improved over the lifetime of the GenDrive product to become the world's most reliable fuel cell power solution for the material handling industry."

Andy Marsh
President and CEO, Plug Power
(July 2010)

BALLARD'S FUEL CELL PRODUCTS

Ballard's fuel cell products are at the heart of complete fuel cell solutions for forklifts. Our dedicated applications engineering team supports lead customers by providing system knowledge and component sourcing information to assist with prototype development.

FCvelocity® - 9SSL

Ballard's FCvelocity-9 SSL fuel cell product is designed to meet the demanding requirements of the material handling end-user. A derivative of our work in automotive fuel cell technology, the **FCvelocity-9SSL** offers excellent reliability and impressive power density, with a demonstrated lifetime of over 10,000 hours.

FCvelocity® - 1020ACS

Featuring dynamic response, robust and reliable operation, durable packaging and a simplified, air-cooled design, the **FCvelocity-1020ACS** is suitable for low power applications or hybrid system designs.

BENEFITS

Fuel cells powered by hydrogen have already demonstrated a wide range of tangible environmental, economic and operational benefits for distribution warehouse operators.

Economic Benefits

The operating cost of powering and maintaining a forklift fleet accounts for over 80% of the lifecycle cost. With fuel cell solutions, a typical high throughput warehouse can expect up to 24% savings in total lifetime ownership costs, resulting in a payback of less than 1 year with over 50,000 hours of productivity recovered per year.

Operating Benefits

In addition to increased productivity, fuel cells provide optimal performance under a wider range of conditions, from sub-zero temperatures to extreme heat, where battery performance rapidly drops.

Zero particulate emissions and low noise output offer improved environments for operators.

Environmental Benefits

'Going Green' is an important corporate responsibility. In many regions, hydrogen-powered fuel cell forklifts reduce greenhouse gas emissions over battery-powered forklifts. For example, in comparison to using electricity from a dirty grid, using hydrogen extracted from waste streams, fuel cell solutions can achieve a 95% reduction in carbon emissions. Using hydrogen created from catalytic processing of natural gas results in a 27% reduction of carbon emissions. Fuel cells also eliminate the need to handle, store and dispose of lead and acid.



MATERIAL HANDLING EQUIPMENT DEPLOYMENTS

Field-tested and proven at distribution centers across North America, the key benefits of fuel cell powered forklifts have been realized by national retailers, including:

- Wal-Mart Canada
- BMW Manufacturing Co., LLC
- Coca Cola
- Central Grocers, Inc.
- FedEx Freight
- GENCO Kimberly-Clark
- Sysco Houston and Front Royal
- Wegmans
- Whole Foods Market
- United Natural Foods Inc.

FUEL SUPPLY



In anticipation of market growth, a number of major industrial gas suppliers have developed flexible options to provide support for programs ranging from small field trials to large-scale deployment. These solutions are specifically tailored for material handling applications complete with hydrogen supply, storage and dispensing. In areas where availability or delivery of industrial hydrogen is limited, on-site generation using natural gas reforming or electrolysis provides a viable alternative solution for end-users.

ABOUT BALLARD



Ballard Power Systems, Inc. is recognized as a world leader in the design, development, manufacture and sale of clean energy fuel cell products. Our **FCgen** family of stationary power products and **FCvelocity** family of motive power products offer important business benefits not available from traditional power sources.

Learn how to put fuel cells to work, contact us:

marketing@ballard.com or call
(+1) 604.454.0900.

Ballard Power Systems, Inc.

9000 Glenlyon Parkway
Burnaby, British Columbia
Canada V5J 5J8

TEL: (+1) 604.454.0900
FAX: (+1) 604.412.4700

www.ballard.com

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