



Swagelok® Hydrogen Fluid System Design Training

Meet requirements for the clean energy industry.

Better Designs for the Future of Clean Energy

The rapid expansion of demand for clean energy solutions and in particular hydrogen clean energy solutions has put pressure on designers to respond with safe, clean, and economical design solutions. The hydrogen molecule because of its size and chemical properties presents a unique challenge - and many designers lack the practical hydrogen fluid system design experience necessary to meet this challenge.

This two-day class intends to offer designers some real-world insights and expertise into hydrogen application design, fabrication, installation and operation.

The Swagelok Hydrogen Story

For more than 70 years, Swagelok has been actively involved in defining key performance criteria for fluid system components used in hydrogen applications. We leverage our knowledge of materials science, manufacturing processes, and end-use application requirements to help global organizations set requirements for safe, effective storage, transportation, and usage of hydrogen.

- Swagelok associates are board members, fellows, and committee members with international organizations such as Hydrogen Europe, ASM International, ASME, SME, and SAE

- Our experts have been involved in writing and updating hydrogen-related codes such as B31.12 (hydrogen piping) and B31.3 (pressure vessels) through ASME, as well as holding leadership positions various hydrogen standards through CSA Group for North America & ISO



Instructor – Chuck Hayes – Clean Energy Global Technical Lead for Swagelok Company

Chuck Hayes is a 32-year veteran of Swagelok Company, a world leader in the development of fluid system products, assemblies, and services. He has spent the last 25 years developing a wide range of fluid system products and the past 20 years focused exclusively on fitting technology for alternative fuel applications. Chuck currently holds 7 patents in the US and numerous patents internationally.

He is an active member of **CSA (Canadian Standards Association Group) committees for both CNG and Hydrogen**. He currently is the **Vice Chair for hydrogen**. Chuck also sits on **ISO-TC97 (Plenary Committee)** and participates in international working groups.





Syllabus

Course content will cover:

Hydrogen Basics

1. Hydrogen Myth Busting
2. Industry breakdown
 - a. Making the molecule
 - i. Electrolyzer
 - ii. GMR
 - b. Distribution
 - i. Injection
 - ii. Trailers
 - c. Infrastructure
 - d. Vehicle
3. Industry standards North America and Europe
4. Electrolyzer activity - hands-on group project

Material Science

1. Metals - Embrittlement
2. Elastomers

System design considerations

1. Differences between Oil & Gas and Hydrogen
 - a. Components
 - b. Small bore
 - c. DBB
 - d. Purge systems

Oil & Gas versus Hydrogen design

Hydrogen characteristics

Additional discussion on detonation deflagration

Fluid dynamics

1. Ideal gas law
2. Pressure drop
3. Erosional velocity

Fitting design

Component selection

1. Hydrogen compatible product

Vent stack design

Tube selection, installation & routing

Sampling

GDP/Purge

Line sizing calculations

System environment considerations

1. Leak control
2. Leak monitoring
3. Enclosure venting

Leak detection

1. Leak detection tools
2. Leak budget
3. Leak panel activity

System Integrity, maintenance

1. Inspection frequency
2. Maintenance considerations/access
3. SBT Management (Asset Register)
4. Maintenance supply kits

Activities

1. Electrolyzer activity - hands-on group project
2. Tube fitting installation
3. Basic hand tube bend
4. Leak panel
5. Case study - group exercise
6. Pop quizzes

GDP/Purge

Sampling

Class Format

The training follows a pattern of explanation, demonstration, drills, and validation. Each attendee will confirm what they have learned through a written exam and practical inspection.

Program Details

Instructor: Program is facilitated by a Swagelok-certified instructor trained in the content and delivery of this specific course.

Attendee Verification: Attendees will be able to verify their course completion and credentials.

When: May 7-8, 2024

Where: 100 Regency Drive,
Glendale Heights, IL 60139

Save Your Seat Today

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