GAS CONTRACTS' IMPACT ON MEASUREMENT ACCURACY

T. Dean Graves

Devon Energy Corporation

INTRODUCTION

Much effort is spent to achieve accurate measurement. Up to date measurement standards, modern meter station design, high quality equipment, and proper measurement operations are all necessary for measurement accuracy. Unfortunately, these processes do not assure measurement accuracy if the contract does not also support accurate measurement. The contract impacts measurement accuracy by what it addresses and what is left unaddressed. More focus needs to be applied to the measurement sections of the contracts. Hopefully this paper will help the reader better understand the relationship between the contract and accuracy.

CONTRACT 'GOVERNS' MEASUREMENT

The contract establishes the rules or guidelines for measurement. Questions such as "what is an MCF or BTU", "what standards apply", "how is the volume calculated", or even "what is the final volume" must be properly addressed in the contract. A common misconception is that current measurement standards 'govern' measurement. The truth is that the contract actually "trumps" measurement standards. If a contract states that certain factors shall be excluded from the calculation, then the volume will be based on this less than accurate process. New standards are not used if the contract acknowledges an older standard without a way of accepting anything newer. A recent trend in contracts is not to list the acceptable standard but leave it vague so the controlling party can use the standard of their choice.

CONTRACT VOLUMES

Many people do not realize there are multiple volumes the contract must address. There are at least 3 different volumes the contract must address:

- Measured Volume - MCF
- Calculated Volume - MMBTU
- Transaction Volume
- Final Volume

If the contract focuses on one but leaves the others vague, the final results will be compromised. Special emphasis should be applied to the "Transaction Volume" because it is the actual volume that is used by accounting for all business functions.

Measured Volume – MCF

The first volume that should be addressed is the measured MCF. There are several items regarding the MCF that the contract must deal with. Otherwise the parties will work under assumptions.
Definitions such as MCF, pressure base, temperature base, atmosphere pressure, day, month are just some of the items that must be defined.

Applicable Standards – What standards and versions of the standard will be used for volume calculation? As stated earlier, many contracts are not stating the exact standard or version but leave it up to the controlling party. This can compromise the accuracy and not leave any way to correct it.

Equipment Installation – What guidelines will be used for the type of equipment and how it is installed? Many contracts say to use "industry accepted" equipment. What does this mean? If one company uses it, is it 'industry accepted"?

Meter Operations – How is the meter operated? How often is it calibrated? Can both parties be involved? What happens when a problem is found? Contracts today are either extending the test frequency or using vague language that leaves it to the prerogative of the controlling party. Is this the best way to handle the cash register?
Calculation – What equation will be used for calculation? What items will be considered in the equation? What assumptions will be allowed? Also to be considered is whether all equations in a standard will be used or can the party pick the equation based on their equipment and measurement systems?

Corrections – When will corrections be allowed? What are the rules for corrections? What are the limits to corrections? Many contracts restrict how far back corrections can go.

Audit / Review – What rights do the other contractual parties have regarding review and audit? What limitations apply?

As stated above, if these items are not adequately addressed then the parties will make assumptions in the calculation of the MCF. These assumptions hardly ever appear to be fair to both parties.

Calculated Volume – MMBTU

MMBTU = MCF * BTU (Equation 1)

The actual process is much more complicated than the simple equation makes it look. Several items must be defined and stated to ensure the accurate MMBTU is calculated. Definitions such as BTU, MMBTU, and water vapor adjustment must be fully defined.

Standards and Guidelines – As in the MCF, what standards and versions of the standard are to be used for BTU determination?

Sampling – Type and Frequency – What type of sample and when is it taken? This language needs to cover whatever sample types will be allowed. The frequency is being extended or becoming vaguer which makes the BTU results less accurate.

Quality Determination – Composition, density, BTU – Once the sample is taken how is the analysis calculated? What results are used for MCF calculation? What results are used for MMBTU determination?

Adjustment for Water Vapor – Water vapor in the gas stream has been overlooked or misunderstood. However, gas contains water vapor unless it is physically removed. Since it is impractical to determine the water vapor content for wellhead gas, the contract must address how to calculate the water vapor when it is not measured. Figure 1 below illustrates the impact of water vapor on the composition of the gas because the water vapor displaces hydrocarbon molecules. The industry has adjusted the BTU for water vapor in the gas but has not always recognized the impact of water vapor on the composition, GPM, density, and compressibility. The contract needs to adequately cover all aspects of this issue.

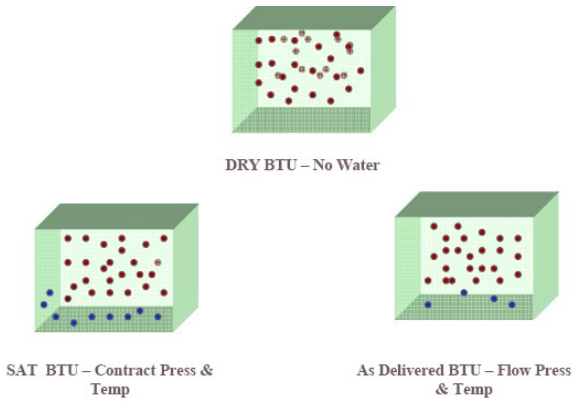

Figure 1. Water Vapor Effects of Gas

Analysis Effective Date – When does the sample become effective? There is a strong push by accounting and business groups to misapply the analysis to eliminate or reduce corrections to the EFM volume. Contract wording has been modified to include this method which in some circumstances creates incorrect MMBTU volumes. The contract should be more focused on accurate measurement rather than quick numbers. Also, the effective date will be different for spot samples and composite samples.

