

AUDITING ELECTRONIC GAS MEASUREMENT PER API CHAPTER 21.1

Class # 7030

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Introduction

Since the 1990's Electronic Gas Measurement has become more widely used than Barton chart recorders. With this comes the necessity of EGM auditing. It is rapidly transforming the element of interpretation by manual chart integrators to the evaluation of numeric data. EGM is quickly becoming the preferred method of gas measurement. Although EGM data is more accurate than chart recorders there is still the possibility of errors occurring. Therefore, EGM auditing is essential to verify the accuracy of the data that is used for volume reporting. Having all necessary data is imperative to the assessment process and is the foundation of a successful audit.

EGM Audit Pre-Requisite Information

- ❖ Prior to beginning an EGM audit, the following information will need to be available for review:
 - **Original Hourly and Daily Records**
 - Key components include:
 - ◆ Differential Pressure
 - ◆ Static Pressure
 - ◆ Temperature
 - ◆ Flow Time
 - ◆ Calculated MCF
 - **Events Log**
 - The Events Log contains changes and exceptions affecting the flow parameters.
 - **Characteristics Log**
 - The Characteristics Log contains constant flow parameters for the meter. Some essential components include:
 - ◆ Orifice plate size
 - ◆ Pipe diameter
 - ◆ Pressure Base
 - ◆ Device ID
 - ◆ Contract Hour
 - **Current Gas Analysis**
 - The Gas Analysis reflects Specific Gravity and a breakdown of gas components.

- **Meter Test Reports**

- Meter Test Reports provide documentation of meter inspection as well as changes in unit equipment such as Orifice Plate changes.

- **Reported Volume Statement**

- The Reported Volume Statement is the previously calculated volumes which are the source for comparison of volume variances.

Review of Data

Once all of the pre-requisite information and documents have been gathered, the previously calculated volumes must be compared to the supporting data. The hourly and daily records, characteristics log, gas analyses, meter test reports, etc. serve to explain the previous calculations as well as reference points for revised calculations. At times, the errors will be apparent simply by observing the supporting documents. However, many times an in-depth review of the data files is required to locate discrepancies.

Reporting Audit Discrepancy Findings

If original volumes prove to be erroneous after the auditing review process is complete, a letter should be drafted to the company requesting the audit. In this letter, the author should clearly define the sources of error as well as provide recommendations and a plan of action to resolve the volume discrepancies.

Frequent Causes for EGM Inaccuracies

There are numerous potential causes for inaccurately reported volumes. Below are some of the most common types of errors. Data entry errors and meter equipment malfunctions are the most prevalent types of causes for imprecision in volume calculations.

❖ Data Entry Errors

- Incorrect gas analysis applied
 - Most current analysis not entered
 - Inaccuracy of gas sample data
 - No analysis applied to calculate volume
- Incorrect characteristics data entered into unit
 - Incorrect orifice plate size
 - Incorrect pipe diameter
 - Incorrect pressure base or atmospheric pressure
 - Incorrect contract hour set
- Volumes for missing data periods
 - Over-estimating volumes
 - Under-estimating volumes
 - Overlooking missing data periods
- Zero cut-off set incorrectly
 - Cut off set too high resulting in low differential being read as zero

❖ Meter Equipment Issues

- Meter out of correct calibration
 - The meter reads at a deviation from zero
- Meter out of service
 - Equalizer valve left open
 - Isolation valve left closed
 - Meter tube totally or partially bypassed
- Bad transducer
 - Data obtained from meter not being transformed into an appropriate and or readable form.
- Dead Battery
 - The unit battery has fallen below minimal charge levels and has initiated sleep mode.
- Over-ranging
 - Differential or static exceeds the set limits defined by the AMU.
- Damaged orifice plate
 - Nicked
 - Bowed
 - Dulled
- Dirty orifice plate
 - Dirt build up
 - Petroleum-related material build up
- Out of beta ratio
 - The orifice plate diameter ratio to the pipe diameter exceeds recommended proportion.

❖ Various Sources of Error

- Freezing of Meters
 - Hydrocarbons and water under specific temperature and pressure constraints can form a solid hydrate, impeding the flow in the pipeline.
- Leaks
 - Leaks can be present at:
 - ◆ Seal ring
 - ◆ Meter
 - ◆ Pipeline
- Fluids
 - Fluids can cause false flow readings.

Conclusion

Proper assessment and management of data ensures accurate volume reporting. To achieve this, necessary documents and data must be accessible and complete. A good working relationship with the company requesting an audit is imperative to accomplish auditing goals. The requesting party supplies the supporting documents and information as well as potentially employs the recommendations made by the auditor. The EGM audit process is a joint venture between the auditor and the requesting entity. Successfully completing an audit requires a cooperative attitude, a thorough compilation of data and meticulous study of the information compiled.

References

American Petroleum Institute. Manual of Petroleum Measurement Standards, Chapter 21 "Flow Management Using Electronic Metering Systems," Section 1 "Electronic Gas Measurement." September 1993.

Fish, David J. "Freeze Protection for Natural Gas Pipeline Systems and Measurement Instrumentation" April 2005 <http://help.intellisitesuite.com/ASGMT%20White%20Papers/papers/057.pdf>. Accessed 18 March 2010.

Menzel, Gary P. & Squyers, R. Michael. "Electronic Gas Measurement Audit." Acadiana Flow Measurement Society. 1999. <http://www.afms.org/scourse/97sc2.htm>. Accessed 11 February 2010