



Improving Productivity and Reducing Operating Costs with Fuel Cell Technology

*A White Paper by Tom Hoying,
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“What can be done to keep my lift trucks on the floor and prevent us from changing batteries?”

This question has been on the minds of multiple-shift fleet users who manage high throughput distribution centers all over the world.

Competitive pressures on distribution costs have never been more intense, promising to continue into the future. In response, companies are daily seeking to push throughput while paring back operating costs.

Management has long regarded lead acid battery systems as one of the most effective ways to meet this challenge. Though this power source is a mature and dependable method of powering electric lift truck fleets, it has many constraints that prevent it from being the ultimate economic solution.

Battery and Charger Systems

In high throughput distribution, each lift truck requires 2 to 3 batteries as they discharge and depending on the duty cycle, need to be changed every 4 to 8 hours. These batteries weigh between 1,000 and 3,000 pounds and require specialized handling and changing equipment to safely perform battery changes.

○ Battery System Management

Large distribution centers run fleets of 150 to 200 lift trucks which require the storage of 150 to 200 extra batteries and chargers. To effectively manage this system the following is required:

- Storage racking for 150 to 200 batteries and chargers.
- Transfer equipment from the storage racks to battery changing positions.
- Transfer cart to perform battery exchange.
- Eye wash safety system.
- Floor drainage system for battery acid containment.
- Proper ventilation for hydrogen dispersion caused during the battery charging process.
- Tools and equipment for watering and maintaining batteries.
- Sign-off sheets for the drivers and maintenance crew.
- Information systems identifying which batteries have been stored, charged, cooled and watered and ready to be put back into service.
- Battery birth certificate for tracking battery life and retirement.

The larger the system, the more cumbersome and challenging it is to manage effectively. Add operator and supervisory personnel turnover, and costs magnify subtly without management's awareness. This scenario leads to reduced battery life, increasing lift truck maintenance and overall decreases in lift truck utilization. The many inherent problems in battery systems often evolve into a dysfunctional and difficult problem to effectively manage.

- **Lost Labour of the Operator and Maintenance Personnel**

Every stop a lift truck operator makes for a battery change means 20 to 30 minutes of lost labour.

- **Space Utilization**

Battery systems require considerable storage and handling space. This area could be more effectively turned over to revenue producing product storage or additional floor space.

- **Management/Supervision**

Given the quantity of constraints demanded by battery and charger systems, a battery management system is essential for reining in operating costs and maximizing battery lifetimes. Couple these issues with staff turnover and you have a never-ending challenge to warehouse management. The need to train new operators on battery changeover procedures and other issues makes this one of the most costly components of operating a lift truck fleet.

- **Inefficiency**

Operator efficiency can suffer from the lift truck's inability to meet performance specifications. This happens with declining battery voltages and/or properly charged batteries being unavailable when needed by the lift truck.

Fuel Cells Product Solutions

- **Fuel Cells Offer the Optimum Solution**

Fuel cells have the best features of lead acid batteries and internal combustion engines (ICE). Like batteries, fuel cells deliver energy to the lift truck and produce zero harmful emissions. Moreover fuel cells fit into the same compartment space as the battery. Fuel cells also act like an ICE as they continually deliver power to the lift truck – so long as the cell has fuel. The fuel cell is like a having “an engine in a battery box.”

- **Full Power – All Day**

Fuel cells also provide lift trucks with consistent voltage at all times. Batteries degrade during the second half of the discharge, and deliver lower voltages than when freshly charged. At lower voltages, lift trucks become unable to meet travel and lift speed specifications, increasing operator fatigue and lift truck motor maintenance. Battery degradation becomes a greater problem as the battery ages, making it unable to deliver full power capacity.

- **Improved Productivity**

Fuel is the only constraint in providing continuous power to fuel cell powered lift trucks. So long as the fuel cell has fuel, productivity increases as lift trucks remain working on the floor. Power is always available when needed, compared to ensuring enough batteries and chargers are sufficiently charged and cooled to handle the upward spikes in the distribution center's throughput. This new form of power eliminates the hassle of properly charging, cooling, maintaining and managing a battery and charger system.

- **Refuel in 60 seconds**

Refueling totals just 6 to 7 minutes of off-floor time (including travel time) versus 25 to 30 minutes for a battery change. Fuel cell run time can outlast batteries by one and a half to two times before requiring a refuel. Refueling takes just 60 seconds and offers opportunity refueling benefits.

- **Eliminate the Battery Room**

Fuel cell products eliminate battery handling and storage equipment freeing up floor space and creating opportunities to increase valuable cubic volume for revenue producing product storage.

- **Higher Energy Density**

Fuel cells have higher energy densities than lead acid batteries and operate more efficiently than ICE. For these reasons the future of fuel cell products presents a host of exciting and worthwhile economic, operator and management benefits.

These problems escalate in larger facilities. Larger fleets with higher throughput require more batteries and chargers resulting in more battery changes and management. When it comes to running lift trucks, the benefits of fuel cell technology give customers economic value with fast payback.

Fuel Cell Technology for Powering Industrial Vehicles Provides:

- Economic benefits by improving productivity, vehicle utilization and reducing operating costs.
- Deliver consistent power to the lift trucks at all times.
- Products that are more productive and provide higher utilization.
- Continuous operation due to quick refueling process.
- Battery room is eliminated.
- Clean, safe to handle, produce zero emissions and environmentally friendly.

So the question -

“What can be done to keep my lift trucks on the floor and prevent us from changing batteries?”

... will soon be answered by Cellex and its fuel cell based products.

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About Tom Hoying

Tom Hoying, MBA – Vice President, Sales and Marketing. Tom Hoying joined Cellex as Vice President of Sales and Marketing in November 2000 and is responsible for the development and implementation of sales, marketing and distribution strategies. Prior to joining Cellex, Mr. Hoying held various positions from 1976-2000 with Crown Equipment Corporation, a company specializing in the manufacturing and distribution of electric lift trucks. His most recent position with Crown was Vice President of Sales and Marketing, a position he held from 1995-2000 and was an officer of the company. Mr. Hoying has undergraduate and graduate business degrees from the University of Dayton, Ohio.