

Material Handling Case Studies

In addition to being environmentally friendly, fuel cells deliver increasing productivity in material handling operations. The economic - and other - benefits of fuel cell products have compelled manufacturers, wholesalers and retailers alike to commercially deploy them. Here are just a few case studies....

CENTRAL GROCERS, INC.

One of the top retailer-owned wholesalers in the U.S. wants to ensure maximum productivity in its newly planned 920,000 sq. ft. Joliet, Illinois distribution center. So, in 2008 Central Grocers placed a commercial order with Plug Power for 231 GenDrive® fuel cell-powered forklift units – these are the company's entire lift truck fleet at its Joliet distribution center.

IMPACTS OF FUEL CELL FORKLIFTS AT GREENFIELD DISTRIBUTION CENTER:

- \$0 invested in a battery charging and changing infrastructure
- Increase in valuable floor space available, compared to a battery approach
- Reduced operational costs
- Reduced carbon footprint
- Elimination of need to store and handle toxic lead-acid batteries

Ballard's FCvelocity™ – 9SSL fuel cell stack



BRIDGESTONE GROUP

Bridgestone Group, the world's largest manufacturer of tires and rubber products, is focused on achieving productivity improvements through industry-leading practices, while also demonstrating environmental stewardship.

Since 2008, the Graniteville, South Carolina and the Morrison, Tennessee Bridgestone-Firestone tire manufacturing plants have been utilizing Plug Power GenDrive® fuel cell powered units. Each facility is currently operating 25 and 48 units respectively. This decision expands on Bridgestone-Firestone's success using hydrogen fuel cells to run industrial vehicles at other facilities.

"The fuel cells... last longer than batteries, take less time to change or refuel and only emit water vapor. This is certainly a step in the right direction as we work continually to minimize our impact on our environment."

Mike Rose
Aiken County Plant Manager,
Bridgestone Firestone
North American Tire

IMPACTS OF FUEL CELL FORKLIFTS AT MANUFACTURING PLANT:

- Run 2-3x longer than battery units – and take 75% less time to refuel
- Positive financial ROI
- Eliminates hazards associated with changing heavy batteries
- Ballard stacks have achieved over 10,000 hours of operation since



BALLARD'S MATERIAL HANDLING FUEL CELL PRODUCT

Ballard's FCvelocity-9SSL fuel cell product is a 3.8-to-21kW power source, available for integration into all classes of lift truck. This fuel cell product is used exclusively by Plug Power (www.plugpower.com) in its GenDrive® fuel cell battery-replacement product. GenDrive® is featured in all case studies described in this document.

INDEPENDENT MARKET RESEARCH

In a report commissioned by the U.S. Department of Energy, non-profit research and development corporation **Battelle Memorial Institute** drew these conclusions about fuel cells in the material handling market:

"Unique benefits of PEM fuel cell-powered forklifts make them attractive for innovators. Specifically, they can be rapidly refueled, eliminating the time and cost of replacing batteries. The voltage delivered... is constant as long as hydrogen fuel is available... (They) have zero emissions with only water and heat as wastes... (They) eliminate trips to the battery changing station, thus decreasing unproductive time; lower energy costs by eliminating chargers; reduce vehicle repairs due to their fewer moving parts; and eliminate the battery storage and changing rooms."

WALMART

The world's largest retailer is integrating innovative technologies into its business, in order to reduce operating costs and promote environmental sustainability. Successful trials of fuel cell-powered forklift technology were conducted in late-2006 and 2008 at two Walmart distribution centers. Then in 2010 Walmart ordered a fleet of 70 Class 1 and 2 Plug Power GenDrive® fuel cell-powered forklift trucks for commercial service at its greenfield refrigeration distribution center near Calgary, Alberta.

"We've seen how fuel cells can improve efficiency in our distribution centers while enabling us to be more responsible global citizens."

Johnnie Dobbş EVP – Logistics and Supply Chain, Wal-Mart Stores

IMPACTS OF FUEL CELL FORKLIFTS AT DISTRIBUTION CENTERS:

- Reduction of operating costs by \$269,000 per year
- Reduction of greenhouse gas emissions by up to 72%



BMW

BMW Manufacturing Co., LLC deployed 86 Plug Power GenDrive® Class 1, 2 and 3 fuel cell units at its newly constructed Greer, South Carolina automotive manufacturing plant. Zero-emission fuel cell powered units competed against lead-acid batteries and fast charge batteries to be deemed the best power source for BMW's material handling fleet.

"BMW is pleased to work with partners that share our commitment to clean production. The implementation of a hydrogen fuel cell based application for our material handling equipment helps solidify BMW's position as the leading, sustainable automotive manufacturer."

Robert Hitt, Department Manager of Public Affairs, BMW Manufacturing

IMPACTS OF FUEL CELL FORKLIFTS AT THE MANUFACTURING PLANT:

- Avoidance of 1.8 million kilowatt-hours per year of electricity consumption that would have been used to charge a battery-powered fleet
- Avoidance of approximately 1200 tonnes per year of CO₂ emissions



ABOVE: BMW employee pumps hydrogen into the forklift's fuel cell power pack.

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:

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