Fundamentals of Crude & NGL Measurement
Training Curriculum
(3 Days)

- Physical properties
  - Chemistry
  - Phase relationships
  - Component distribution
  - Chromatography
  - Hazards and safety issues
  - Density
  - Viscosity
- Basics of volume and mass measurement
  - Measurement – mass or volume?
  - Solution mixing
  - How mass is determined using volume measurement
  - Types of equipment used in mass measurement
  - Methods used to determine composition
  - Inferential mass computation
  - Basic measurement terminologies
- General introduction to crude oil from wellhead to refinery
- Production allocation: measurement at first point of separation
  - Two-phase and three-phase separator measurement
  - Multi-phase measurement
- Tanks
  - Construction
  - Gauging
    - Manual volume gauging
    - Automatic volume gauging
    - Temperature determination
    - Overall function
    - Examination of components
    - Safety features
    - Security
    - Sampling systems

- LACT units *(Focus on routine checks and key items to ensure working correctly as audience is accountable for monitoring & maintenance)*
  - Temperature determination
  - Overall function
  - Examination of components
  - Safety features
  - Security
  - Sampling systems
    - Setup
    - Maintenance
- LACT controllers, PLCs and ticketing *(Less focus)*
- Physical properties
  - Gravity determination
  - Water determination, managing the shakeout
  - H2S hazards and safe work practices
- Proving
  - Mass
  - Volumetric
  - Meter factor
    - Witnessing
- Performance verification
  - Proving of Densitometers
  - Pycnometers
    - Selection
    - Installation
    - Field Use
  - Meter provers
    - Types
    - Certification
    - Pulse Interpolation Technique

- Densitometry
  - It's all about the money!
  - Types
    - Principles of Operation of Vibrating Tube Densitometers
- Material balancing in NGL systems
  - Primary measurement
  - The 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
- Asset Balancing *(Students need to understand the 'why' of the task.)*
  - Calculations
  - API requirements - meeting the standards
  - Balancing a gathering system
  - Balancing a pipeline
  - Maintaining an auditable process
- Review of calibration and maintenance of measurement equipment
- Questions and open discussion on measurement issues by the field