

Fundamentals of Liquid Measurement

2.5 Days

- **Fundamentals**
 - Historical perspective
 - Purpose of measurement
 - Physical properties
 - » Chemistry
 - » Phase relationships
 - » Component distribution
 - » Chromatography
 - » Hazards and safety issues
 - » Density
 - » Viscosity
- **Basics of Volume and Mass Measurement**
 - Why mass measurement is used
 - Why volume measurement is sometimes used
 - Solution mixing
 - How mass is determined using volume measurement
 - Types of equipment used in mass measurement
 - Methods used to determine the composition
 - Inferential mass computation
 - Basic measurement terminologies
- **Direct and Inferential Measuring Devices**
 - Principles of operation and performance evaluations
 - » PD meters
 - » Coriolis mass flow
 - » Flow conditioning
- **Performance Verification**
 - Proving of densitometers
 - » Pycnometers
 - » Meter provers
- **Densitometry**
 - Types
 - Principles of operation of vibrating tube densitometers
- **Performance Verification**
 - Provers, meter factors, and control logs
 - Meter factor deviation limits
 - Ensuring efficient proving operations
 - Why some meter types are harder to prove
 - Proving an ultrasonic flow meter
 - Estimating required proof volumes
 - Variation in meter frequency due to turbulence
 - Output stability and process delay

- **Operational Experience with Small Volume Provers (SVP)**
 - SVP defined
 - Dual chronometry
 - Optical switches
 - Reliance on mechanical precision
 - Seals
 - Inspection
 - Water draw
 - Field operations
- **Material Balance in NGL Systems**
 - Primary measurement
 - Role of densitometry
 - Sampling
 - » Sizing the sampler
 - » Establishing sampler pacing
 - Chromatographic analysis and its impact on component balances
 - Fundamental differences between measurement and component balances
 - Troubleshooting and establishing the origins of LAUF in NGL systems
- **Static Measurement**
 - Calibration of storage tanks
 - » Tank strapping
 - » Circumferential measurement
 - » Tilt
 - » Deadwood
 - » Bottom survey
 - » Floating roof measurement
 - » Tank capacity calculations
 - Measurement of liquid quantities
 - » Care of equipment
 - » Gauging
 - » Tank sampling
 - » Observation of gravity and temperature
 - » Corrected or API gravity
 - » Gauging of free water
 - » Tank temperature