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COURSE BROCHURE

# Hydrogen Infrastructure Design and Maintenance Training Course

21 – 25 November 2027
Sharm El-Sheikh

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Registered in the United Kingdom and Saudi Arabia

# Hydrogen Infrastructure Design and Maintenance Training Course

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Hydrogen Infrastructure Design and Maintenance is a 1-week training course for engineers and asset managers in hydrogen projects, and each participant leaves with a hydrogen asset design review and inspection plan. As production sites, transport lines and refuelling stations move from concept to operation, owners must prove that pipework, compressors and storage vessels can hold a small, leak-prone molecule for decades. Jupiter Prime Training builds this course around that proof.

## Why Hydrogen Infrastructure Design and Maintenance Matters Now

Three pressures shape hydrogen infrastructure design and maintenance today. Project developers are moving from pilot plants to networks of pipelines, compressor stations and dispensers, so design choices now carry long service lives. Insurers and asset owners ask for evidence that steels, welds and seals resist embrittlement and fatigue under cycling pressure. Operations crews inherit equipment with few maintenance records. Sound practice gives safe uptime and predictable costs; weak practice brings leaks, cracked components and unplanned shutdowns. The course follows internationally recognised gas and pressure equipment practice, described in general terms.

## Who Gains Most from Hydrogen Infrastructure Design and Maintenance

- Design engineers who specify pipework, vessels and compressors for hydrogen service
- Asset managers who set inspection intervals and maintenance budgets for hydrogen plant
- Integrity engineers who judge material condition and remaining life
- Operations supervisors who run compressor stations and refuelling sites
- Project engineers who review contractor designs before construction

A hydrogen project team gains most when its design, integrity and operations engineers attend together and leave with one agreed view of design limits and inspection duties.

## Hydrogen Infrastructure Design and Maintenance Capabilities

These outcomes connect material behaviour, pressure cycling and leak control to the choices made at design review and in the maintenance calendar.

- Assess pipeline routing, wall thickness and operating pressure for hydrogen duty — design approval
- Specify compressor types, seals and cooling for hydrogen service — equipment purchase
- Weigh compressed gas, liquid and solid storage options for a site — storage selection
- Apply material selection rules against embrittlement and fatigue cracking — steel and weld choice
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Design leak detection, ventilation and hazard zoning for hydrogen areas — site safety sign-off
- Build an inspection and maintenance schedule for hydrogen assets — the asset owner's budget

## Key Hydrogen Infrastructure Design and Maintenance Terms

- Hydrogen embrittlement — loss of ductility in metals as hydrogen atoms enter the steel and help cracks grow.
- Pressure cycling fatigue — crack growth caused by repeated filling and emptying of vessels and pipework.
- Diaphragm compressor — a compressor that separates gas from oil with a flexing metal membrane, keeping hydrogen clean.
- Cascade storage — banks of vessels at staged pressures that let a station fill vehicles quickly.
- Boil-off — the gas lost as stored liquid hydrogen warms and evaporates.
- Hazardous area zoning — mapping where flammable gas may be present so equipment and ignition sources are controlled.

## Hydrogen Infrastructure Design and Maintenance Day by Day

### Day 1: Hydrogen Properties and the Infrastructure Chain

- Density, Diffusion and Flammability Range of Hydrogen — Design Basis Assumptions
- Production, Transport, Storage and Dispensing Links — Mapping the Asset Chain
- Design Pressure, Temperature and Purity Requirements — Setting the Duty Specification
- Hazard Identification for Hydrogen Facilities — Early Layout Decisions
- Owner, Designer and Operator Responsibilities — Clear Design Review Roles

### Day 2: Pipelines, Compression and Materials

- Pipeline Routing, Wall Thickness and Pressure Limits — New Line Design
- Reciprocating, Diaphragm and Ionic Compressors — Compressor Selection
- Seals, Valves and Flanged Joints for Small Molecules — Leak Path Reduction
- Steel Grades, Hardness Limits and Weld Procedures — Embrittlement Resistance
- Polymer and Composite Liners — Non-Metallic Material Choice

### Day 3: Storage and Refuelling Station Design

- Compressed Gas Vessels and Tube Trailers — Storage Pressure Choice
- Liquid Hydrogen Tanks and Boil-Off Handling — Cryogenic Storage Decisions
- Solid and Chemical Carrier Storage Options — Site Suitability
- Cascade Banks, Precooling and Dispenser Layout — Refuelling Station Throughput
- Separation Distances and Vent Stack Placement — Station Layout Approval

## Day 4: Leak Detection, Inspection and Maintenance

- Fixed Gas Detectors, Flame Detectors and Ventilation — Leak Response Design
- Hazardous Area Zoning and Ignition Source Control — Equipment Selection
- Inspection Methods for Cracking and Fatigue — Inspection Interval Setting
- Compressor Overhaul and Seal Replacement Routines — Maintenance Task Planning
- Condition Records and Failure Trend Logs — Remaining Life Judgement

## Day 5: Practising the Design Review and Inspection Plan

- Design Review of a Sample Compressor and Storage Package — Applying Day 2 and Day 3
- Material Check Against Embrittlement Rules — Applying Day 2 Material Limits
- Leak Detection and Zoning Layout Exercise — Applying Day 4 Safety Methods
- Peer Challenge of Draft Inspection Intervals — Testing Assumptions
- Completed Hydrogen Asset Design Review and Inspection Plan — Owner Approval

## Applying Hydrogen Infrastructure Design and Maintenance After the Course

- Lead a design review of one hydrogen compressor, vessel or pipeline section using the material and leak path checks taught.
- Set inspection intervals for one hydrogen asset group, based on pressure cycling, material grade and condition records.

## Hydrogen Infrastructure Design and Maintenance Questions FAQ

### What is hydrogen infrastructure design and maintenance and why does it matter now?

Hydrogen infrastructure design and maintenance is the work of specifying, building and keeping safe the pipelines, compressors, storage and refuelling equipment that carry hydrogen. It matters now because projects are moving from pilots to long-life networks.

### Which roles gain most from hydrogen infrastructure design and maintenance training?

Design engineers and asset managers gain most. Integrity engineers, operations supervisors and project engineers also benefit.

### How does hydrogen infrastructure design and maintenance differ from a hydrogen economics or pipeline conversion course?

Hydrogen infrastructure design and maintenance focuses on new equipment, materials, leak control and inspection. An economics course weighs project value chains, and a pipeline conversion course judges whether existing gas lines can be reused.

## What do you bring back from hydrogen infrastructure design and maintenance training?

You bring back a design review and inspection plan for one hydrogen asset. It records design limits, material choices, leak detection layout and inspection intervals.

## Hydrogen Infrastructure Design and Maintenance: The Way Forward

The hydrogen asset design review and inspection plan first informs whether a proposed compressor, vessel or pipeline section is approved for construction. Design engineers, integrity engineers and asset managers use it from design review through operation. After its first use, revisit the inspection intervals as condition records and failure trends build up.