COURSE OVERVIEW IE0339
Oil & Gas Metering and Calculations - Fundamentals (E-Learning Module)

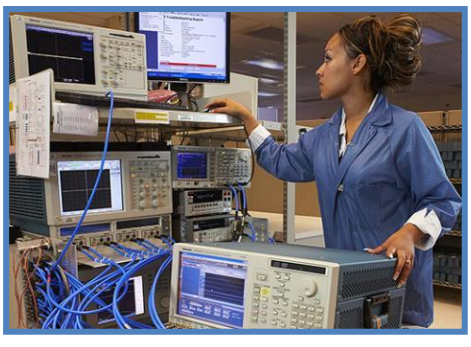
Course Title
Oil & Gas Metering and Calculations - Fundamentals (E-Learning Module)

Course Reference
IE0339

Course Format & Compatibility
SCORM 1.2. Compatible with IE11, MS-Edge, Google Chrome, Windows, Linux, Unix, Android, IOS, iPadOS, macOS, iPhone, iPad & HarmonyOS (Huawei)

Course Duration
30 online contact hours
(3.0 CEUs/30 PDHs)

Course Description



This E-Learning course is designed to provide participants with a detailed and up-to-date overview of the fundamental of oil & gas metering and calculations. It covers the basics of flow measurement and fluid flow metering systems; the factors affecting flow rates in pipes; the fluid velocity, pipe friction, viscosity, density, flow meter specifications, and hygiene requirements; the fluid flow metering systems; the four main meter styles for flow measurement; and the coriolis flow meters, oil ultrasonic flow meters, thermal flow meters and turbine flow meters.

During this interactive course, participants will learn the differential pressure flow meter; the detailed specifications of orifice flow meters; the flow meter installation, start-up procedure, operation limitations, turbine flowmeter troubleshooting guide and calibration; the gravimetric method, volumetric method, troubleshooting tips, capillary tube viscometer test method, rotary viscometer test method and volumetric method; the turbine flow meter verification, basic diagram of a meter proving, volumetric method, calculations using K-factors; the rotameter design components, the benefits of thermal mass flow meter, natural gas to combustion sources and thermal flow measurement.

Course Objectives

At the end of this course, the Trainee will be able to:-

- Apply and gain a fundamental knowledge on oil and gas metering and calculations
- Explain the basics of Oil & Gas flow measurement
- Explain different kinds of metering, purposes and importance of each
- Describe the setup of a metering skid and its components
- Explain the working principles of different types of meters (orifice meter, pitot tube, rotameter, turbine meter, volumetric meter, ultrasound meter, electromagnetic, vortex, thermal etc.) used in Oil & Gas industry
- Explain the importance of calibration and correction factors
- Explain the theory and equipment used for multi-phase metering
- Describe the metering equipment for gas metering
- Describe the factors affecting the accuracy of measurement
- Explain the methods to validate measurement
- Calculate specific gravity, density, molecular weight, gross/net heating values, GOR etc.
- Take readings and perform simple calculations for Oil & Gas flow measurement
- Discuss the basics of flow measurement and fluid flow metering systems including the factors affecting flow rates in pipes
- Determine fluid velocity, pipe friction, viscosity, density, flow meter specifications, and hygiene requirements
- Recognize fluid flow metering systems and provide vital information for the following purpose
- Identify the four main meter styles for flow measurement as well as coriolis flow meters, oil ultrasonic flow meters, thermal flow meters and turbine flow meters
- Discuss differential pressure flow meter including its types, advantages and disadvantages
- Describe the detailed specifications of orifice flow meters and apply flow meter installation, start-up procedure, operation limitations, turbine flowmeter troubleshooting guide and calibration
- Employ gravimetric method, volumetric method, troubleshooting tips, capillary tube viscometer test method, rotary viscometer test method and volumetric method
- Illustrate turbine flow meter verification, basic diagram of a meter proving, volumetric method, calculations using K-factors
- Identify the rotameter design components, the benefits of thermal mass flow meter, natural gas to combustion sources and thermal flow measurement

Who Should Attend

This course provides an overview of all significant aspects and considerations of the fundamental of oil and gas metering and calculations for engineers and other technical staff who are in charge of custody measurement and loss control for petroleum products in oil/gas fields, gas plants, export facilities, refineries, marine terminals or bulk storage plants. Engineers, shift supervisors and other technical staff involved in meter proving and calibration will benefit from this course.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course.

