

Hydrogen Technology: Value Chain and Projects (G572)



Tutor(s)

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Overview

This course is designed to provide the participants with a summary of the technical and engineering challenges within hydrogen energy, including production, storage and transport, in addition to associated risk and safety challenges.

Duration and Logistics

Classroom version: A 1-day in-person classroom course. An electronic copy of the manual will be provided by the tutor at the end of the course.

Virtual version: Two 3.5-hour interactive online sessions presented over 2 days, including a mix of lectures and discussion. The course manual will be provided in digital format.

Level and Audience

Advanced. This course is designed for all technical staff working on hydrogen projects with an emphasis on operations, facilities and engineering aspects.

Objectives

You will learn to:

1. Outline the different 'colours' of hydrogen and how these are produced.
2. Evaluate the technical challenges with hydrogen, including thermodynamic modelling of H₂ mixtures.
3. Review how H₂ can be stored and transported safely.
4. Outline the design specifications of H₂ networks with a focus on pipelines, including material of construction and reuse of existing infrastructure.

Course Content

Session 1

Hydrogen commodity strategy

- Value of H₂ and its strategic position in the energy transition
- Economic study case: key takeaways, its challenges and conclusions

Hydrogen production

- Green hydrogen
- Blue hydrogen
- Other colours

Technical challenges with hydrogen

- Quantum effects and kinetics of isomer conversion
- Thermodynamic modelling of H₂-rich mixtures
- What are the current engineering and scientific practices? Learnings from CERN and NASA
- Energy content

Session 2

Large-scale storage and compression

- Seasonal underground storage
- Long-term pressurized storage
- Types of compressors
- Energy consumption

Hydrogen transport

- Gas pipelines
- Liquid bulk transport

Hydrogen carriers

- LOHC
- Ammonia
- Methanol
- Natural gas

Session 3

Material of construction

- Material selection
- Reuse of pipelines
- Codes and standards

Risk and safety

- Gas and flame detection
- Fire and explosion risks session

Current projects worldwide and value chains

- Description of current project in Europe
- Blue CCS project
- Integration with oil and gas
- Green and blue hydrogen corridor