

**Course Title:** Pipeline Flow Assurance

**Duration:** 3 Days

**Course Description:**

This comprehensive “Pipeline Flow Assurance” course comprises of lectures, photos and video presentations, some case studies and workshops providing an overview of pipelines flow assurance. This course provides an insight into the fundamentals of flow assurance design of pipelines issues for a reliable, safe, and economical design of pipeline systems. The topics of the course are carefully selected to cover flow assurance aspects from conceptual to detailed design, operation and maintenance. The principal code followed in this course is API-RP-14E (Recommended Practice for Design and Installation of Offshore Products Platform Piping Systems).

The attendees will receive a certificate from Z-Subsea by completion of the training course.

**This training course helps to gain understanding on:**

- Fundamental of flow assurance concepts
- Flow assurance in Onshore pipeline system;
- Flow Assurance in Subsea Pipeline System;
- Flow Assurance in Single phase and Multiphase pipeline systems;
- Steady State and Transient Flow Assurance
- Flow Assurance in multi-product pipeline systems .

**Who should attend:**

- Pipeline engineers;
- Marine engineers;
- Flow Assurance and Process Engineers;
- Subsea and offshore engineers;
- Project engineers and managers;
- Engineers from other sectors of the Oil and Gas industry who wish to gain understanding of Pipeline Flow Assurance.

## Course Contents

1. **Flow Assurance Concepts**
  - Basic Fluid Mechanics
  - Basics of Fluid Machines
  - Centrifugal Pumps
  - Centrifugal Compressors
  - Reciprocating pumps
  - Other types of pumps
  - Pipeline operations
  - Thermal Analysis
2. **Flow Assurance in Onshore Pipelines**
  - Onshore pipeline components
  - Pressure Boosting
  - Topographical considerations
  - Pilferage and safety (Case Study)
  - Flow Control vs Pressure Control
  - Considerations for multi-delivery pipelines
  - Ullage requirement calculations
  - Special considerations for station piping
  - Monitoring and detection of leaks
  - Solved Example
3. **Flow Assurance in Subsea Pipelines**
  - Infield Flowlines
  - Export Pipelines
  - Separation of Multiphase fluid
  - Processing of gas
4. **Flow Assurance in Single Phase Pipelines**
  - Single Phase Liquid Pipelines
  - Single Phase Gas Pipelines
5. **Flow Assurance in Multiphase pipelines**
  - Flow Regimes and flow pattern maps
  - Liquid Hold-up
  - Significance of GOR and watercut
  - Slugging in pipelines
6. **Steady state Flow Assurance in pipelines**
  - Pipeline sizing
  - Hydraulics
  - Pressure, Temperature profile generation
  - Well modelling
  - Simple pipeline modelling
  - Pipeline network modelling
  - Solved Example
7. **Transient Flow Assurance in pipelines**
  - Pipeline Shutdown Analysis
  - Pipeline re-start analysis
  - Flow rate ramp-up
  - Flowrate turndown
  - Cooldown analysis
  - Surge Analysis (Waterhammer)
8. **Internal corrosion and erosion**
  - Introduction to corrosion and Erosion
  - Cause of corrosion
  - Cause of erosion
  - Calculation of pipeline internal erosion
9. **Thermal Analysis in Pipelines**
  - Various Models of internal corrosion
  - Corrosion inhibitors
  - Erosion Calculation and API RP 14E
10. **Pipeline Pigging**
  - What are Pigs?
  - Types of pigs
  - Purpose of pigging
  - Infrastructure required for pigging
11. **Flow Assurance in Multi-Product Pipelines**
  - Properties of refined Petroleum Products
  - Simultaneous pumping of multiple products
  - Interface Management
  - Batching Pigs
  - Special considerations for ATF pipelines
  - Special consideration for LPG pipelines
12. **Hydrate management in pipelines**
  - Introduction to hydrates
  - Phase Envelope and hydrate formation curve
  - Avoidance of hydrates formation
  - Methanol or Mono-Ethylene Glycol injection
  - Kinematic hydrate inhibition
  - Anti-agglomerants
  - Hydrate modelling in Olga Hydrates software
13. **Slurry Pipelines**
  - Applications of slurry pipelines
  - Hydraulics of Slurry Pipelines
  - Pumps used in slurry pipelines
  - Special instrumentation in slurry pipelines
14. **Flow Assurance in Waxy oil pipelines**
  - Introduction to Wax
  - Wax appearance and formation temperature
  - Methods of wax management
  - Mitigation methods
  - Heat tracing
  - Catalytic cracking
  - Use of pour point depressants
  - Wax formation modeling in OLGA Wax software
  - Case Study (Rajasthan Crude Oil)
  - Intermediate heating
15. **Flow Enhancement methods**
  - Use of Drag Reducing additives
  - Use of Loop lines
  - Intermediate pressure boosting