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AUDITING GAS MEASUREMENT AND ACCOUNTING SYSTEMS

Class # 7040.1

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INTRODUCTION

The intent of this paper is to address the different auditing requirements of Natural Gas Measurement and most common measurement adjustment issues. The following issues should be addressed in the audit process:

1. The Contract
2. Measurement Systems
3. Measurement Standards
4. Measurement Statements and Reports
5. Accounting Systems

CONTRACTS

Obtaining a contract for the measurement station to be audited is the first step. Review the contract to learn the applicable conditions and standards. The sections of the contract usually concerning Measurement Auditing are Definitions, Quality and Measurement. These three sections usually define the physical conditions, equipment, units and standards agreed by the parties to measure the gas flow at the specific location. Good contracts are specific and refer to a particular standard or standards as guidelines. Manufacturing guidelines are requested in some contracts. Some contracts are not specific and have generalizations. A generalization common to contracts is “accepted engineering practices”. Other concerns not in a contract between two parties are regulatory agency requirements. Regulatory agencies have measurement requirements not included in a specific contract. These agencies are Bureau of Land Management (BLM), Federal Energy Regulatory Commission (FERC), Bureau of Indian Affairs (BIA), and individual state regulatory agencies.

MEASUREMENT SYSTEMS

Primary (physical meter), Secondary (recording device) and Tertiary (office systems) are the three elements of a measurement system. Most contracts specify the type of meter (Primary Element) for measurement. The most common meter in gas measurement is the Orifice meter. Other common types of meters are Turbine, Ultra-Sonic, Positive Displacement, V-Cone, and Coriolis. The recording device is usually a chart recorder, a separate Electronic Flow Meter or incorporated in the physical meter. The Tertiary element is the data collection and accounting systems. These accounting systems collect data, archive data, audit data, disperse and allocate financial earnings and debits.

MEASUREMENT STANDARDS

Measurement Standards have been produced by organizations compromised of representatives from companies throughout the industry. Many hours and dollars have been spent to acquire information to produce better measurement standards. Gas measurement standards may be divided into two parts. The two parts are Flow Measurement and Analysis. The following are the most common standards pertaining to each part.

Flow Measurement Standards:	Application
AGA (American Gas Association) 3	Meter Tube Specifications
AGA 8	Compressibility Standard
API (American Gas Institute) 21.1	EFM (Electronic Flow Measurement) Standard
API 20.1	Allocation Standard

Analysis Standards:	Application
GPA (Gas Processors Association) 2145	Factors for Calculations
GPA 2166	Gas Sampling
API 14.1	Gas Sampling
GPA 2172	Gas Calculation
GPA 2261	Natural Gas Analysis
GPA 2286	Natural Gas Extended Analysis

MEASUREMENT STATEMENTS AND REPORTS

When auditing a system, several statements and reports will be required. The most common reports required are:

1. Pumper Reports
2. Calibration Reports
3. Witness Reports
4. Volume Statements – Original and Edited (final)
5. Flow Charts
6. Configuration Reports
7. Gas Analyses
8. Event Reports

Any information concerning the operation of the well or system in the audit is helpful. The transfer of field to office data is one of the most common errors found in measurement auditing. The contract usually sets the limit of retention time of all data. B.L.M., B.I.A. and other agencies may require longer retention periods.

ACCOUNTING SYSTEMS

Event Log

The event log is a record that notes and records all exceptions and changes to the flow parameters contained within the configuration log that occur and have an impact on a quantity transaction record. The event log will list the old and new value with the date and time of the change chronologically. EFM's may have alarms included or a separate log for alarms.

Corrected Transaction Records

The Corrected Transaction Records reflect the constant flow parameters not available, entered incorrectly or an error at a later time. These are also documents corrected as a result of calibration, failure, or adverse operating conditions of the operating equipment. The original records should always remain intact as a permanent record. The combination of the original record and the corrected record will provide detailed tracking of the custody transfer quantities.

Test Records

Test records are any documentation either electronic or hard copy produced in the testing or operation of the metering equipment that would effect the final measurement quantities.

Data Retention

Unless specified by regulation, tariff, or contract the minimum retention period for the electronic flow measurement trail shall be two years.

Most Common Adjustments in Measurement

1. Data Entry Errors
    a. Incorrect Orifice Plate or Meter Tube size
    b. Incorrect analysis data in volume statement
    c. Incorrect Atmospheric pressure (PSIG or PSIA)
    d. Incorrect range of recorder
2. Calibration and Verification of Recording Device
    a. Not testing all the required set points
    b. Most common requirement + or – 2% accuracy
    c. Not testing for DP under pressure
    d. Not testing per contract scheduled time
    e. Calibration and test equipment not certified in a timely manner
    f. Zeroing transducer or recorder
3. Gas analysis
    a. Using Ideal instead of Real values
    b. Incorrect Contract pressure base
    c. Incorrect Moisture Content – (Dry, Saturated or As-Delivered)
    d. Default analysis in EFM
4. Test Reports not filled out properly.
5. Operational
    a. Batteries with low power
    b. High or Low DP Cut-Off
    c. Bad Transducer
    d. Meter frozen
    e. Plunger lift and intermitter applications

How to calculate discrepancies

The equation to calculate the money produced for a known quantity in Thousand Cubic Feet (MCF) of gas at a designated quality of gas in British Thermal Units (BTU) is:

MCF X $$$/MCF X BTU Factor = Total $$$

1 BTU Factor = 1000 BTU

Example: 1,000 MCF or 1MMCF X $5.00 X 1.000 BTU Factor (1000 BTU) = $5000

This equation is used to determine the difference in dollar values between different volume statements.

Example: If an error of 10 BTU from an analysis for 1000 MCF/ Day was produced. The following calculation would be used to calculate the amount of correction in dollars:

1,000 X $5 X 0.010 = $50.00/Day error

CONCLUSION

The auditing of Gas Measurement and Auditing Systems requires the auditing of the 3 different elements of measurement, the Primary (physical meter), Secondary (recording device) and Tertiary (office systems) systems. It is always recommended to visit the measurement site before an audit to secure the identification of the measurement equipment. The most common errors are incorrect values entered in the accounting process from the field to office. If communication between the office and field are not present, errors will occur. Contracts contain the rules governing the audit process. It is recommended to use Industry Standards in contract language. The more measurement and operational information available, the greater probability of a successful audit performed.