Global Hydrogen Safety Codes and Standards Webinar Q&A

Key Words: electrolyzer, Canada, Europe, China, USA, mining

The information in this document provides answers to the questions that were raised during the Center for Hydrogen Safety June 21, 2021 webinar.

1. Is a CO2 Flooding system recommended for an electrolyzer? There are no recommendations for fire suppression systems such as CO2 in the ISO 22734 electrolyzer safety standard or nationalized versions.

2. In Canada, would organizations like TSSA or ABSA play a role in supporting public safety and industries compliance? Yes, but requirements of the Provincial Fire Commissioner and the regional Fire Marshalls that all follow the Fire and Building codes specific to their region also need to be considered.

ABSA (Alberta Boilers Safety Association)-publishes regulations for the operation of pressure vessels like Anhydrous Ammonia refrigeration plants in cold storage facilities, arenas etc. But they don't have any influence or jurisdiction outside the Province of Alberta.

TSSA (Technical Standards & Safety Authority) appears to be a branch of the Ontario Provincial government. Reading the website, it looks a lot like ABSA above.

The Federal and Provincial versions of the Fire Code don't generally regulate things like pressure vessels and boilers, thus the Provincial specific agencies like ABSA in Alberta and TSSA in Ontario. There are similar agencies in the other Provinces and Territories.

Regarding Hydrogen as a fuel source, the Canadian Fire Code and Building Code probably needs updating including references to the CHIC (Canadian Hydrogen Installation Code) and NFPA-2 where applicable.

3. Are current standards applicable to hydrogen used in mining operations? Current standards certainly could be used in those facilities.

4. Is there a list or code that lists acceptable materials to use in H2 service? There is an evolving ISO document (ISO/TR 15916) that treats materials selection in an informed manner. The document does not strictly present a list of specific acceptable materials, but it does provide guidance on considering various classes of structural metals for hydrogen gas service.

5. If your home state wants to look at the feasibility of using existing oil and gas infrastructure for H2 transport, is there a good roadmap/paper for illustrating the effort required? One aspect of re-purposing is a structural integrity assessment of the assets. This cannot be performed generically as it depends on the design features of the system, 'health' of the system today, and the planned operational conditions. Sandia has attempted to provide a simplified example of the type of calculations that can serve this purpose to show prospect of re-purposing NG assets, along with some perspectives about important considerations in ASME PVP2021-62045 (J.A. Ronevich, C. San Marchi, "Materials compatibility concerns for hydrogen blended into natural gas" (PVP2021-62045) ASME Pressure Vessels and Piping Conference 13-15 July 2021), as well as in SAND2021-6869PE. Similar perspectives can be

found in the literature, such as Huising and Krom, "H2 in existing natural gas pipeline" (IPC2020-9205) Proceedings of the ASME 2020 International Pipeline Conference, 28 Sept – 2 Oct 2020, Calgary, Canada.

6. Currently NFPA 2 only addresses capacities up to 75,000 gallons but we have seen storage inquiries for capacities greater than 10x that amount. Is there a current standard or one in development that addresses large scale storage of LH2? How should large scale storage be handled within the existing codes/regulations? For the US, this type of large facility should perhaps be regulated similarly to LNG plants – which are regulated by PHMSA. I am not aware of the development of a limit, but I would guess the risk analysis/permitting process would be similar to LNG.

7. Are there specific standards for green electrolyzers? ISO22734 and nationalized versions are not specific on this point.

8. In terms of European regulations (CE compliance) and standards such as ISO or CENLEC, are the standards that govern product design written to ensure regulatory compliance to the relevant directives?

There are three possibilities:

a) An ISO standard is approved, and the country in question chooses to publish through their national standards body – this has no guarantee of meeting regulatory requirements.
b) A CEN standard is approved, and the country in question has to publish through their national standards body – however this has no guarantee of meeting regulatory requirements. Note, A standard can be an EN standard, but not a harmonised standard
c) The standard is prepared (either EN, or ISO under Vienna Agreement, creating an EN ISO), and as part of the process, a HAS consultant is involved in order to generate what is called a harmonised standard, see https://ec.europa.eu/growth/single-market/european-standards/harmonised-standards_en - for the standard to be harmonised against a particular CE marking Directive, the content of the document needs to address comments

from the HAS consultant, elements such as a EN specific Annex need to be prepared (for when the document is published by European National Standards Bodies), and a dated reference to the standard then needs to be published in the Official Journal of the EU.

9. Are there codes and standards that limit the maximum allowable working pressure for hydrogen? Some codes and standards limit the MAWP of equipment within their scope.

10. Is there a global regulating body for hydrogen fuel tanks? There is no global regulating agency.

11. What codes and standards would we have to follow to design/build H2 facilities (vessels, pipes, electrolyzers)? This is dependent on your location and what is required by the approving/permitting agency.

12. What sort of Codes and Standards are the Chinese implementing? Are they pulling from existing standards or creating their own? Here is some information on Chinese H2 standards: http://www.fuelcellstandards.com/pacificrim_loc.html