Certificate Accreditations

Certificates are accredited by the following international accreditation organizations: -

- USA International Association for Continuing Education and Training (IACET)

  Haward Technology is an Authorized Training Provider by the International Association for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 1-2013 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 1-2013 Standard**.

  Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Association for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

  Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

Training Methodology

This Trainee-centered course includes the following training methodologies:-

- Talking presentation Slides (ppt with audio)
- Simulation & Animation
- Exercises
- Videos
- Case Studies
- Gamification (learning through games)
- Quizzes, Pre-test & Post-test

Every section/module of the course ends up with a Quiz which must be passed by the trainee in order to move to the next section/module. A Post-test at the end of the course must be passed in order to get the online accredited certificate.

Course Fee

As per proposal

Course Contents

- Basics of Flow Measurement
- What is a Flow Meter?
- Flow Measurement Basics
- Fluid Flow Metering Systems
- What is Flow?
- Factors Affecting Flow Rates in Pipes
- Fluid Velocity
- Pipe Friction
- Viscosity
- Density
- Mass Flow Rate = Density x Volume Flow Rate
- Flow Meter Specifications
- Accuracy
- Repeatability
- Turndown Ratio or Rangeability
- Hygiene Requirements
- Cost

- Experience Matters
- The Three Different Flow Quantities to be Measured
- Fluid Flow Metering Systems Provide Vital Information for the Following Purpose
- Understanding Flow
- The Four Main Meter Styles for Flow Measurement
- Flowmeter Styles
- Turbine Flow Meters: Measure Volumetric Flow
- Transit Time Ultrasonic Flow Meter
- Ultrasonic Flow Meters Measure
- Vortex Gas Flow Meter
- Differential Pressure Meters
- Orifice Plate
- An Averaging Pitot Tube
- Why is Measuring Mass Flow Important?
- Coriolis Flow Meters
- Oil Ultrasonic Flow Meters
- Thermal Flow Meters
- Turbine Flow Meters
- Differential Pressure Flow Meter
- What is a Differential Pressure Meter?
- Types of Differential Pressure Flow Meter
- Advantages and Disadvantages of DP Meters
- The Main Disadvantages to DP Meters
- Common Terminology
- Orifice Flow Meters: Detailed Specifications
- Orifice Specifications
- Facts About Orifice Flow Meters
- Design Considerations of Orifice Plate
- Density
- Beta (β) Ratio
- β Ratio < 0.2 Means
- β ratio > 0.7 Means
- Selection of Differential Pressure Transmitter Range

- Orifice Tapping
- Flange Taps
- Vena Contracta Taps
- Corner Taps
- What is Integral Flow Orifice Assembly?
- Advantages of Integral Meter run assembly
- Flow Meter Installation
- DP Flow Transmitter Re-Ranging Calculation
- DP Flow Transmitter Re-Range
- DP Flow Transmitter Re-Ranging
- Variable Area Flowmeters
- Turbine Flow Meter
- Turbine Flow Meter Working Principle
- Flow Meter Ideal for Batching Applications
- Applications
- Cautions for Turbine Flow Meters
- Turbine Meter Advantages
- Turbine Meter Limitations
- Characteristics
- Installation Procedure
- Start-up Procedure
- Operation Limitations
- Turbine Flowmeter Troubleshooting Guide
- Calibration
- Master Meter
- Gravimetric Method
- Volumetric Method
- K-Factor
- Repeatability
- Troubleshooting Tips
- Density, Specific Gravity, Viscosity
- Density
- What is Weight and What is Mass

