



THE CHEMICAL ENGINEERING MAJOR

Flow Measurement For Industries

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Flow Measurement for Industries

Introduction:

Accurate flow measurement is essential to today's industries, oil & gas operations. Our Fiscal Metering Training Course aims to provide training to facility operators, technicians and engineers, which, once delivered, "keep on working".

Delegates are encouraged to raise queries both during and at any time after attending the course. Delegates are also encouraged to bring with them any issues that they may have to the course.

High quality multi-media is used to supplement traditional methods throughout the presentation, (based on our Interactive Training Software) which has proven to be more useful in explaining and understanding the topic than actually seeing a system in operation.

Who Should Attend?

Our General Industries, Oil & Gas Fiscal Metering Courses are designed to satisfy the information required of any one concerned with the operation, maintenance and readings from metering systems. This includes:-

- Operations Engineers
- Graduate Engineers

- Supervisors
- Operators
- Metering Specialist/Technicians

Objectives:

- Understanding the Legal and Commercial Metering Requirements
- Appreciate design criteria and importance of accuracy
- Understand measurement concepts and types of error
- Understand the basic concepts, principle of operation and equipment used for Gas metering, liquid metering, proving and sampling
- Understood the basic concepts, principle of operation and hardware used for typical flow computers, Prover Control Micro-computers and Supervisory Systems.
- Understand the typical operations, control functions and record keeping requirements
- Evaluate the results of Turbine Meter Calibration and determine the validity by use of Control Chart

Course Outline:

DAY 1

- TYPICAL GAS SYSTEM OVERVIEW
- Typical Gas Pipeline System
- Role of Operator

- Overview of Typical Gas Sales
- Contracts
- TYPICAL GAS METERING SYSTEM OVERVIEW
- Introduction to Fiscal Metering
- Pipework and Valving
- Flow Measurement
- Secondary Instrumentation
- PRIMARY FLOW MEASUREMENT INSTRUMENTATION
- The Flowmeter
- Meter Tubes and Other Fittings
- Removals/Replacement Procedure
- FLOW MEASUREMENT ACCURACY
- Flow Measurement Uncertainty,
- Rangeability and Calibration
- Calculating Uncertainty
- Traceability
- SECONDARY MEASUREMENT INSTRUMENTATION
- Pressure Measurement
- Temperature Measurement
- Density Measurement

DAY 2

- GAS QUALITY MEASUREMENT
- The Gas Sampling and Conditioning System
- Relative Density Analyser

- Moisture Analyser
- GAS CHROMATOGRAPHS
- Introduction to Gas Chromatography
- Gas Conditioning System
- Gas Chromatograph
- Chromatograph Controller
- Calibration and Maintenance
- COMPUTER SYSTEM OVERVIEW
- Hardware
- Software
- Display Formats
- Alarm Handling and Interpretations
- Response to Input Failures
- SUPERVISORY COMPUTER SYSTEM
- Hardware and Software
- Operator Interface
- System Security
- Communications
- METERING PANEL AUXILIARY EQUIPMENT
- Analogue to Digital Conversion
- Power Supplies

DAY 3

- INTRODUCTION TO PRIMARY FLOW MEASUREMENT DEVICES
- Introduction

- Basic Principles of Pipe Flow
- Mathematical Developments
- PRIMARY FLOW MEASUREMENT DEVICES - Differential Pressure Type
- Simple Theory
- Orifice Meters
- Venturi Meters
- Flow Nozzles
- Low Loss Devices
- Variable Orifice Meters
- Variable Area Meters
- Pitot Tubes and Pitot Static Tubes
- Target Flowmeters
- PRIMARY FLOW MEASUREMENT DEVICES - Displacement Flowmeters
- Basic Principles
- Liquid Meters
- Designs for Gases
- Advantages and Disadvantages
- Applications
- PRIMARY FLOW MEASUREMENT DEVICES - Rotary Inferential Meters
- Turbine Flowmeters
- Miscellaneous Designs

- Advantages and Disadvantages
- PRIMARY FLOW MEASUREMENT DEVICES - Fluid Oscillatory Flowmeters
- Principle of Operation
- Vortex Shedders
- Advantages and Disadvantages
- PRIMARY FLOW MEASUREMENT DEVICES - Electromagnetic Flowmeters
- Principle of Operation
- AC and Pulsed DC Types
- Applications
- Advantages and Disadvantages
- PRIMARY FLOW MEASUREMENT DEVICES - Ultrasonic Flowmeters
- Doppler Type
- Time-of -Flight Type
- Clamp-on Type
- Applications
- Advantages and Disadvantages
- PRIMARY FLOW MEASUREMENT DEVICES - Mass Flow Measurement
- Coriolis Flowmeters
- Angular Momentum Devices
- Thermal Meters
- Applications

- Advantages and Disadvantages
- PRIMARY FLOW MEASUREMENT DEVICES - Miscellaneous
- Cross Correlation
- Tracer Methods
- Weighing Methods
- Lasers

DAY 4

- CALIBRATION AND MAINTENANCE
- General Techniques
- Volumetric Methods
- Gravimetric Methods
- Meter Provers
- Reference Meters
- Miscellaneous Methods
- Gas Meter Calibration
- TYPICAL OIL DEVELOPMENT OVERVIEW
- Typical Oil Pipeline System
- Role Of Operator
- Overview of Pipeline
- Transportation Agreement
- FLOWMETER INSTALLATION GUIDANCE
- Introduction
- Sources of Installation Effects
- Effect of Installation on Flowmeter Performance

- Meter Run Design Criteria
- PRESENT DAY INDUSTRIAL PRACTICE
- Operation Conditions
- Size and Performance
- Industrial Usage of Flowmeters
- FLOWMETER COSTS AND FLOWMETER SELECTION
- Initial Considerations
- Flowmeter Selection Procedure
- Additional Factors
- COMPUTER MODELLING TECHNIQUES
- Software Packages
- Applications
- Limitations

DAY 5

- QUALITY ASSURANCE AND STANDARDS
- Traceability
- standards
- National Measurement Systems
- Accreditation Certificates
- MULTIPHASE FLOW MEASUREMENT
- Basic Principles
- Meter Classification
- Measurement Accuracy
- Problems

- Flow Regimes
- Modelling
- Phase Effects
- OIL QUALITY MEASUREMENT
- The Oil Sampling and Densitometer Fast Loop
- Water-in-Oil Monitor
- SELECTION AND BEST PRACTICE OF FLOWMETERS
- Classification
- Selection Considerations
- Problems
- Installation Planning and Installation
- Faults and Failures
- Application Tables
- FUTURE DEVELOPMENTS IN FLOW MEASUREMENT
- Flowmeter Developments
- Secondary Instrumentation
- New Materials