

Advanced Flow Measurement: Next-Level Oil and Gas Industry Training Courses

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Overview

Accurate fiscal allocation and custody transfer operations depend on precise metering systems to avoid financial discrepancies and process upsets. This course in advanced flow measurement examines primary flow elements, fluid dynamics, and automated meter verification protocols across upstream, midstream, and downstream operations. Participants evaluate meter station design, uncertainty budgets, diagnostic field logging, and multiphase metering technologies under prevailing engineering standards. Field practitioners leave equipped with calibration work plans, diagnostic matrices, and allocation auditing models. This course is delivered by Agile Leaders Training Center.

Who Should Attend

- Engineers responsible for maintaining fiscal metering skids and custody transfer stations.
- Instrumentation specialists responsible for calibrating Coriolis, ultrasonic, and differential pressure devices.
- Allocation coordinators responsible for multi-field hydrocarbon accounting and balance auditing.
- Project engineers responsible for designing metering stations and specification packages.
- Operations supervisors responsible for proving run compliance and meter diagnostics.

Departments and Industries

This course serves measurement and technical teams managing critical fluid accounting across process and transport sectors.

- Custody Transfer and Fiscal Metering Units in Crude Oil Terminals
- Process Automation and Control Groups in Natural Gas Processing Plants
- Hydrocarbon Allocation and Accounting Teams in Offshore Production Platforms
- Pipeline Integrity and Flow Assurance Divisions in Chemical Distribution Networks
- Instrumentation and Measurement Sections in Oil Refining Facilities

Learning Objectives

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

- Apply API MPMS and ISO standards to calculate measurement uncertainty across fiscal metering runs.
- Diagnose signal anomalies and velocity profile distortions in multipath ultrasonic flow meters.
- Evaluate Coriolis mass flow meter configurations under entrained gas and slurry conditions.
- Build calibration and proving workflows using pipe provers and compact prover records.
- Analyse wet gas and multiphase flow streams using differential pressure and radiometric data.

• Prioritise maintenance interventions using diagnostic logs from digital flow computers.

Course Agenda

Day 1: Fiscal Measurement Fundamentals and Differential Pressure

• Fluid Property Characterisation using AGA Report No. 8 and GERG-2008 Equations of State
• Orifice Meter Run Calculations using ISO 5167 Geometry and Discharge Coefficients
• Differential Pressure Transmitter Calibration using HART Protocol Communicator Tools
• Primary Element Inspection Protocols using API MPMS Chapter 14.3 Dimension Criteria
• Flow Computer Configuration Auditing using Custody Transfer Measurement Logs

Day 2: Ultrasonic and Turbine Flow Measurement Systems

• Transit-Time Multipath Ultrasonic Metering under AGA Report No. 9 Standards
• Chordal Velocity Profile Diagnostics using Path-by-Path Signal Ratio Analysis
• Axial Turbine Meter Verification using API MPMS Chapter 5.3 Performance Curves
• Flow Conditioning Design using Mitsubishi and Nova Flow Conditioner Layouts
• Acoustic Noise Mitigation Techniques using Valve Silencer and Swirl Reduction Sizing

Day 3: Coriolis Mass Metering and Gas Quality Analysis

• Direct Mass Flow and Density Measurement using ISO 10790 Coriolis Sensor Models
• Zero-Point Stability Verification using Field Zeroing and Diagnostic Damping Tests
• Online Gas Chromatography Setup using GPA Standard 2172 Calorific Calculations
• Moisture and Hydrocarbon Dew Point Tracking using Chilled Mirror and Laser Sensors
• Phase Separation and Entrained Gas Recovery using Drive Gain Envelope Monitoring

Day 4: Proving Systems, Calibration, and Dynamic Uncertainty

• Displacement Prover Sizing and Operation using API MPMS Chapter 4.2 Standards
• Master Meter Run Proving using Pulse Interpolation and Dual Chronometry Counters
• Uncertainty Budget Calculation using ISO/IEC Guide 98-3 GUM Worksheets
• Electronic Meter Prover Certification using Water Draw Calibration Methods
• Temperature and Pressure Compensation using API MPMS Chapter 11 Volume Correction Tables

Day 5: Multiphase Flow Measurement and Allocation Auditing

• Multiphase Flow Regime Mapping using API MPMS Chapter 20.3 Guidelines
• Water-Cut Monitor Verification using Microwave Resonance and Density Meter Data
• Subsea Wet Gas Metering Verification using Venturi Differential Pressure Correlations
• Hydrocarbon Allocation Auditing using Material Balance Reconciled Spreadsheets
• Capstone Dynamic Metering Station Commissioning Simulation and Handover Review

Practical Exercises

Participants work through technical measurement challenges to generate functional engineering deliverables.

- Suggested activity: Calculate the expanded uncertainty budget for a high-pressure gas ultrasonic metering system.
- Suggested activity: Analyse diagnostic path plots from an ultrasonic meter to identify asymmetric swirl distortion.
- Suggested activity: Calibrate a Coriolis density calculation curve against laboratory hydrocarbon samples.
- Suggested activity: Reconcile production allocation discrepancies using a pipeline network material balance sheet.

FAQs

How do ultrasonic and Coriolis technologies compare in fiscal service?

Ultrasonic meters handle large volumetric gas and liquid throughput with zero pressure drop, whereas Coriolis meters provide direct mass and density measurement without upstream straight runs, excelling in high-viscosity and fluctuating fluids.

What standard governs measurement uncertainty calculations in this curriculum?

Uncertainty workflows follow the ISO/IEC Guide 98-3 Guide to the Expression of Uncertainty in Measurement, combined with specific industry tolerances defined in API MPMS Chapter 13.

Does the agenda address wet gas and multiphase challenges?

Yes, the course examines over-reading corrections, phase split monitoring, and dual-energy gamma attenuation principles outlined in API MPMS Chapter 20.3 for non-homogeneous fluid streams.

What background is needed to gain value from this programme?

Participants should possess fundamental knowledge of fluid mechanics, basic instrumentation principles, and common field operations in hydrocarbon transport, refining, or processing facilities.

Conclusion

Participants return to their facilities prepared to lead flow measurement operations with rigorous engineering precision. By applying verified uncertainty models, diagnostic validation methods, and compliance standards, engineers ensure fiscal integrity, reduce allocation disputes, and maintain operational stability across fluid metering assets.

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