VII.10 California State University, Los Angeles Hydrogen Refueling Facility Performance Evaluation and Optimization

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Subcontractor
Hydrogenics Corporation, Mississauga, ON, Canada

Project Start Date: October 1, 2012
Project End Date: September 30, 2016

Overall Objectives

Technical Objectives

- Test, collect data, and validate hydrogen refueling architecture deployed at CSULA and its individual components in a real-world operating environment
- Provide the performance evaluations data to the National Fuel Cell Technology Evaluation Center (NFCTEC) at the National Renewable Energy Laboratory (NREL)
- Contribute to the development of new industry standards
- Develop and implement fueling station system performance optimization

Educational Objectives

- Conduct outreach and training activities promoting the project and hydrogen and fuel cell technologies
- Provide a living-lab environment for engineering and technology students pursuing interests in hydrogen and fuel cell technologies

Fiscal Year (FY) 2014 Objectives

- Complete design and install data collection system for the station and its major components
- Start regular collection of station performance data and submission of quarterly reports to NREL

Technical Barriers

This project addresses the following technical barriers from the Fuel Cell Technologies Office Multi-Year Research, Development, and Demonstration Plan:

Hydrogen Production

(L) Operations and Maintenance

(M) Control and Safety

Technology Validation

(D) Lack of Hydrogen Refueling Infrastructure Performance and Availability Data

Contribution to Achievement of DOE Hydrogen Production and Technology Validation Milestones

This project will contribute to achievement of the following DOE milestones from the Hydrogen Production and Technology Validation sections of the Fuel Cell Technologies Office Multi-Year Research, Development, and Demonstration Plan:

Hydrogen Production

- Milestone 2.6: Verify the total capital investment for a distributed electrolysis system against the 2015 targets using H2A. (Q2, 2016)
- Milestone 2.7: Verify 2015 distributed hydrogen production levelized cost target through pilot scale testing coupled with H2A analysis to project economies of scale cost reduction. (Q3, 2017)

Technology Validation

- Milestone 3.4: Validate station compression technology provided by delivery team. (4Q, 2018)

FY 2014 Accomplishments

This is the first year of the project with its accomplishments listed in the following:

- Completed installation and calibration of data acquisition equipment
- Developed automated data collection, storage and retrieval including NREL format reports
- Started regular reporting to NREL

- Upgraded station with a buffer volume to improve high-pressure end of fill
- Hosted grand-opening of the CSULA hydrogen research and fueling facility

INTRODUCTION

The CSULA hydrogen station deploys the latest technologies with the capacity to produce and dispense 60 kg/day, sufficient to fuel 15-20 vehicles. The station utilizes a Hydrogenics electrolyzer, first and second stage compressors enabling 350- and 700-bar fueling and 60 kg of hydrogen storage. The station is grid-tied and to be supplied by 100% renewable power.

In addition to collecting data per NREL specifications, the comprehensive data collection enhances research opportunities in evaluating and optimizing performance of the hydrogen fueling facility.

APPROACH

To enable effective data collection on the station performance, the team utilizes significant number of sensors and meters installed at the station. A software package has been developed to achieve maximum automation in data collection and reporting per NREL requirements.

As data is collected and analyzed for a period of time, the station performance will be evaluated for potential optimization and other technical enhancements. The goals would be to reduce maintenance cost, reduce hydrogen costs and improve user experience.

RESULTS

As part of the project, a large number of meters and sensors were installed throughout the station, see Figure 1. They were calibrated and wired into the programmable logic controller equipment. The data is stored into a Microsoft SQL database that can be quarried for reports per time periods and per meter of interest including populating the NREL quarterly reports and other research sub-projects, see Figure 2.

CONCLUSIONS AND FUTURE DIRECTIONS

The project has achieved the goals set for its first phase to complete data acquisition and enable report generation. In addition, most of the individual equipment is power metered allowing further research into performance efficiency not only of the entire facility but also its equipment.

