

CGA HYDROGEN SEMINAR 2006

THURSDAY, MARCH 16, 2006 • 8:30 am-5:00 pm

Preliminary Schedule (as of 2/13/06):

Hydrogen: Properties, Specifications, and Terminologies Associated with Fuel Technology

Presenter: David Farese, Air Products and Chemicals, Inc.

Hydrogen has unique properties that make it different than fuels commonly used by the public. Recent development of hydrogen powered vehicles, as well as portable and stationary fuel cell power systems, has prompted expansion of existing hydrogen specifications and terminologies that have been common in the industry for years. This presentation will review the properties of hydrogen as found in CGA G-5, *Hydrogen*, compare them with existing fuels, and discuss terminologies associated with hydrogen technology as found in CGA H-4, *Terminology Associated with Hydrogen Fuel Technologies*.

Gaseous Hydrogen Storage and Distribution: Design Features and Installation Guidelines

Presenter: Robert Boyd, BOC Gases

The developing hydrogen economy will require new approaches to manage hydrogen storage for fuel cell systems and the fueling of hydrogen powered vehicles. This presentation will include a review of CGA standards pertaining to traditional carbon steel cylinders and tube trailers, as well as new position papers on storage of hydrogen in overhead locations, the use of carbon fiber wrapped composite storage vessels, and mixed fuel gas CNG/H₂ storage.

Cryogenic Hydrogen Storage and Distribution: Design Features and Installation Guidelines

Presenters: Scott Nason and Kenneth Paul, Chart Industries, Inc.

Cryogenic (liquid) hydrogen has been used in industrial applications for many years. This presentation will review existing liquid hydrogen storage tank designs and installations and emerging (underground) designs and installations. Existing distribution methods for liquid hydrogen will be discussed. CGA Publications H-3, *Cryogenic Hydrogen Storage*, PS-17, *CGA Position Statement on Underground Installation of Liquid Hydrogen Storage Tanks*, and a document currently under development (*Installation Standards for Cryogenic Hydrogen Storage Systems*) address these issues.

Risk Management Plan for Bulk Distribution Hydrogen Systems

Presenter: Rob Early, Praxair, Inc.

Hydrogen is sometimes perceived to be hazardous to handle, but the risks can be managed properly. This presentation discusses how to manage the risks of a bulk hydrogen system. Topics include safe handling of hydrogen, safe work practices, hazards of hydrogen compared to other industrial gases, and CGA member company experience and established practices for handling hydrogen. This presentation also presents CGA's standardized approach to assessing the risks of hydrogen systems to meet OSHA and EPA regulations for large bulk liquid hydrogen systems (those with more than 10,000 pounds of hydrogen storage).

Hydrogen Pipeline Systems and Embrittlement Issues

Presenters: Kang Xu and Robert Zawierucha, Praxair, Inc.

This presentation will review CGA's new publication on cross country hydrogen transmission, CGA G-5.6, *Hydrogen Pipeline Systems*. The presentation will focus on materials selection, pipeline design, construction, and maintenance of these systems for hydrogen pressures from 150 psi to 3000 psi. In addition, hydrogen embrittlement issues related to pipeline systems and mitigation approaches will be discussed.

Hydrogen Piping and Vent Systems

Presenter: Tom Witte, Air Products and Chemicals, Inc.

This presentation will review CGA publications on hydrogen piping and vent lines with special emphasis on practical applications. These publications include CGA G-5.4, *Standard for Hydrogen Piping Systems at Consumer Locations*, and CGA 5.5, *Hydrogen Vent Systems*. The presentation topics include pipeline design, instrumentation, cleaning, installation, start-up, and maintenance.

Metal Hydride Storage Systems

Presenter: Glenn Dunn, Jadoo Power Systems

The success of the hydrogen economy depends in part on reliable methods for storing hydrogen for portable applications. This presentation will review the technology of metal hydride storage and discuss design issues related to portable storage systems. In addition, CGA guidelines for service and design standards for hydride cylinders, including valves and relief devices, will be discussed as well as monitoring and support of international standards.

Review of Installation Codes and Standards

Presenter: Tom Joseph, Air Products and Chemicals, Inc.

The compressed gas industry has over fifty years of experience in the installation of gaseous and liquid hydrogen systems. NFPA and the International Codes were developed over the years building on industry's knowledge. Emergence of the need for installing hydrogen systems for its use as a fuel and the limitations of a corner fuel station have brought additional challenges. This presentation will review the applicable sections of the published codes and offer a platform for discussion around the industry's position on commonly debated issues.

Question and Answer session