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COURSE BROCHURE

# Hydrogen and Carbon Dioxide Pipeline Repurposing Training Course

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Amman

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Registered in the United Kingdom and Saudi Arabia

# Hydrogen and Carbon Dioxide Pipeline Repurposing Training Course

**Ref:** 2455_92808 **Date:** 24 – 28 October 2027 **Location:** Amman **Fees:** 4200 GBP

Hydrogen and Carbon Dioxide Pipeline Repurposing is a 1-week training course for pipeline engineers and integrity specialists who judge whether an existing line can carry a new energy carrier, ending with a pipeline repurposing assessment for one real asset. Operators now weigh conversion against new build as hydrogen and carbon capture projects seek routes to market. Jupiter Prime Training delivers this course for engineers working on that decision.

## Why Hydrogen and Carbon Dioxide Pipeline Repurposing Matters Now

Three forces shape this decision: capture schemes needing trunk lines for carbon dioxide, hydrogen producers seeking transport capacity, and owners of ageing gas networks seeking a second life for assets. A line converted on sound evidence saves years of permitting and much new-route capital; one converted without checking embrittlement or fracture arrest can fail without warning. The course rests on fracture mechanics, equation of state modelling for mixtures and recognised pipeline integrity management practice, applied to steel lines in both gas and liquid service.

## Who Gains Most from Hydrogen and Carbon Dioxide Pipeline Repurposing

- Engineers owning design checks and pressure rating
- Integrity specialists owning defect assessment and remaining life
- Materials and corrosion engineers who approve steel grades, welds and seals
- Process engineers who set composition limits, compression and dehydration duty
- Project leads presenting conversion options to investment committees

Asset teams sending a design engineer, an integrity specialist and a project lead together gain most.

## Hydrogen and Carbon Dioxide Pipeline Repurposing Capabilities

Participants test an existing line against hydrogen or dense phase carbon dioxide service and explain the result.

- Assess embrittlement risk for existing steel grades and welds — material acceptance decision
- Calculate dense phase hydraulics and minimum metal temperature — operating envelope sign-off
- Specify impurity and water limits for captured carbon dioxide — capture plant and shipper agreements
- Weigh fracture arrest demand against crack arrestor cost — design authority approval
- Apply dispersion and jet fire results to routing — emergency planners and landowners
- Build a conversion case with remediation scope — investment committee choice

## Key Hydrogen and Carbon Dioxide Pipeline Repurposing Terms

- Hydrogen embrittlement — loss of steel toughness as hydrogen atoms enter the metal, speeding crack growth.
- Dense phase — carbon dioxide above its critical pressure, with liquid-like density, used for efficient transport.
- Running ductile fracture — a crack travelling along the pipe because decompression keeps its tip loaded.
- Decompression wave — the pressure drop moving from a rupture; its speed decides whether a fracture arrests.
- Crack arrestor — a sleeve or thicker pipe section installed at intervals to stop a running fracture within a set length.
- Change of service — the formal move of a line to a new fluid with integrity checks and a new operating envelope.

## Hydrogen and Carbon Dioxide Pipeline Repurposing Day by Day

### Day 1: Energy Carriers and the Existing Line Network

- Hydrogen Versus Natural Gas Properties — Line Capacity and Compression Need
- Carbon Dioxide Phase Diagram — Gas, Liquid or Dense Phase Operation
- Line Records and As-Built Data — Gaps Blocking a Conversion Case
- Stakeholder and Permitting Mapping — Who Must Accept the Change of Service
- Conversion Versus New Build Screening — Early Go or No-Go Call

### Day 2: Hydrogen Embrittlement and Line Pipe Materials

- Embrittlement Mechanisms in Carbon Steel — Toughness Loss Under Pressure Cycling
- Steel Grade, Hardness and Weld Zone Checks — Acceptable Material Envelope
- Fatigue Crack Growth in Hydrogen — Remaining Life of Existing Defects
- Valves, Seals and Non-Metallic Components — Replacement Scope and Cost
- Blending Ratios and Partial Pressure Limits — Safe Operating Window

### Day 3: Dense Phase Carbon Dioxide Flow and Impurities

- Equation of State Selection for Mixtures — Hydraulic and Thermal Accuracy
- Impurity Limits for Water, Oxygen and Hydrogen Sulphide — Capture Source Specification
- Free Water and Carbonic Acid Corrosion — Dehydration Duty and Monitoring
- Depressurisation and Joule-Thomson Cooling — Minimum Design Metal Temperature
- Booster Pump and Compressor Duty — Capacity Over the Injection Profile

### Day 4: Fracture Control and Leak Consequences

- Running Ductile Fracture and Decompression Wave — Arrest Toughness Demand
- Crack Arrestors and Wall Thickness Upgrades — Cost of Fracture Control
- Dense Gas Dispersion Modelling — Carbon Dioxide Hazard Distances
- Hydrogen Jet Fire and Ignition Behaviour — Separation and Routing Decisions
- Leak Detection and Block Valve Spacing — Emergency Response Planning

## Day 5: Practising the Pipeline Repurposing Assessment

- Material Envelope Applied to a Sample Line — Pass or Mitigate Verdict
- Hydraulic and Phase Check for the New Service — Required Pressure Rating
- Fracture and Dispersion Results Combined — Population and Route Risk
- Integrity Baseline and Inspection Before Conversion — Remediation Scope
- Assembling the Pipeline Repurposing Assessment — Recommendation to Management

## Applying Hydrogen and Carbon Dioxide Pipeline Repurposing After the Course

- Run a material envelope screen on one candidate line.
- Lead a fracture arrest and dispersion review for a planned route.

## Hydrogen and Carbon Dioxide Pipeline Repurposing Questions FAQ

### What is Hydrogen and Carbon Dioxide Pipeline Repurposing and why does it matter now?

It is the engineering check of whether an existing pipeline can safely carry hydrogen or dense phase carbon dioxide. It matters now because capture and hydrogen projects need transport quickly, and conversion can beat new build.

### Which roles gain most from Hydrogen and Carbon Dioxide Pipeline Repurposing training?

Pipeline design engineers, integrity specialists, materials and corrosion engineers, process engineers and project leads gain most. You benefit most when those signing off materials, hydraulics and risk attend together.

### How does Hydrogen and Carbon Dioxide Pipeline Repurposing differ from a general pipeline engineering course?

It focuses on the new demands of a changed fluid rather than on standard hydrocarbon design. It tests an existing line against embrittlement, dense phase behaviour, impurities, fracture arrest and new hazard distances.

### What do you bring back from Hydrogen and Carbon Dioxide Pipeline Repurposing training?

You bring back a structured assessment of one line covering materials, hydraulics, fracture control, consequences and remediation.

## Hydrogen and Carbon Dioxide Pipeline Repurposing: The Way Forward

The pipeline repurposing assessment first informs whether a candidate line moves to detailed engineering or is set aside in favour of a new route. Design authorities, integrity owners and project sponsors use it to agree remediation scope and operating limits. After its first use, revisit the impurity limits and fracture arrest margins as capture sources and blend ratios change over the life of the asset.