

VII.5 H2 Incident Reporting Tool and H2 Safety Best Practices Web Site

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Project End Date: Project continuation and
direction determined annually by DOE

Objectives

- Establish and maintain a web-based database for open sharing of lessons learned from hydrogen incidents and near misses through use of a confidential reporting tool for such safety events.
- Develop and maintain the Hydrogen Safety Best Practices web site to enable widespread benefit from the wealth of knowledge and experience already attained in industry, aerospace, and elsewhere.

Technical Barriers

This project addresses the following technical barriers from the Hydrogen Safety section (3.7.4) of the Hydrogen, Fuel Cells and Infrastructure Technologies (HFCIT) Program Multi-Year Research, Development and Demonstration Plan:

- (A) Limited Historical Database
- (B) Proprietary Data

Contribution to Achievement of DOE Safety Milestones

This project will contribute to achievement of the following DOE Hydrogen Safety milestones from the Hydrogen Safety section (3.7.6) of the Hydrogen, Fuel Cells and Infrastructure Technologies (HFCIT) Program Multi-Year Research, Development and Demonstration Plan:

- **Milestone 18:** Publish safety bibliography and incident databases. (3Q, 2006)
- **Milestone 19:** Publish a Best Practices Handbook. (1Q, 2008)

- **Milestone 20:** Update peer-reviewed Best Practices Handbook. (4Q, 2008)

Accomplishments

- A total of 62 hydrogen incident records have been added to the H2Incidents database since July 1, 2006.
- PNNL incorporated technical review comments from the Hydrogen Safety Panel and others who reviewed the incidents and near misses.
- A Japan Science and Technology Agency – Failure Knowledge Database was identified and queried for new hydrogen incidents.
- A new search mechanism was developed and is currently being reviewed on an internal PNNL developmental server.
- A new “Recent Incident Alerts” section was developed to highlight recent incident reports that have been the subject of media attention, but for which sufficient details are not yet available. This section is currently being tested on an internal PNNL developmental server.
- The Best Practices web site has been designed and tested on an internal PNNL developmental server.
- The following eight Best Practices sections were drafted by PNNL and Los Alamos National Laboratory (LANL):
 - Safety Culture
 - Safety Planning and Risk Assessment
 - Incident Procedures
 - Operating Procedures
 - Communications
 - Design of Facilities and Equipment
 - Hydrogen Storage and Piping Systems
 - Equipment Maintenance and Integrity
- PNNL and LANL have incorporated comments from the Hydrogen Safety Panel reviews of the draft Best Practices sections.



Introduction

Hydrogen has been safely used for decades in the industrial and aerospace environments. Nonetheless, a large volume of information on hydrogen incidents, near-misses, and other safety-related events has accumulated over time and offers significant lessons, experiences, and wisdom to those able to access this

information. A key to improving the safety records of hydrogen systems is sharing such experiences and knowledge with others so that they may avoid similar incidents in the future.

Approach

Much information and data pertaining to experiences with hydrogen exist, but reside in disparate locations. These data sources are often not easily accessible to researchers and implementers of hydrogen technologies without special access privileges (e.g., being members of an organization that collects such information). In FY 2006, this project focused on identifying potential sources of hydrogen incident information, including both historical sources and other ongoing collection efforts. Numerous sources were identified and pursued.

A web site (www.H2Incidents.org) was constructed to provide a central location for historical incident information, and for reporting current incidents and related information. Much effort went into making this web site user friendly and intuitive. To encourage the free sharing of information regarding new incidents, a confidential submission system was built into the web site to eliminate any concerns over negative publicity, liability, or other reservations that an organization might have about submitting incident records.

The collection of best practices information was initiated in FY 2006 using Hydrogen Safety Panel site visit reports and safety plan reviews, and the input of various subject matter experts. In addition, the literature contains numerous references to hydrogen safety best practices. These have been compiled and are being organized and assembled into the H2Safety Best Practices web site, which, like H2Incidents.org, will be a publicly available source of hydrogen safety information. These two web sites will be closely linked wherever relevant ties exist between incidents, lessons learned, and resulting or related best practices.

Results

The H2Incidents.org web site has been well received, getting 16,000 “hits” from about 1,600 unique visitors during June 2007. The site is easy to navigate and useful information can be obtained relatively quickly. Figure 1 shows the welcome page.

The purpose of the Hydrogen Safety Best Practices web site is to share the benefits of the extensive historical experience by providing a resource where those who are unfamiliar with hydrogen can find suggestions and recommendations pertaining to its safe handling and use. Best Practices are organized under eight categories in this web site, with the major headings displayed down the left-hand column of the welcome



FIGURE 1. H2Incidents.org Welcome Page

page (see Figure 2). Because of the interdependence of the topical areas, however, individual pages are often accessible via multiple internal links. A web-based electronic document format lends itself well to this type of overlapping content.

A best practice is a technique or methodology that has reliably led to a desired result. Using best practices is a commitment to utilizing available knowledge and technology to achieve success. The hydrogen safety best practices have been compiled from a variety of resources, many of which are in the public domain and can be downloaded directly from the References section of the web site. Many others can be obtained via reference links throughout the website (e.g., a link to the DOE Hydrogen Safety Bibliographic Database). The web site also includes a Glossary, a list of Acronyms, and the ability to see the definitions of key terms when the mouse is rolled over them.

