

Natural Gas Storage

General Objectives:

To provide an overview of technical issues of various natural gas storage facilities.

Specific Objectives:

At the end of training the trainees will be able to:

- ✓ Review features and operating conditions of natural gas storage facilities;
- ✓ Learn about gas storage equipment specificities: wells, manifolds, compression, auxiliary equipment, etc;
- ✓ Understand gas treatment techniques applied upon extraction from storage in order to conform to specifications;
- ✓ Grasp fundamental issues of natural gas storage economics and third-party access.

Audience:

Professionals interested in natural gas storage.

Workload: 20 hours

CONTENTS:

Module I – Natural gas as a storable energy

- ✓ Why to store natural gas? Needs expressed by suppliers, administration and network operators;
- ✓ How? Summary presentation of the different storage systems: depleted reservoirs, aquifers, salt domes, LNG storage tanks;
- ✓ Where? History of underground gas storage. Storage sites in World. Maps and tables by types of storage, per country and stored volumes;
- ✓ Gas storage and his environment: noise, exhaust, surface footprints, landscape integration, local taxes, workforce.

Module II – Storage types

- ✓ Fluid flow in porous media. Reservoir modeling;
- ✓ Depleted reservoirs, aquifers, salt domes, LNG storage tanks;
- ✓ For each type of storage, presentation of development conditions, geological and structural characteristics and their specificities, the inherent hazards, the operational constraint, the repartition of sites throughout the world.

Module III – Storage equipment

- ✓ Wells: drilling specificities, downhole and surface equipment;
- ✓ Gathering network;
- ✓ Gas compression: why, when and how?;
- ✓ Extracted gas treatment: dehydration, sweetening, odorization;
- ✓ Auxiliary equipment: manifolds, instrumentation and control system, safety, treatment of effluents;
- ✓ Metering: primary meter, correctors, data processing.

Module IV – Compression

- ✓ Characteristics of compressors specific to natural gas storage sites: compression ratio, runtime frequency, environment related issues (exhaust gases, noise), power types;
- ✓ Types of compressor units: driver type (engine, electrical motor, gas turbine...), reciprocating or centrifugal compressor;
- ✓ Comparison between gas turbine and motor drivers, fuel gas and electricity power.

Module V – Gas treatment

- ✓ At the wellhead: hydrate prevention by heating or methanol injection;
- ✓ In the station: dehydration, sweetening, odorization;
- ✓ For each treatment, presentation of the target, the risks, the regulation aspects, treatment techniques, common processes used for gas treatment and product regeneration, effluent treatment.

Module VI – Economical aspect of gas storage

- ✓ Life cycle for a gas storage site;
- ✓ Estimated values for CAPEX and OPEX for each storage type;
- ✓ Pricing of access of third parties to storage facilities: analysis of the price breakdown, taking into account constraints and specificities of the storage;
- ✓ Simulation of cost price per kWh, stored or delivered, for common site configurations.