- How is Density Calculated?
- Unit of Density
- SI Unit of Density
- Other Density Units
- Density & Specific Gravity Instruments Information
- Specifications
- Specific Gravity (Relative Density) Instruments for the Gravity/Relative Density
- Application of Specific Gravity in Flow Measurement
- Methods for Determining Specific Gravity
- Effusion & Weighing Technology
- Viscosity
- Oil Viscosity – How It's measured & Reported
- Capillary Tube Viscometer Test Method
- Rotary Viscometer Test Method
- Viscosity Index
- Units of Viscosity
- Reynolds Number Formula
- Important Factors in Flow Measurement
- Ultrasonic Flow Meters, Ultrasonic Flow Meters
- Ultrasonic Flow Meters Working Principle
- Disadvantages
- Applications of Doppler Flow Meter
- In-line Ultrasonic Flowmeters for Liquids by the Transit-time Differential Method
- Flanged & Welded Versions
- The Same Principle as for Liquids
- Ultrasonic Gas Flowmeters
- Ultrasonic Gas Flowmeters for Custody Transfer
- High-temperature Versions
- UL330 Ultrasonic Flowmeter
- Types of Ultrasonic Flowmeter Operating by the Transit-time Differential Method
- Clamp-on Flowmeters
- In-line Ultrasonic Flowmeters for Gases by the Transit-time Differential Method
- The Same Principle as for Liquids

- Ultrasonic flowmeter system for custody transfer of Oil products
- Calibration of ALTOSONIC V
- KROHNE Altometer Calibration Facility
- Volumetric Method
- Magnetic Flow Meters
- Where Magnetic Flow Meters to use
- Metering Skids: Meter Prover
- What is Meter Prover?
- Why Companies Prove Flow Meters?
- Equipment Used for Proving
- Turbine Flow Meter Verification
- Basic Diagram of a Meter Proving
- Volumetric Proving Tank
- Pipe/Ball Provers
- Volumetric Method
- Standard Factory Calibration on Water
- Organization of Legal Metrology (OIML)
- How Custody Transfer Works
- Oil and Gas Custody Transfer
- How Custody Transfer Works
- Custody Transfer Measurement Technologies
- Ultrasonic Flowmeters
- Coriolis Mass Flowmeters
- Accuracy & Uncertainty
- Vortex Flow Meter and Pitot Tube
- Target Flow Meter
- Reynolds Number Formula
- Strain Gauge Sensor
- Ultrasonic Sensors
- Pitot Tube
- What is Averaging Pitot Tube?
- Averaging Pitot Tube
- Advantages of Averaging Pitot Tube

- Target Flow Meter
- Target Flow Meter Working Principle
- Flow Meter K-factor & Calculations & Flow Meter Accuracy
- Flow Meter K-factor
- Calculations Using K-Factors
- Pulse Signal K-factors
- Impact of Flow Meter Accuracy
- Repeatability
- Uncertainty
- Accuracy
- Percentage of Full-Scale Deflection (FSD)
- Difference between Different Types of Flow Meters
- Hysteresis
- Comparison of Flowmeter
- Electromagnetic
- Mass-Coriolis
- Mass-Thermal
- Orifice
- Turbine
- Ultrasonic
- Vortex
- Flow Units Converting Table
- Rotameter
- Rotameter Working Principal
- Advantages
- Disadvantages
- The Basics of Rotameters
- Rotameter Design Components
- Glass Tube Rotameters
- Metal Tube Rotameters
- Plastic Tube Rotameters
- Thermal Mass Flow Meter
- Thermal Flow Meter

- Benefits of Thermal Mass Flow Meter
- Applications
- Natural Gas to Combustion Sources
- Compressed Air
- Biogas Production
- Flare Gas
- Aeration Air
- Combustion Air
- Actual Flow versus Standard Flow
- Thermal Flow Measurement