Welcome to the **FUNDAMENTALS OF LIQUID HYDROCARBON MEASUREMENT** course presented by the International School of Hydrocarbon Measurement (ISHM). This course provides foundational understanding of the core principles used to determine liquid hydrocarbon quantities and qualities in the energy industry.

This course will cover current technologies used in the energy industry. In approximately 11 hours, students will enhance their understanding of current liquid hydrocarbon measurement practices.

The content for this course will include:

1. Introduction to Liquid Measurement
    a. Objective of Liquid Measurement
    b. Liquid Measurement
        i. Units of Measurement
        ii. Industry Standards
            1. API
            2. ASTM
            3. GPA
        iii. ISO
        iv. Types of Liquid Measurement
            1. Volume
            2. Inferred Mass
            3. Direct Mass and Why the Difference
        v. Influence of Liquid Types on Measurement

2. Properties of Petroleum
    a. Introduction
    b. Chemical Composition of Hydrocarbons
    c. Testing Procedures for Hydrocarbons
    d. Significance of Petroleum Testing
    e. Impact operational parameters have on liquid measurement

3. Static Measurement
    a. Introduction
    b. Basic Tank Calibration
    c. Calculation of Tables required for Static measurement

d. Gauging Equipment and Methods
    i. Manual Method
    ii. Automatic Method
e. Static Measurement Calculations

4. Dynamic Measurement
    a. Criteria for Metering
    b. Types of Meters and Principles of Measurement
        i. Displacement Meters
        ii. Turbine Meters
        iii. Coriolis Meters
        iv. Ultrasonic Meters
    c. Accessory Equipment

5. Overview of Meter Provers
    a. Types
    b. Calibrations
    c. Sizing
    d. Operation of provers

6. Overview of Dynamic Measurement Systems
    a. Gathering Systems
        i. LACT Units
        ii. Truck Loading Systems
        iii. Truck Un-Loading System
            1. Refined products type systems
            2. LPG/NGL/Chemical type systems
        iv. Mass Measurement systems
        v. Pipeline systems
            1. Offshore platform systems
            2. Marine loading and unloading systems
            3. Bi-directional systems
            4. Viscous fluids systems
            5. Dense Phase Systems

7. Quality Determination
    a. Introduction
    b. Definitions
    c. Representative Sampling
        i. Manual Sampling
        ii. Dynamic Sampling
    d. Manual Sampling Components
        i. Manual Sampling Devices/Components
    e. Dynamic Sampling Systems (Types)

i. Crude systems
ii. Refined Products systems
iii. Light Hydrocarbon systems
iv. Analytical testing/Industry Standards and how they guide testing
    1. API
    2. ASTM
    3. GPA
    4. ISO
v. Crude Oil (typical tests)
    1. Field
    2. Lab
vi. Refined Product (typical tests)
    1. Density
vii. Light Hydrocarbon (typical tests)
    1. Chromatographic Analysis
    2. Density

8. Calculation of Quantities
    a. Definitions
    b. Physical Properties
    c. Typical Calculations
        i. Static Calculation
            1. Upright Cylindrical Tank
            2. Marine Tank
        ii. Dynamic Calculation
            1. Meter Factor Calculation
            2. Meter Ticket Calculation
            3. Meter Prover Calibration Calculations

9. Loss Control Analysis
    a. Metering Accuracy
    b. Tank Gauging Accuracy
    c. Other Factors affecting Accuracy
        i. Physical Properties
        ii. Operations Conditions
        iii. Equipment Limitations
    d. Sources of Measurement Losses and Gains