CONCEPT

Flow Measurement and Custody Transfer: Fiscal Metering, Proving and Allocation

24 – 28 October 2027
Dammam - Eastern Province five-star



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Introduction:

Flow measurement and custody transfer errors turn directly into money: a drifting meter factor, a wrong base condition, a poorly taken sample or an unlogged flow computer change can shift thousands of barrels or cubic metres between buyer and seller before anyone notices. This Core Concept course takes metering, instrument and allocation engineers through fiscal meter technologies, metering station design, proving, sampling, uncertainty, flow computers, allocation and dispute reconciliation. Participants build a Custody Transfer Metering Audit and Reconciliation Workbook for a station from their own operation.

Course Objectives:

- Convert metered quantities from actual to base conditions using the fluid properties that affect fiscal volume and mass
- Select and specify orifice, turbine, ultrasonic and Coriolis meters and meter run layouts for liquid and gas custody transfer points
- Prove meters with pipe provers, small volume provers and master meters and control meter factors over time
- Calculate net standard volume from sampling, BS&W and gas composition results
- Estimate the measurement uncertainty of a metering station and audit flow computer configuration and event logs
- Reconcile measurement imbalances, allocate production and prepare evidence for custody transfer disputes

Target Audience:

- Engineers responsible for designing, operating and maintaining fiscal and custody transfer metering stations
- Instrument engineers and technicians who prove, calibrate and verify flowmeters, transmitters and gas chromatographs
- Allocation and production accounting engineers who prepare hydrocarbon balances and back-allocation
- Measurement quality staff who audit flow computers, sampling systems and meter factor records
- Terminal, pipeline and gas plant engineers who handle meter tickets and measurement queries with counterparties

Course Outline:

Day 1: Custody Transfer Foundations: Fluid Properties and Base Conditions

- Custody Transfer Metering Points in Sales, Pipeline and Terminal Agreements
- Fluid Properties for Metering: Density, Viscosity, Compressibility and Water Content
- Base Conditions and Conversion from Actual to Standard Volume
- Volumetric Versus Mass Measurement Choice for Crude Oil, Products and Natural Gas
- Metering Station Current-State Assessment Checklist

Day 2: Fiscal Flowmeter Technologies and Metering System Design

- Orifice Metering to ISO 5167: Beta Ratio, Tappings and Reader-Harris/Gallagher Discharge Coefficient
- Turbine and Positive Displacement Meters for Liquid Hydrocarbon Batches
- Multipath Transit-Time Ultrasonic Gas Meters with AGA-9 as Reference
- Coriolis Mass Meters: Zero Stability, Density Output and Pressure Effects
- Meter Run Design: Straight Lengths, Flow Conditioners and Parallel Streams

Day 3: Meter Proving, Sampling and Gas Quality Measurement

- Pipe Prover, Small Volume Prover and Master Meter Proving Methods
- Meter Factor Calculation, Repeatability Limits and Control Charts
- Automatic Pipeline Sampling to ISO 3171 and Sample Handling Chain
- BS&W Determination and Net Standard Volume Calculation
- Gas Chromatograph Composition, Heating Value and Density at Overview

Day 4: Uncertainty, Flow Computers, Allocation and Loss Control

- Metering Station Uncertainty Budget Using ISO 5725-1 Accuracy Terms
- Flow Computer Configuration Parameters, Alarm Logs and Audit Trail Review
- Unaccounted-For Gas and Liquid Loss Tracking Against Tolerance Limits
- Production Allocation by Pro-Rata and By-Difference Methods
- Custody Transfer Dispute Causes: Meter Drift, Sampling Bias and Unlogged Configuration Changes

Day 5: Modelling Build: Metering Audit and Reconciliation Workbook

- Build: Station Uncertainty Calculation for a Gas and a Liquid Meter Run
- Build: Prover Data Reduction and Meter Factor Trend Sheet
- Build: Monthly Measurement Balance with Loss Investigation Log
- Build: Mismeasurement Correction and Counterparty Reconciliation Statement
- Metering Audit and Reconciliation Workbook Peer Review

Skills You Will Gain:

- Base Condition Correction
- Fiscal Meter Selection
- Meter Proving
- Net Standard Volume Calculation
- Measurement Uncertainty Analysis
- Flow Computer Auditing
- Hydrocarbon Allocation
- Measurement Dispute Resolution

Why Attend This Course:

- Return with a Custody Transfer Metering Audit and Reconciliation Workbook built around a metering station from your own operation
- Find the source of a measurement imbalance faster by checking meter factor, base conditions, sampling and flow computer logs in a set order
- Answer counterparty queries and mismeasurement claims with calculated evidence rather than estimates
- Compare metering practice with peers from upstream, pipeline, terminal and gas processing operations

Conclusion:

Every custody transfer figure rests on a chain of fluid properties, meter performance, proving, sampling, calculation and records, and a weak link anywhere moves value between parties. The course moves from base conditions and fluid behaviour through fiscal meter technologies and station design, proving, sampling and gas quality, then to uncertainty, flow computer audit trails, allocation and loss control. The final day produces a Metering Audit and Reconciliation Workbook ready for the next station audit or counterparty meeting.