Training Program:

Flow Measurement and Custody Transfer Training

INTRODUCTION

Every process plant in the world takes in bulk raw materials and fuel from tanker ships, railroad cars, tanker trucks, or pipelines. Refineries, chemical plants, pharmaceutical companies, and a host of other industries, have to measure raw materials and finished products accurately, because they pay for what comes in and get paid for what goes out. Transportation companies—the ones who own the tankers, railroad cars, or pipelines—also get paid for the amount of materials they move. Companies that push oil or gas through pipelines, for example, may operate on slim margins, so they want to know exactly how much of the oil or gas transported is involved. In addition, greenhouse gas emissions and CO2 trading are emerging applications, where accurate Flow Measurement is needed.
Whether it is oil, gas, or chemicals, a tiny error in the flow measurement of materials being transferred can cost a company millions of dollars in one year.
Custody Transfer takes place any time fluids are passed from the possession of one party to another (e.g., from producer to pipeline, pipeline to plant, or pipeline to storage facility).
Custody Transfer (or Fiscal Metering) refers to metering, that is a point of a commercial transaction, such as when a change in ownership of fluids takes place.
Hence, Custody Transfer defines the point at which ownership changes hands for the product being measured.
The custody transfer system must generate detailed and indisputable cargo reports, based on accurate flow measurements and calculations.
What makes custody transfer unique among flow-meter applications is that money changes hands and that accuracy requirements are higher than they are for most other applications.
Hence, Custody transfer systems are more than just flow-meters and they represent a combination of highly engineered flow measurement systems for the intended application.
Custody transfer metering requires exceptional accuracy, repeatability, and auditable values.
For instance, liquid custody transfer meters used to measure refined hydrocarbons have accuracy of ±0.125% or better, and repeatability in the range of ±0.02%.

COURSE OBJECTIVES:

- This course introduces participants to a variety of flow measurement technologies and systems that are used custody transfer applications, and gain an understanding about how measurement systems can work properly and accurately

- These include differential pressure (DP) measurement, turbine meters, positive displacement meters, Coriolis flow measurement, Magnetic and ultrasonic flow measurement
- Participants will gain the ability to determine if a metering system is adequate for the purpose, select appropriate systems and identify potential problems
- Other key learning objectives of this course include the understanding of the principles and applications of Multiple meters/meter runs, Flow computers, Quality systems, Calibration, Meter Runs, Proving and Supporting Automation
- Participants will also have a sound understanding of relevant fluid Laws that are needed for the use of flow measurement devices

COURSE OUTLINE

Day 1 - Basic Fluid and Gas Laws

- Pressure
- Flow Volume
- Continuity Principle
- Energy Law (Bernoulli's Equation)
- Pressure Change Equation
- Flow Configurations (Flow Profiles)
- Laminar Flow
- Turbulent Flow
- Reynold's Number
- Flow Losses (Friction Losses)
- Viscosity
- Ideal Gases
- Gas Laws, Boyle's Law, Charles's Law, Gay-Lussac's Law

Day 2 - General Characteristics and Performance of Flow-Meters

- System Characteristics
- Flow range and viscosity range
- Performance
- Accuracy
- Stability and Repeatability
- Sensitivity
- Noise
- Linearity
- Reliability
- Applications and Usage
- Sizing
- Calibration

Day 3 - Types and Applications of Flow-Meters
Differential Pressure (DP) Flow Meters

- Types; Orifice plates, Venturi tubes, flow nozzles, averaging Pitot tubes
- Systems, Operating Principle, Performance, Properties, Characteristics, Uses and Applications, Installation, Calibration
- Standard AGA3

Positive Displacement (PD) Flow Meters

- Types; Rotor, Oscillating Piston, Oval Gear, Rotating Paddle
- Slippage, Volume displacement

- Systems, Operating Principle, Performance, Properties, Characteristics, Uses and Applications, Installation, Calibration

Turbine Flow Meters

- Types; Conventional and Helical
- Problems with Erosion, corrosion, Cavitation and Obstructions
- Systems, Operating Principle, Performance, Properties, Characteristics, Uses and Applications, Installation, Calibration
- Standard AGA7

Day 4 - Types and Applications of Flow-Meters

Ultrasonic Flow Meters

- Systems, Operating Principle, Performance, Properties, Characteristics, Uses and Applications, Installation, Calibration
- Straight run requirement
- Standard AGA 9

Magnetic Flow Meters

- Systems, Operating Principle, Performance, Properties, Characteristics, Uses and Applications, Installation, Calibration

Coriolis Flow Meters

- Systems, Operating Principle, Performance, Properties, Characteristics, Uses and Applications, Installation, Calibration
- Standard AGA 11

Day 5 - Flow Measurement systems and other considerations

- Meter Factor
- Meter Runs
- Proving Systems; Direct, Indirect, Master Meter, Volume, Displacement

- Time Delay
- Quality Systems (Gas Chromatographs and Sampling Systems)
- Custody Transfer Skids
- Flow Computers and Communication
- Temperature and Pressure Measurements