
XI.9 Fuel Cell-Powered Lift Truck FedEx Freight Fleet Deployment

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Subcontractors:

- Plug Power Inc., Latham, NY
- Air Products and Chemicals, Inc., Allentown, PA

Project Start Date: October 1, 2009
Project End Date: September 30, 2013

- Permits for indoor dispensing.
 - There was an issue with the permitting of the dispensers because the city of Springfield went by a different set of codes for putting in hydrogen than what Air Products was use to and these codes did not match up in all areas. An example of this was that it was required from the city that the indoor dispensers required labeling that it was rated for dispensing indoors. This was new to Air Products so they had to go back to the dispensers' manufacturers and have the dispensers tested by a 3rd party and labeled that they were rated for indoor dispensing.
- Introducing hydrogen into the everyday world of FedEx Freight.
 - Working with hydrogen is very new to FedEx Freight. This created some challenges on how to address uninformed and inaccurate perceptions regarding hydrogen safety risks, to having to know how to work with new equipment, to how to do accounting for the project. Despite these challenges FedEx Freight has work to learn more about fuel cells and how they work to overcome these challenges.

Objectives

- Safe and reliable operations of hydrogen material handling equipment (MHE).
- Convert an entire MHE fleet at FedEx Springfield, MO facility with fuel cell-powered forklifts (class-1).
- Demonstrate economic benefits of conversion.
- Provide cost effective and reliable hydrogen.
- Spur further lift truck fleet conversions.
- Establish proving ground for hydrogen MHE.

Technical Barriers

- Interim forklifts at new facility until fuel cells come on-line.
 - Because it was not possible to have the fuel cells operational at the time the new center opened, propane forklifts were used until the fuel cells could come online. The forklifts were pulled from other centers that at the time were not being used. However freight levels are beginning to rise and there is a need for the forklifts to be moved back to their original center. That is why it was imperative to get the fuel cell up and running.

American Recovery and Reinvestment Act

The purchase of these fuel cells from Plug Power resulted in approximately five jobs created at Plug Power to build the fuel cells. In addition, the success of this project could contribute to accelerating commercialization and deployment of fuel cells and hydrogen technologies, with an accompanying increase in jobs for fuel cell manufactures, hydrogen providers, and associated maintenance and support services.

Accomplishments

- Plug Power built and delivered 35 GenDrive class-1 power units two months ahead of schedule.
- Air Products installed the liquid hydrogen handling and gaseous compression, storage and dispensing equipment.
- This includes all interconnecting piping, civil, electrical and mechanical connections, and safety systems:
 - Two indoor dispensers
 - 6,000 US gallon liquid hydrogen horizontal tank
 - Refuel time 3-6 minutes
 - ~91 kg/day usage



Introduction

This project addresses the DOE's priorities related to acquiring data from real-world fuel cell operation, eliminating non-technical barriers, and increasing opportunities for market expansion of hydrogen fuel cell technologies.

Approach

The project involves replacing the batteries in a complete fleet of class-1 electric lift trucks at FedEx Freight's Springfield, MO service center with 35 Plug Power GenDrive fuel cell power units. Fuel for the power units involves on-site hydrogen handling and dispensing equipment and liquid hydrogen delivery by Air Products.

The project builds on FedEx Freight's previous field trial experience with a handful of Plug Power's GenDrive power units. Those trials demonstrated productivity gains and improved performance compared to battery-powered lift trucks. Full lift truck conversion at our Springfield location allows improved competitiveness of operations and helps the environment by reducing greenhouse gas emissions and toxic battery material use. Success at this service center may lead to further fleet conversions at some of the other larger FedEx Freight service centers and possible conversion of other fleets in the Less-than-Truckload market.

Results

Milestones	Progress	% Complete
Fueling Station Installation	Air Products' completed construction and installation of the fueling equipment. FedEx to finish system integration.	100%
Hydrogen Safety Plan	Working with Air Products and Plug Power to complete the hydrogen safety plan.	90%
► Go/No Go	Fueling station tested and operational.	100%
GenDrive Power Unit Build	Plug Power completed build of 35 class-1 units in December 2009.	100%
Start-up and Training	Start-up and training completed.	100%
Lift Truck Operation and Evaluation	Operation and evaluation will begin after commissioning.	1%

Conclusions and Future Directions

FedEx Freight's project is well under way. The GenDrive units have been delivered, hydrogen infrastructure is completed and approved and is in use. Now that the units and infrastructure are in use the remainder of the project will require regular monitoring and evaluation. This includes:

- Data collection from the power units and evaluation of performance, operability and safety.
- Data collection from the liquid and gaseous hydrogen fueling equipment and evaluation of performance, operability and safety.

FY 2010 Publications/Presentations

1. 2010 DOE Hydrogen Program Annual Merit Review (presentation ARRAH2009), Washington, D.C. June 2010.
2. 2010 DOE Energy Empowers blog *FedEx Freight delivers on clean energy*, March 19, 2010.