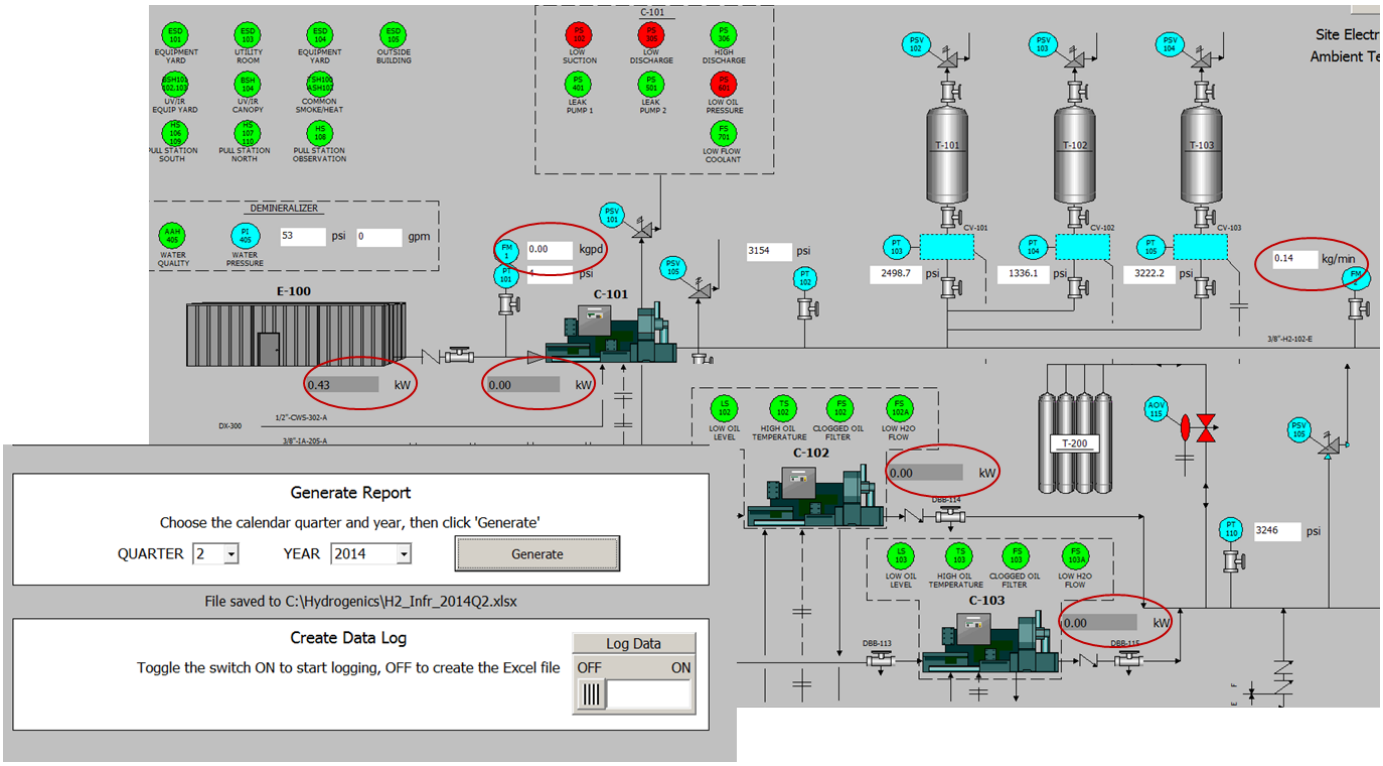

FIGURE 1. One of the Programmable Logic Controller Station Interfaces with New Meters (Circled Red) and the Screen with Report Generation Request

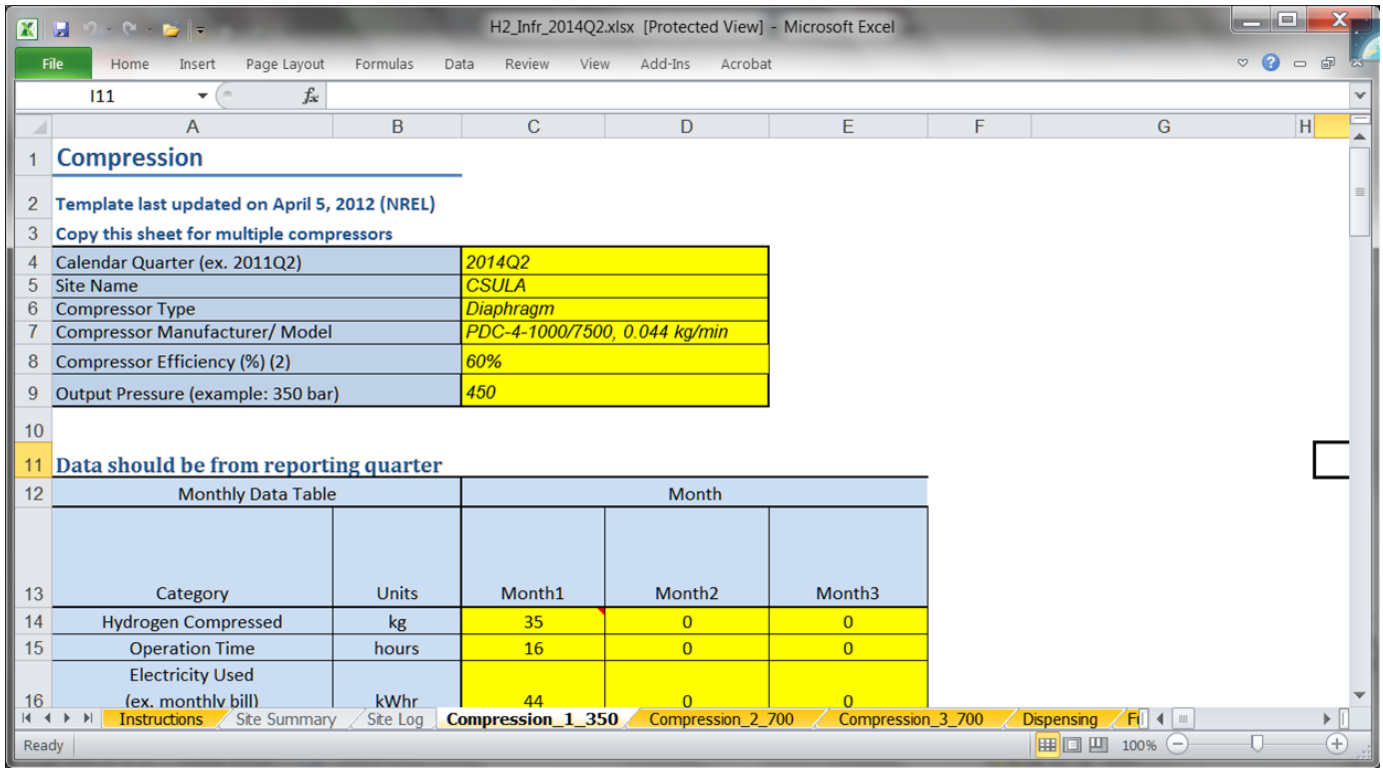

FIGURE 2. Example of an NREL Report with Multiple Tabs Populated Automatically