

Introduction:

Precise flow measurement is a fundamental requirement in the oil and gas sector. This training program, which covers the foundations of process piping engineering in oil and gas, is designed to provide comprehensive knowledge of oil and gas processing to facility operators, technicians, and engineers.

Participants will gain an understanding of oil and gas flow measurement, including pneumatic devices used in the oil and gas field, and will acquire skills that remain useful long after the course is completed.

Targeted Groups:

- Engineers and technicians from all disciplines
- Instrumentation specialists
- Procurement and quality control staff
- Inspection and maintenance engineers involved in oil and gas certification programs

Course Objectives:

Upon completion of this oil and gas process training program, participants will be able to:

- Understand the legal and commercial metering requirements within oil and gas gathering systems
- Recognize design criteria, security systems, and the significance of accuracy in oil and gas operations
- Comprehend measurement concepts related to certification in the oil and gas industry and identify common types of error
- Grasp the principles of oil and gas flow measurement, meter proving, and sampling methods
- Assess certification programs in the oil and gas sector, turbine meter calibration, and control chart methods

Targeted Competencies:

- Laws governing fluid and gas behavior in process engineering within the oil and gas sector
- Core principles of flow metering, including precision and repeatability
- Main types and uses of flowmeters with a focus on custody transfer
- Techniques for proving and calibrating flowmeters in the oil and gas industry
- Custody transfer principles and their practical applications in oil and gas production

Course Content:

Unit 1: Typical Gas System Overview

- Typical gas pipeline system
- Role of the operator in gathering systems
- Overview of typical gas sales contracts

Unit 2: Typical Gas Metering System Overview

- Introduction to fiscal metering
- Pipework and valve arrangements
- Flow measurement in oil and gas systems
- Secondary instrumentation

Unit 3: Primary Flow Measurement Instrumentation

- Flowmeters
- Meter tubes and fittings
- Procedures for removal and replacement

Unit 4: Flow Measurement Accuracy

- Flow measurement uncertainty
- Rangeability and calibration
- Methods for calculating uncertainty
- Traceability

Unit 5: Secondary Measurement Instrumentation

- Pressure measurement
- Temperature measurement
- Density measurement

Unit 6: Gas Quality Measurement

- Gas sampling and conditioning system
- Relative density analyzers
- Moisture analyzers

Unit 7: Gas Chromatographs

- Introduction to gas chromatography
- Gas conditioning system
- Chromatograph operation and controllers
- Calibration and maintenance

Unit 8: Calibration and Proving

- Principles of proving and calibration
- Proving flowmeters and secondary measurement devices
- Meter prover performance issues
- Calibration of meter provers
- Calibration report calculations including meter factor and uncertainty

Unit 9: Computer System Overview

- Hardware and software functions
- Display formats
- Alarm handling and interpretation
- Response to input failures
- Stream flow computers (introduction, web server functions, personal computer setup, display and report editing)
- Supervisory computers

Unit 10: Supervisory Computer System

- Hardware and software
- Operator interface
- System security measures
- Communication systems

Unit 11: Metering Panel Auxiliary Equipment

- Analog to digital conversion
- Power supply systems

Unit 12: Introduction to Primary Flow Measurement Devices

- Introduction and basic pipe flow principles
- Mathematical models

Unit 13: Differential Pressure Flow Measurement Devices

- Basic theory
- Orifice meters, Venturi meters, and flow nozzles
- Low-loss devices
- Variable orifice meters and variable area meters
- Pitot tubes and Pitot-static tubes
- Target flowmeters

Unit 14: Displacement Flowmeters

- Fundamental principles
- Liquid meters
- Designs for gases
- Advantages, disadvantages, and applications

Unit 15: Rotary Inferential Flowmeters

- Turbine flowmeters
- Miscellaneous designs
- Advantages and disadvantages

Unit 16: Fluid Oscillatory Flowmeters

- Operating principles
- Vortex shedders
- Advantages and disadvantages

Unit 17: Electromagnetic Flowmeters

- Operating principles
- Alternating current and pulsed direct current types
- Applications
- Advantages and disadvantages

Unit 18: Ultrasonic Flowmeters

- Doppler type
- Time-of-flight type
- Clamp-on type
- Applications, advantages, and disadvantages

Unit 19: Mass Flow Measurement Devices

- Coriolis flowmeters
- Angular momentum devices
- Thermal meters
- Applications, advantages, disadvantages, and troubleshooting

Unit 20: Miscellaneous Flow Measurement Devices

- Cross-correlation methods
- Tracer methods
- Weighing methods
- Laser-based methods

Unit 21: Flow Measurement Systems and Custody Transfer Considerations

- Custody transfer requirements
- Meter factor
- Proving systems including direct, indirect, master meter, volume, and displacement methods
- Custody transfer skids
- Flow computers and communications
- Pressure and temperature measurements

Unit 22: Lease Automatic Custody Transfer System

- Overview of lease automatic custody transfer and automatic custody transfer installations
- Metering system components and functions
- Valves in liquid metering systems
- Temperature and pressure instrumentation
- Automatic sampling system

Unit 23: American Petroleum Institute Manual of Petroleum Measurement Standards

- Volume correction factors
- Calculation of petroleum quantities as related to certification training in oil and gas

Professional Certification Course in Oil and Gas:

Participants wishing to strengthen their credentials in the oil and gas industry may pursue a professional certification course. This program confirms a professional's expertise in specialized areas of the industry such as flow measurement, instrumentation, and processing. Earning such certification can support career growth and provide industry recognition in this highly specialized field.