Key Measurement Audit Practices

by ADMINISTRATOR IMEC Corporation

Delivery Point Management is a sequence of controls that provide assurance that delivery point volume and component balances are being achieved at a standard of excellence established by concerned parties.

Production, midstream and pipeline companies often experience monetary product losses but sometimes lack the resources required to investigate root causes. Most oil and gas related companies have two or more departments involved with the measurement process, product balance, component balance, and allocations, all of which have an impact on the financial interests of their ownership. This multi-jurisdictional process requires well defined authorities, responsibilities and controls for effective material balance management.

This is where an effective measurement audit protocol comes in to play.

Why Audit?

The focus of the AER (Alberta Energy Regulator, see the directive017) is on volumetric imbalances. Hence, production accountants are focused on estimates to actuals, volume imbalance, shrinkage and yield, and revenue collection. If the PA checks and balances are fine then measurement, engineering, JV, commercial operations, and marketing typically have no issues.

Allocations may cause component losses; these volume losses by component are sometimes made up by lighter less valuable components in the allocation. This process causes financial impact of component imbalances to slip through the volume validation processes.

Good measurement audit practices are required to investigate liquid and gas metering, liquid and gas sampling, liquid and gas analytical methods, allocations, and reporting processes. The audit should focus on mitigating or eliminating monetary losses from production to final sales of fluids. This requires a volumetric balance review and a component allocation review of streams that are or may have been blended.

The audit should be established around the AER EPAP protocol (Directive 17) as a minimum but should be enhanced where practical and necessary to ensure measurement practices are meeting company minimum standards that are likely more stringent to ensure high-risk items are being addressed appropriately.

What are the high-risk items that the audit should target?

High-risk facilities are typically ones with third party volumes associated with the company's volumes. Production Accounting checks and balances are not configured to the component level. The volume balances used for reporting are not detailed enough to detect the missing components.

A thorough understanding of the following is required;

- Volumetric shrinkage, yields and the typical losses / gains across various processes.
- Measurement uncertainties for metering and sampling of all fluid types.
- Blending equations and the impact of blending on monetary gains and losses.
- Component analysis of sales and production streams

- Determination of net gain/ loss based upon allocations
- Configuration of volume and/ or component allocation systems to resemble the questioned plants allocation process.
- Contract analysis and input on new contracts associated with blending of liquids and midstream contracts
- Third party facility review to validate measurement sampling and analysis processes.
- Review process equipment pressures and temperatures to run HYSYS models on the facility.
- Calibration, certification and verification schedules for all metering and measurement related instrumentation.

What should the Audit report contain?

- Overview
    - Location, time, date
    - List of participants
    - Scope of work
    - Reference to Check Sheets
- Executive summary of observations and recommendations.
    - General statement of findings
        - Positive
        - Improvements
        - Concerns
- Detailed list of:
    - Information required to conduct the review and reconstruct the allocation,
    - Onsite review of measurement equipment and processes used in the allocation,
    - Detailed reconstruction of allocation to determine fairness and accuracy.
- Observations including:
    - Impact assessment of design and operations of gas and liquid measurement facilities,
    - Impact assessment of meter proving and transmitter calibrations,
    - Impact assessment of Equation of State for liquid and gas correction to STD pressure and temperature,
    - Impact assessment of Liquid and gas sampling and analysis,
    - Overall impact of allocation and metering uncertainties.
    - Detailed report of measurement biases of all metering reviewed, proposals to increase monetary value.
    - Regulatory compliance review, and
    - Measurement schematics for all facilities under review.
    - Copies of calibrations, certifications and verification schedules.
    - List of non-compliance events/items to include
        - Regulatory reference
        - Company standard reference
        - Suggested priority rating.
- Recommendations:
    - Follow **I.O.R** to make recommendations on improvements or corrections to deficiencies
        - Define the **I**ssue.
        - Provide **O**ptions.
        - Suggest **R**ecommended Option.
    - For Improvement
        - Identify and quantify if possible the potential benefits.
    - For Deficiencies
        - Identify the items that need attention and reference the appropriate standard/requirements c/w deficiency analysis.
        - Set a timeline and assign responsibility.
        - Provide I.O.R for each deficient item

- Conclusions:
    - Statement outlining the overall assessment