

V.D.6 Praxair Hydrogen Fueling Station at LAX – Small-Footprint H₂ Capability at the Corner Filling Station

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Subcontractor: BP, Inc., Naperville, IL

Objectives

Establish and implement a small-footprint hydrogen fueling station design compatible with a retail fueling station facility

- Support a small fleet of hydrogen-fueled vehicles, with expandability
- Make the design modular and reproducible
- Station Characterization – Determine performance, maintenance, and operation costs, as well as cost of delivered product

Technical Barriers

This project addresses the following technical barrier from the Technology Validation section of the Hydrogen, Fuel Cells and Infrastructure Technologies Program Multi-Year Research, Development and Demonstration Plan:

- C. Hydrogen Refueling Infrastructure

Approach

- Design a compact, flexible hydrogen fueling station package
- Integrate H₂ compression, chilling, instrument air & inerting
- Minimize footprint within an aesthetic enclosure
- Ensure compatibility with multiple H₂ sources (electrolysis, reformer, cryogenic liquid hydrogen, partial oxidation)
- Enable fast fill for cars or slow fill for buses with flexible-speed compressor
- Generate N₂ onboard for purging/inerting

Accomplishments

- Site development & design completed
- Building permits issued
- Equipment & skid fabrication completed
- Construction started June 4, 2004

Future Directions

- Startup & commissioning – October 2004
- Commercial opening planned for November 2004
- Auxiliary equipment system (compression) adaptable for 10,000 psig fueling
- Higher level of integration between storage & compression
- Eventual integration of fueling system with Praxair small-scale steam methane reformer (SMR) H₂ generator

Introduction

The Praxair-BP hydrogen fueling station at the Los Angeles International Airport (LAX) will serve as a demonstration hydrogen fueling station for a fleet of hydrogen-powered vehicles to be placed at LAX and vicinity within the next several years. In addition to being one of the first publicly accessible hydrogen fueling stations within the South Coast Air Basin, the station's objectives include development of a small-footprint template (including rooftop hydrogen storage) that will be compatible with the needs of conventional commercial retail fueling station facilities. The initial capability of the station will be fast-fill refueling of up to three light-duty hydrogen-powered vehicles in succession, with

future expansion plans allowing for the slow (overnight) refueling of buses via a manifold on the compressor skid that will allow tube trailer hydrogen to augment the production capacity of the station's on-site electrolysis unit. Additional future goals will be to provide high-pressure hydrogen refueling at 10,000 psig for the next generation of vehicles requiring greater driving range between refueling events.

Approach

The overarching approach of the team was to design the 'back end' (e.g., compressor, storage, and dispensing portions) of the LAX hydrogen fueling station so that these elements of the design package could be easily implemented at a variety of sites,

