

# Gas & Liquid Hydrocarbons Transportation Engineering Certification

60.00 days

PROD/TRANSPORTGB

## Overview

### AUDIENCE

Graduate Engineers and Engineers in conversion, aiming at specializing in transportation facilities.

This certification program is well suited for junior engineers and engineers in conversion. It can also be tailored to experienced engineers.

### PURPOSE

To acquire a comprehensive knowledge and practical know-how in gas and liquid hydrocarbons transport facilities, from technical to HSE and economics issues.

### LEARNING OBJECTIVES

Upon completion of the course, participants will be able to:  
explain pipeline network design, technology and construction,  
efficiently blend in operation and maintenance teams of hydrocarbon pipeline network,  
enforce industry best practices of network operation and maintenance,  
identify main risks associated to hydrocarbons pipelines operations and implement mitigation measures.

### PREREQUISITE

Engineering degree or equivalent professional experience within the petroleum industry.

### WAYS AND MEANS

Highly interactive training course delivered by industry experts and adapted to participants' experience.  
Numerous industrial case studies.

## Agenda

### INTRODUCTION TO CRUDE OIL & NATURAL GAS PRODUCTION & TRANSPORT

5.00 d

Crude oil and natural gas production: fundamentals of reservoir, drilling and completion; well effluent behavior, need for effluent field processing; crude oil processing, gas processing and conditioning.  
Crude oil, natural gas and Natural Gas Liquids (NGLs) transport by pipeline: overview of transport network and interaction with other blocks of the crude oil chain and natural gas chain.

### DESIGN, CONSTRUCTION & OPERATION OF PIPELINES

10.00 d

Fundamentals of fluid mechanics and friction losses in single-phase flow.  
Pipeline design standards: pressure, length, volume, diameter.  
Technology of pipelines: standards, material grades, insulation techniques.  
Pipe laying: different steps of pipe laying operations (onshore and offshore approaches), cost and duration of pipe laying and compression station construction.  
Pipeline operation and maintenance: main flow assurance problems, main available technical solutions; introduction to pipe corrosion monitoring and prevention; introduction to pipeline maintenance.

### PUMPING STATIONS

5.00 d

Centrifugal pump operating principle, technology and selection criteria.

Pumping system performances and operating conditions.  
Centrifugal pump operation and troubleshooting.  
Centrifugal pump maintenance (preventive, conditional and corrective).

## COMPRESSION STATIONS

5.00 d

Centrifugal compressor operating principle, technology and selection criteria.  
Centrifugal compressor performances and operating conditions.  
Centrifugal compressor operation and troubleshooting.  
Centrifugal compressor maintenance (preventive, conditional and corrective).

## METALLURGY & MATERIALS, WELDING

5.00 d

Metallurgy: structures and behavior of metals and alloys at service conditions for static equipment, evaluation of the mechanical characteristics required for predictable behavior at service conditions.  
Most widely used metals and metal alloys in transport facilities: steels, their composition, structure and behavior at service conditions.  
Effect of heat treatments resulting from welding or deliberately applied. Common defects in steels.  
Welding: impact of welding on metals structure, post-welding heat treatment, identification of welding defects.

## CORROSION PREVENTION - CATHODIC PROTECTION

5.00 d

Common types of corrosion: origin and development process, possible methods of prevention.  
Corrosion prevention: design of equipment, choice of materials, corrosion inhibitors, anti-corrosion coatings and systems; cathodic protection with sacrificial anodes or imposed current (principles and applications, coating and cathodic protection, cathodic protection systems design).

## INSTRUMENTATION & AUTOMATION

5.00 d

Process control overview.  
Field instrumentation, controllers, control loop structures.  
Distributed Control System (DCS).  
Safety Instrumented Systems (SIS): ESD, HIPS, Fire & Gas System.

## NETWORK OPERATION MANAGEMENT

10.00  
d

Planning, material balance, allocations and accounts.  
Monitoring: facilities remote monitoring, cathodic protection systems performance monitoring.  
Metering stations: single-phase metering: operating principle and equipment, transactional metering of liquids, transactional metering of gases.  
Maintenance management: maintenance policy and objectives, maintenance costs and failure costs; reliability process measurement and follow-up, reliability analysis and improvement methods; outsourcing and subcontracting, shutdown management.

## HSE IN TRANSPORT FACILITIES

4.00 d

Main hazards associated with hydrocarbon transportation.  
Risk assessment tools. Job safety analysis.  
Risk in normal transport operations.  
Safe isolation of plant and equipment.  
HSE in maintenance and construction works. Permit to work system.  
Organizational framework, human factors.  
Sustainability management in transport operations. Environmental impact.

## TRANSPORT ECONOMICS

1.00 d

Investment costs (CAPEX). Operation costs (OPEX).  
Fundamentals of contracts. Pricing for access of third parties to the gas transport network.

## FINAL PROJECT & JURY

5.00 d

5-day teamwork on a real case study with deliverables to be presented on the last day (jury).  
The final project consists in proposing a design and operation philosophy for a pipeline network project.