Conclusions and Future Directions

Like virtually all energy forms, hydrogen can be used safely when proper procedures and engineering techniques are followed, but its use still involves a degree of risk that must be respected. The importance of avoiding complacency and/or haste in the safety-related emphasis of projects involving hydrogen cannot

be understated. The interest generated to date in H2Incidents.org clearly demonstrates a need for shared experiences and information from hydrogen-related safety events. The high value associated with sharing this information is also acknowledged from those on the provider side. Open sharing of safety-related information not only helps prevent event recurrence, but also conveys a collaborative and progressive image to the public eye.

Both the H2Incidents.org and Best Practices web sites will continue to be developed and enhanced over the next few years. Other identified sources of potential hydrogen incident information will also be pursued to add to what is already available. Future enhancements to the H2Incidents.org web site will include graphical trend tools for displaying information about the records in the database (e.g., pie charts displaying contributing factors or other graphics showing correlations between common elements in incidents reported).

The H2Safety Best Practices web site will make its initial public debut to a limited set of approximately 50 reviewers in October 2007. An HFCIT milestone exists for publicly launching this web site in the first quarter of FY 2008; at that time the web site content should be relatively comprehensive, although new best practices will likely continue to be added in the future.

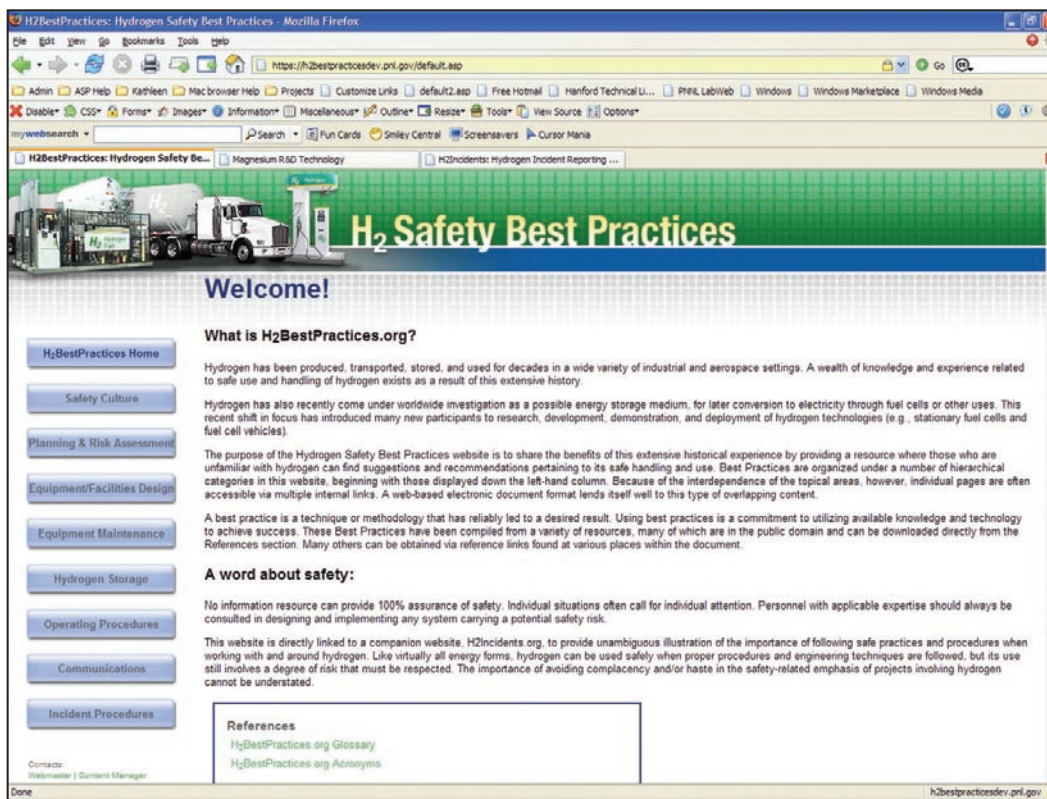


FIGURE 2. H2Best Practices Welcome Page

FY 2007 Publications/Presentations

1. Fassbender, L.L., “H2 Incident Reporting Database and H2 Safety Best Practices Website,” 2007 U.S. Department of Energy Hydrogen Program Annual Merit Review & Peer Evaluation, Arlington, VA, May 17, 2007.
2. Fassbender, L.L., “H2 Incident Reporting Database and H2 Safety Best Practices Website,” presentation to the Hydrogen Safety Panel meeting, Washington, D.C., July 17, 2007.
3. Weiner, S.C., Kinzey, B.R., Dean, J., Davis, P.B. and Ruiz, A., “Incident Reporting: Learning from Experience,” International Conference on Hydrogen Safety, San Sebastian, Spain, September 11–13, 2007.

References

1. H2Incidents website: www.h2incidents.org.
2. DOE Hydrogen Program website: www.hydrogen.energy.gov.