

Oil & Gas Flow Measurement: Precision Training Course

Amsterdam (Netherlands)

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Introduction

Accurate flow measurement is essential for achieving efficiency, safety, reliability, and profitability throughout the oil and gas value chain. From production and pipeline transportation to processing, refining, and custody transfer, dependable flow data supports process optimization, regulatory compliance, effective operational control, and revenue integrity.

Flow measurement systems are exposed to numerous technical and operational challenges, including changing fluid properties, unstable flow conditions, equipment degradation, calibration errors, and measurement uncertainty. Even minor inaccuracies can lead to production losses, incorrect allocation, contractual disputes, inefficient process control, and significant financial consequences.

The Flow Measurement in Oil & Gas Processing course is an intensive five-day technical program designed for engineers, technicians, operators, maintenance personnel, and professionals responsible for flow metering and measurement systems. It provides participants with a comprehensive understanding of flow measurement principles, flow dynamics, meter technologies, calibration methods, uncertainty analysis, troubleshooting, and system optimization.

Participants will examine the operating principles and applications of differential pressure, positive displacement, turbine, vortex, ultrasonic, and Coriolis flow meters. The course also addresses multiphase flow measurement, custody transfer, fiscal metering, flow computers, leak detection, pipeline monitoring, traceability, and international standards.

Through technical presentations, practical exercises, calculations, case studies, and troubleshooting workshops, participants will develop the knowledge and analytical skills required to improve measurement accuracy, maintain system reliability, and support operational excellence across oil and gas processing environments.

Course Objectives

By the end of this course, participants will be able to:

- Understand the scientific principles and fluid dynamics that influence flow measurement accuracy.
- Differentiate between laminar, turbulent, and multiphase flow, and apply standard flow equations and Reynolds number calculations.
- Select suitable flow measurement devices based on fluid properties, operating conditions, and accuracy requirements.
- Understand the operation and applications of differential pressure, positive displacement, turbine, vortex, ultrasonic, and Coriolis flow meters.
- Apply calibration procedures, meter proving techniques, correction factors, and meter factor calculations.
- Conduct uncertainty analysis, identify measurement errors, and evaluate calibration records and performance data.
- Apply best practices in custody transfer, fiscal metering, flow computer management, and leak detection systems.

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- Troubleshoot flow measurement systems, optimize performance, and apply digital and smart metering solutions in line with API, ISO, AGA, and OIML standards.

Course Outlines

Day 1: Fundamentals of Flow Measurement

- Core principles of flow measurement and metering theory.
- Classification of flow types in oil and gas operations, including laminar, turbulent, and multiphase flow.
- Units, conversions, and standard flow equations.
- Fluid properties and their impact on measurement accuracy.
- Understanding flow profiles and Reynolds number calculations.

Day 2: Flow Measurement Devices

- Differential pressure flow meters, including orifice, Venturi, and nozzle types.
- Positive displacement meters and their applications in custody transfer.
- Turbine and vortex flow meters: operating principles and performance characteristics.
- Advanced flow measurement technologies, including ultrasonic and Coriolis flow meters.
- Comparative analysis of metering technologies for oil and gas processes.

Day 3: Calibration and Uncertainty Analysis

- Calibration principles, standards, and field procedures.
- Traceability requirements and calibration hierarchy.
- Uncertainty analysis in flow measurement and error quantification.
- Meter proving systems, correction factors, and meter factor determination.
- Performing uncertainty calculations and analyzing calibration records.

Day 4: Advanced Measurement Techniques

- Multiphase flow measurement technologies and operational challenges.
- Custody transfer and fiscal metering best practices.
- Flow computer systems: configuration, verification, and data management.
- Leak detection, mass balance, and pipeline monitoring systems.
- Custody transfer system validation and dispute resolution.

Day 5: Troubleshooting and Optimization

- Common causes of flow measurement errors and deviations.
- Diagnostic tools and field verification techniques.
- System optimization and maintenance planning for sustained accuracy.
- Integrating digitalization and smart metering solutions.
- Industry best practices and real-world troubleshooting case studies.

Why Attend this Course: Wins & Losses!

- Gain a comprehensive technical understanding of flow measurement principles and technologies in oil and gas operations.



- Select the most appropriate metering technology for different fluids and operating conditions.
- Improve the ability to calibrate, verify, and evaluate flow meter performance.
- Apply uncertainty analysis to identify error sources and improve measurement accuracy.
- Strengthen the reliability of custody transfer and fiscal metering systems while protecting revenue.
- Develop stronger troubleshooting, field verification, and problem-solving capabilities.
- Improve maintenance planning, reduce equipment downtime, and minimize operational losses.
- Enhance compliance with international standards while adopting digitalization and smart metering solutions.

Conclusion

Reliable flow measurement is a critical requirement for safe, efficient, and profitable oil and gas operations. The accuracy of metering systems directly affects process control, production reporting, custody transfer, regulatory compliance, maintenance performance, and revenue protection.

This course provides participants with a comprehensive technical framework covering flow measurement fundamentals, meter technologies, calibration procedures, uncertainty analysis, advanced measurement techniques, troubleshooting, and performance optimization.

Participants will gain practical knowledge of the selection, operation, verification, and maintenance of different flow measurement devices. They will also understand how to evaluate uncertainty, perform calibration and meter proving activities, manage flow computer systems, and apply custody transfer and fiscal metering best practices.

By the end of the course, participants will be equipped with the technical expertise and analytical tools required to improve measurement integrity, diagnose system problems, reduce operational losses, and maintain accurate and reliable flow measurement systems across oil and gas processing operations.



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