



Underground Gas Storage Course: Depleted Reservoirs, Salt Caverns and Storage Integrity



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Introduction:

Underground gas storage covering depleted reservoirs, salt caverns and storage integrity is a 1-week course for reservoir, wells, facilities and gas planning engineers, ending with a Storage Development and Operating Plan for a case storage site. Operators lose working capacity, deliverability and inventory when cushion gas is sized loosely, caprock and well barriers are not verified and injection and withdrawal seasons are planned without the limits of the site. Nominees already work on gas fields, wells or supply planning, and the course runs as a modelling build on case storage data. CoreConcept Training Center delivers this underground gas storage course.

Course Objectives:

- Screen candidate depleted gas fields, aquifers and salt formations for storage using trap geometry, caprock seal, depth and proximity to demand
- Size cushion gas, working gas and maximum and minimum operating pressures for a storage site and justify the split with pressure and inventory calculations
- Forecast injection and withdrawal deliverability curves across a storage season and plan cycling for seasonal and peak demand
- Assess storage well barriers, caprock threshold pressure and salt cavern stability, and set monitoring that detects gas migration and loss
- Specify surface compression, dehydration and metering for a storage station and estimate its energy and fuel use
- Compile a Storage Development and Operating Plan with capacity products, inventory verification and an integrity monitoring programme

Target Audience:

- Reservoir engineers responsible for storage capacity, pressure limits and inventory forecasts at gas storage sites
 - Well engineers responsible for storage well design, workovers and barrier integrity testing
 - Facilities engineers responsible for storage compressors, dehydration units and wellhead and metering skids
 - Gas supply planners responsible for seasonal injection and withdrawal schedules and peak day cover
 - Geoscientists responsible for caprock, spill point and salt formation characterisation for storage projects
 - Storage operations engineers responsible for daily cycling, surveillance data and inventory reporting
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Course Outline:

Day 1: Underground Gas Storage Fundamentals and Site Screening

- Storage Role in Seasonal, Peak and Strategic Gas Supply
- Depleted Field, Aquifer and Salt Cavern Type Comparison
- Storage Capacity Terms Including Base, Working and Unrecoverable Gas
- Site Screening Matrix for Trap, Seal, Depth and Market Distance
- Current Storage Portfolio Review of Capacity and Deliverability

Day 2: Storage Reservoir and Salt Cavern Design Basis

- Cushion Gas Sizing With p/z Inventory and Pressure Limits
- Maximum Operating Pressure Set Against Caprock Threshold Pressure
- Aquifer Gas Bubble Growth and Spill Point Control
- Solution Mining Design With Leaching Strings and Brine Handling
- Salt Cavern Creep, Minimum Pressure and Sonar Shape Surveys

Day 3: Injection, Withdrawal Cycling and Surface Facilities

- Deliverability Curve Construction Against Inventory Level
- Injection Capacity Decline Near Full Inventory Analysis
- Seasonal Cycling Schedule for Single and Multiple Turnovers
- Storage Compressor Selection Between Reciprocating and Centrifugal Units
- Glycol Dehydration and Water Dew Point Control for Withdrawn Gas

Day 4: Storage Well Integrity, Caprock Monitoring and Commercial Models

- API RP 1171 Practices for Depleted Reservoir Storage Integrity
- API RP 1170 Practices for Salt Cavern Well Design
- Annulus Pressure Monitoring and Barrier Verification Testing Routine
- Inventory Verification and Gas Loss Detection Using Pressure History
- Storage Capacity Products, Bundled Units and Tariff Structures

Day 5: Modelling Build of the Storage Development and Operating Plan

- Case Storage Site Data Review and Screening Score
 - Case Cushion and Working Gas Split Calculation
 - Case Season Injection and Withdrawal Deliverability Forecast
 - Case Integrity Monitoring Programme and Surveillance Frequencies
 - Storage Development and Operating Plan Completion and Panel Review
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Skills You Will Gain:

- Storage Site Screening
- Cushion Gas Sizing
- Deliverability Forecasting
- Salt Cavern Stability Assessment
- Storage Well Barrier Verification
- Inventory Reconciliation
- Storage Compression Specification
- Storage Capacity Product Design

Why Attend This Course:

- Deliver a Storage Development and Operating Plan for a case site to the asset manager and the gas supply planning lead for approval
- Decide how much cushion gas to hold, which pressure limits to operate within and how many cycles the site can support each season
- Avoid lost inventory, caprock breach, cavern closure and missed peak day deliveries that surface only after a withdrawal season
- Share the screening matrix, deliverability curves, barrier test routine and inventory reconciliation sheet with storage operations colleagues

Conclusion:

Back at work, the participant presents the Storage Development and Operating Plan to the asset manager, the gas supply planning lead and the integrity team. The plan supports decisions on cushion gas purchases, pressure limits, cycling targets, compressor additions and the capacity products offered to shippers. After the first full injection and withdrawal season under the plan, the organisation should compare measured inventory, deliverability and well barrier results against the forecast and adjust pressure limits and surveillance frequencies.

Frequently Asked Questions FAQ:

What should participants know before the underground gas storage course?

Participants should already work with gas reservoirs, wells, surface facilities or gas supply planning. Familiarity with gas compressibility and pressure data helps. A laptop with a spreadsheet application is used for the cushion gas, deliverability and inventory models built during the course.

How does underground gas storage differ from a reservoir engineering course or a carbon dioxide storage course?

Underground gas storage deals with repeated injection and withdrawal of natural gas, cushion gas, deliverability and storage well integrity. Reservoir engineering courses focus on primary recovery and waterflooding, and carbon dioxide storage courses deal with permanent one-way injection and capture chains.

Why do salt caverns and depleted reservoirs need different underground gas storage design?

Depleted reservoirs hold large volumes in porous rock, need a large share of cushion gas and usually cycle once a season. Salt caverns are solution-mined voids with less cushion gas and high deliverability that can cycle several times, but they must be protected from creep and closure.

What do participants take back from the underground gas storage course?

Participants take back a Storage Development and Operating Plan for a case site, covering a screening score, cushion and working gas split, seasonal deliverability forecast, integrity monitoring programme and storage capacity products they can adapt to their own facilities.
