



Chemical, Mechanical Engineering



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Course: Flow Measurement and Custody Transfer

Code	City	hotel	Start	End	price	Hours
364	Beirut (Lebanon)	Hotel Meeting Room	2023-12-17	2023-12-21	2550 €	25

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 $\pm 0.125\%$ or better, and repeatability in the range of $\pm 0.02\%$.

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 seminar 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.

Training Methodology

The course combines structured and focused presentations and discussions of topics covered with relevant examples and question & answer sessions to maximise the benefits to the participants.

Participants will be provided with comprehensive course notes and soft copies of all presentation material. These will be very valuable for detailed study and future reference.

Organizational Impact

The company will achieve improved and optimised control of its custody Transfer and flow measurement operations.

Optimised process selection criteria will increase efficiency and Financial Performance and result in Fiscal Savings.

This will be brought about by more accurate measurement techniques and more robust Custody Transfer operations.

Improved competencies will result in higher staff productivity and effectiveness.

Personal Impact

Participants will gain sound and practical understanding and extend their knowledge of Custody Transfer and Flow Measurement systems, principles and types, and how to assess their impact on the strategic and tactical aspirations of the company.

Participants will have the necessary information and confidence to conduct reviews of flow measurement systems and the ability to report to management on the status of the custody transfer systems in place and methods of improvement.

Participants will be able to minimise loss and increase Fiscal Gains, through the correct selection and operation of



flow measurement systems that are related to Custody Transfer.

Who Should Attend?

- Mechanical Engineers
- Process Engineers
- Chemical Engineers
- Instrumentation Engineers/ Metering Engineers
- Production Engineers
- Reservoir Engineers
- Valve Technicians
- Measurement Superintendent
- Custody Technicians
- Design Engineers
- Hydrocarbon Accountant
- Regulators (Government Agencies)
- Metering System Suppliers

Seminar outline

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

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



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

Flow Measurement Systems and Other Consideration

- 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

Types and Applications of Flow Meters (contd.)

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



The Scandinavian Academy employs modern methods in training and skills development, enhancing the efficiency of human resource development. We follow these practices:

- **Theoretical Lectures:**
 - We deliver knowledge through advanced presentations such as PowerPoint and visual materials, including videos and short films.
- **Scientific Assessment:**
 - We evaluate trainees skills before and after the course to ensure their progress.
- **Brainstorming and Interaction:**
 - We encourage active participation through brainstorming sessions and applying concepts through role play.
- **Practical Cases:**
 - We provide practical cases that align with the scientific content and the participants specific needs.
- **Examinations:**
 - Tests are conducted at the end of the program to assess knowledge retention.
- **Educational Materials:**
 - We provide both printed and digital scientific and practical materials to participants.
- **Attendance and Final Result Reports:**
 - We prepare detailed attendance reports for participants and offer a comprehensive program evaluation.
- **Professionals and Experts:**
 - The programs scientific content is prepared by the best professors and trainers in various fields.
- **Professional Completion Certificate:**
 - Participants receive a professional completion certificate issued by the Scandinavian Academy for Training and Development in the Kingdom of Sweden, with the option for international authentication.
- **Program Timings:**
 - Training programs are held from 10:00 AM to 2:00 PM and include buffet sessions for light meals during lectures.