

Cellex powered twelve class 3 electric pallet trucks with its fuel cell power units at two Ohio based Wal-Mart distribution centers for four months to demonstrate the commercial viability of hydrogen fuel cells. This project was funded by the Ohio Department of Development's Third Frontier Fuel Cell Program, which provides grants to support the growth of Ohio's fuel cell industry through collaborations between research organizations, businesses and higher education institutions. Here are the results.

The Objective

The objective of the project was to demonstrate to potential customers operating large fleets of lift trucks that Cellex fuel cell products provide superior performance as well as health and safety benefits compared to the incumbent lead acid battery technology.

The Players

A consortium of companies active in Ohio was formed to assist Cellex in providing the full product solution required by customers. Fuel cell compatible pallet trucks were supplied by Crown Equipment Corporation (headquartered in New Bremen, Ohio); safe indoor supply of hydrogen by BOC/Linde; fuel cell stacks from Ballard Power; and product support provided by OKI Systems (headquartered in Cincinnati, Ohio).

The Benefits

Cellex believes electric lift trucks are one of the first commercially viable applications for hydrogen fuel cells and will precede the use of fuel cells in other markets. The limitations of industrial lead acid batteries used to power the lift trucks are a major cause of operational inefficiencies. The typical discharge time for a lead acid battery used in electric lift trucks is between 4 to 8 hours. Recharging plus battery cooling take an additional 8 to 16 hours. To support this, distribution centers (DCs) require battery changing and maintenance equipment, high voltage electrical infrastructure and premium warehouse space. To maintain the power required for multiple shift operations, operators need to continually swap and replace batteries, then recharge and cool depleted batteries. Accordingly, fleet owners purchase and maintain 2 to 3 batteries and dedicated charger per lift truck. Battery removal, handling and disposal of lead and acid on a daily basis create workplace health, safety and environmental issues. High throughput DCs have fleets of between 100 and 250 lift trucks at each location and provide the platform for high volume business opportunities.

Cellex fuel cell power solutions (as shown in the photo) run longer than batteries, they eliminate battery changing, can be fueled within 2-minutes and run at full power all day ([see full benefit details](#)).



The Results

The four-month beta trials were successfully completed on November 3, 2006. Twelve Cellex CX-P150 fuel cell power units were operating at two Wal-Mart DCs (six at each DC) and were fuelled using the

BOC/Linde indoor hydrogen fuel stations during the trials. The units logged over 18,500 hours of operation that included 2,100 indoor fueling events performed by the lift truck operators. Fueling took less than 2-minutes to complete. Over 100 Wal-Mart and OKI personnel were trained to provide service and back-up support. Data was collected to evaluate the cost/benefits, assess product safety, reliability and performance of the fuel cell power units and the associated hydrogen fueling system.

During the trials there were no safety incidences, personnel related injuries, damage to property or the environment. All aspects of the project were completed on time and the total project was within 5% of the budgeted amount.

The Ohio Lieutenant Governor and other delegates from Ohio Department of Development (ODOD) visited Wal-Mart's Grove City DC in September 2006 and witnessed the first ever full scale comprehensive demonstration of working fuel cell power units utilizing an indoor hydrogen fueling system for electric lift truck fleets ([see full story](#)).



Lt. Governor Bruce Johnson speaks at the Wal-Mart Grove City Distribution Center

Projected Long Term Economic Impacts in Ohio

- Establish Ohio's hydrogen and fuel cell cluster of companies into a leadership positions.
- Attract significant investment in on-site hydrogen production facilities in Ohio.
- Become a hub for fuel cell and hydrogen service and support skills.
- Leverage product development efforts via Ohio based Original Equipment Manufacturers (OEM).
- Potential to leverage Ohio manufacturing and supply chain strengths via establishment of manufacturing and/or assembly operations.
- Additional spin-off support opportunities such as educational institutions.
- New job opportunities.
- Product and service revenues generating taxable income.

About Cellex Power

Cellex has been focused on the development of fuel cell based power products since 1998 and is targeting electric lift trucks. Cellex has conducted extensive field trials and as a result, believes the replacement of lead acid batteries and internal combustion engine (ICE) drive systems with its fuel cell based power systems is an excellent opportunity for the early adoption of fuel cell technology. Cellex estimates the global annual potential for fuel cells to power electric lift trucks is over \$6 billion. To date, Cellex has performed almost 2,000 truck days of customer field trials and most recently successfully completed a 4-month beta program at two Wal-Mart DCs in Ohio.



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