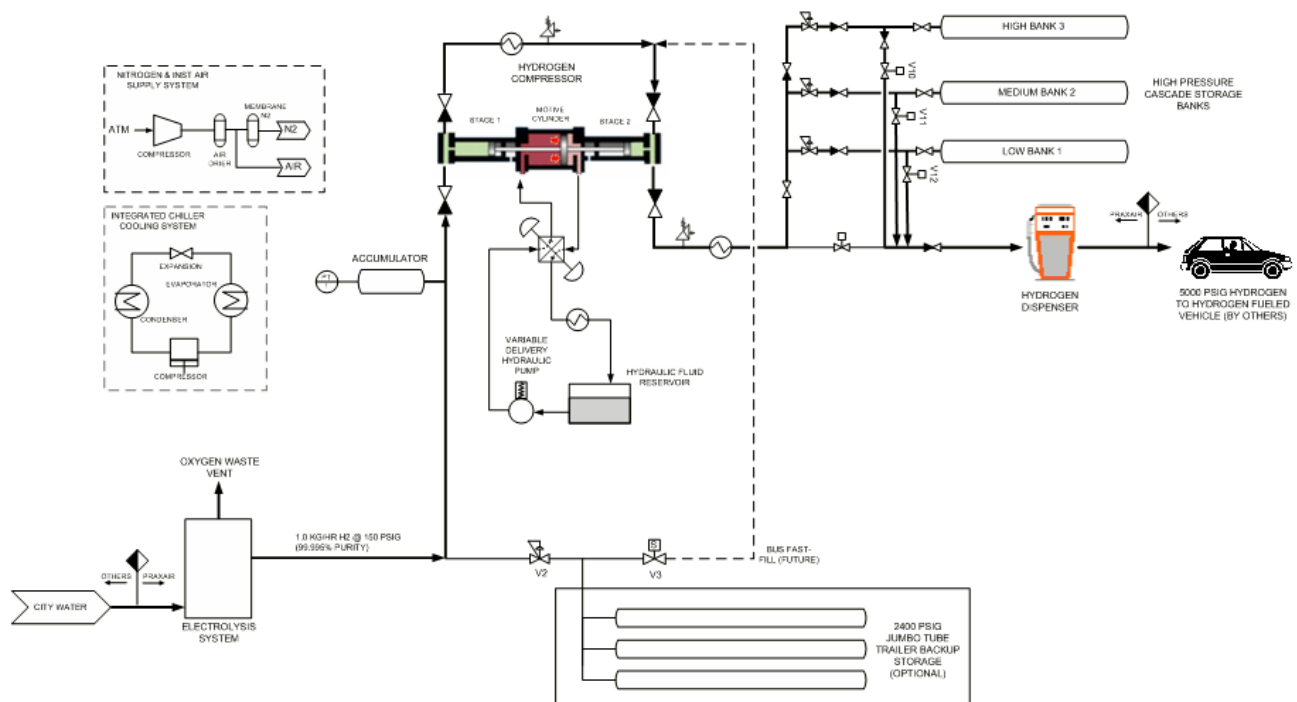


Figure 1. Block Flow Diagram

utilizing any of several hydrogen supply modes, including on-site electrolysis, tube trailer hydrogen delivery, liquid hydrogen delivery, as well as partial oxidation (POX) or SMR-based on-site reforming (Figure 1). Concurrent to this template approach for the station's back end, the overall footprint of the LAX station was designed to occupy the least amount of space at the fueling station site, thereby enhancing the prospects for adding hydrogen fueling capability to existing refueling station sites with minimal adverse economic effects (Figure 2).

Results

After overcoming substantial delays related to our lease agreement with the station's landlord (the issues causing these delays centered around liability and indemnification issues related to hydrogen refueling and vehicle operations in a real-world environment), the project has gained considerable renewed momentum as construction commenced on June 4, 2004. Integration of critical back-end components of the project, including the electrolysis unit, compressor, and rooftop hydrogen storage, will be accomplished at the site during July and August of 2004, following completion of ongoing site preparation. Another key target of the project related to station implementation includes facilitating the placement of hydrogen-powered vehicles in the station's vicinity, and this objective is progressing smoothly as well. We anticipate delivery of hydrogen-powered vehicles to the LAX fleet manager in November 2004.

Summary

- After initial construction delays related to lease issues, the project is now back on track for the November 2004 commercial opening date.

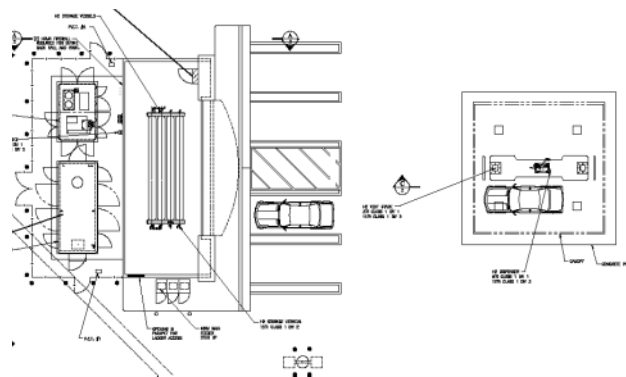


Figure 2. Station Layout

- Hydrogen vehicle contracts are close to being secured to provide hydrogen demand at site.
- Equipment and skid fabrication has been completed, and integration of all units into a small-footprint design compatible with retail fueling stations is on track for the fourth quarter of 2004.
- Modular and reproducible design will enable more rapid and cost-effective deployment of future H₂ stations.

FY 2004 Publications/Presentations

1. "LAX Hydrogen Fueling Station - Small Footprint H₂ Capability at the Corner Filling Station," presented at the DOE Hydrogen Program Review, Philadelphia, PA, 2004
2. "LAX Hydrogen Fueling Station - Small Footprint H₂ Capability at the Corner Filling Station," presented at the DOE Clean Cities Conference, Ft. Lauderdale, FL, 2004