Almost all contracts in effect today deal with the MMBTU rather than the MCF for final transactions. However, the contract is usually too vague regarding the determination of the BTU and MMBTU.

Transaction Volume

The transaction volume is the volume to be used for purchase, sales, transport, or whatever the contract covers. One of the biggest misunderstandings regarding volumes and measurement is the wrong assumption that the measured MCF and MMBTU are the volumes used for contractual transactions. Very seldom is the calculated MMBTU used for the transaction volume. Almost all measured wellhead volumes are adjusted in some way for transaction purposes. Many field technicians do not know the volume they work hard to make accurate is changed because of the contract. This must be recognized and addressed to maintain accuracy or understand why the volumes are changed.

Measured volumes are adjusted for system fuel, system losses, treating, system allocations, and other reasons. The contract needs to address these carefully and completely. Limits for fuel and system losses need to be considered and stated. More focus needs to be put on this major process that impacts measurement accuracy.

Definitions – define all items that are used in the determination of the transaction volume. Items such as fuels, usage gas, shrinkage, unaccounted for gas, and L&U are some items that should be defined fully.

Changes to the measured MCF and calculated MMBTU – State what will change the transaction volume. Also fully explain how the adjustments are calculated.

Allocations – Are volumes adjusted for system or plant allocations? If so, just how is this to be calculated? Figure 2 below illustrates what a system can be. The contract must make it clear what constitutes the system. It also needs to spell out what is included in any allocation.

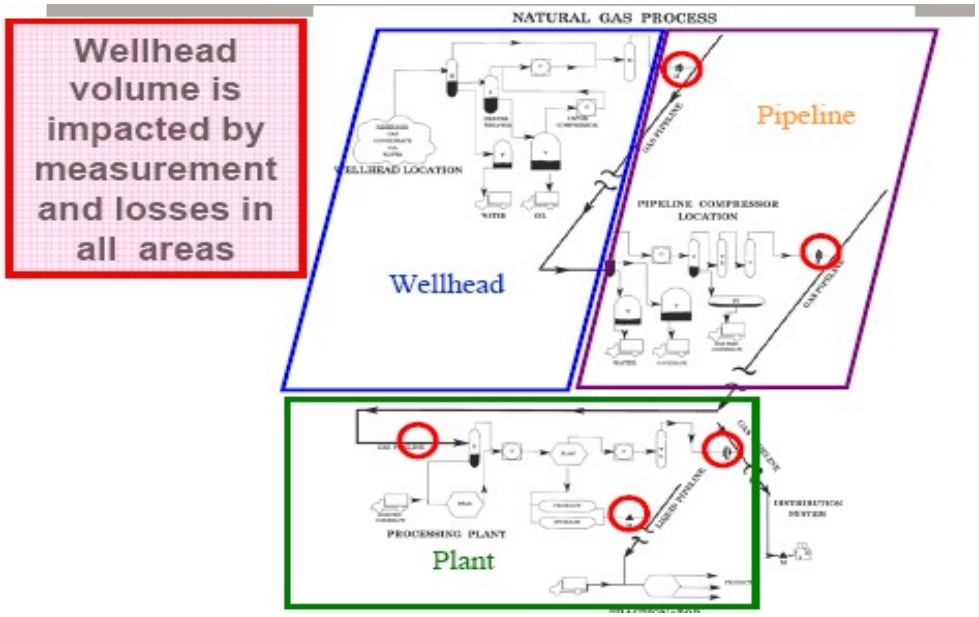

Figure 2. Typical Allocation System

Limitations – Each of the items that impact the transacted volume should be evaluated to determine if there are limits. Can a company allocate a 10% system loss or is there a limit?

The transaction volume section is possibly the most important focus of the contract in regards to measurement. Measurement personnel need to be more aware and included in the development of this part of the contract.

CONTRACT VAGUENESS

Many times the contract writers will try to leave certain subjects vague or unaddressed. This makes it easier for the controlling company. However, it can and will have a major impact on the final volume and volume accuracy. Both parties need to review all segments of the contract to make sure the measured MCF, measured MMBTU, and the calculated transaction volume are properly addressed and fully explained. This reduces the questions and controversies because of misinterpretation.

MEASUREMENT ACCURACY

As stated at the beginning of this paper, the contract has a major impact on the measurement accuracy. We spend time and money on equipment, processes, and standards. We also need to spend time and money to ensure the contract is worded to achieve accurate measurement. Also, the transaction process must be completely understood to ensure measurement accuracy is not compromised.