UNDERSTANDING THE DIFFERENT STANDARDS THAT GOVERN MEASUREMENT

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INTRODUCTION

The measurement of natural gas and those associated with the measurement of natural gas are in a unique situation. Many companies are practicing gas measurement using AGA 1985, AGA 1992 (Revision) or a latest standard. The AGA 1992 (Revision) was slow to be accepted as the latest standard. Many companies could not make the separation between equipment in the field and the calculation as presented by the AGA 1992 (Revision). Consequently many companies did nothing for a considerable amount of time to make the changes from 1985 to 1992. The use of more flow computers and transmitters has encouraged the use of AGA 1992, in recent years.

AGA 1985

The purpose of the 1985 standard was to provide a procedure for the measurement of Natural Gas Hydrocarbon and other related Fluid Flows using a Flange Tap or Pipe Tap Orifice measurement.
AGA 1985 provides the standard procedures for :

- Construction and installation of Meter Tubes and Orifice Plates
- Fittings associated with meter tube installation
- Instruction for computing the flow of Natural Gas and Hydrocarbon Fluids through Orifice Meters.
- Equations and tables to make necessary adjustments from base conditions to actual conditions
- Tables are provided for Basic Orifice Factor, Reynolds, Expansion, Specific Gravity (Density) Supercompressibility and pressure and temperature base factors.

The primary consideration in the design of a measuring station is sustained accuracy. The 1985 standard provides specifications for meter tube manufacture and for associated piping. Upstream and down stream pipe dimensions are also provided. The 1985 standard also provides specifications for meter tube bore smoothness, strightening vane and tap hole dimensions.

ORIFICE PLATES

The standard provides detailed procedures for orifice plates and orifice plate installation. Specifications are given for upstream face smoothness, flatness, upstream edge square, sharp and without burrs. The standard references the orifice being clean, centered in the meter run and sized within the .15 - .70 Beta Ratio range.

CALCULATIONS

The standard provides instructions for computing the flow of gas through a meter run and orifice. Formulas and tables are provided to correct from base conditions to actual flowing conditions as was mentioned in the introduction.

AGA 1992 (Revision)

As the use of the computer became more commonplace, both in the office and in the field, the AGA 1992 (Revision) standard was developed and published. Studies in both the United States and Europe idenitifed deficiencies in the previous standard to be inadequate to achieve the degree of accuracy required.

1992 CHANGES FROM 1985

The orifice bore should be concentric in a meter tube within a minimum tolerance of .020. On higher Beta Ratios that tolerance could be less.

ORIFICE SEALS

Protrusions from the gasket or sealing device immediately upstream and downstream of the orifice are not permitted. Sealing devices are to be the same nominal inside pipe diameter as the orifice holder. A recess from an orifice gasket or sealing device of .25" (inches) or less does not create additional uncertainty.

BY-PASS CHECKS

Orifice fittings should be tested to ensure that there is no communication between upstream and downstream taps. Orifice seal tests are generally performed using water or air with a blank plate. After pressuring the meter tube with a blank plate, the downstream pressure is reduced. If the pressure does not equalize, the device is acceptable.

METER TUBES

Surface roughness has an increased effect on uncertainty when Beta Ratios are above .60. Internal finish should be

300 micro inches for Beta Ratios less than .60. On Beta Ratios above .60, the internal roughness reduces to 250 micro inches.

Meter tube design, upstream. and downstream piping configuration are provided in the AGA 1992 standard and by company policy. There is now a reference temperature which applies to both meter tube and orifice plates.

AGA 1992 CALCUALTIONS

The formula change for calculating gas is probably the heart of the 1992 revision. He factored method has been replaced in the new standard by the calculation of the coefficient of discharge. With the large amount of data generated by the computer the coefficient of discharge can be constantly updated for greater accuracy.

Included in the Revision are instructions to always use a (Real) Specific gravity or Density. Supercompressibility is calculated from AGA 8 using the gross or detailed method. The factored method of calculating is now an appendix in the 1992 Revision. Finally, pipe taps are no longer supported. Directions end with AGA 3-1985.

GAS PROCESSORS ASSOCIATION (GPA)

As gas contracts have changed, the required gas sample, the Chromatograph Analysis, and correct Accounting are as important as the measurement. The following GPA publications have become a very important part of the measurement process.

- GPA 2145-Physical Constants for Paraffin Hydrocarbons and other components of Natural Gas
- GPA 2261-Standard for analysis for Natural Gas Mixtures by Chromatograph
- GPA 2166-Obtaining Natural Gas Samples for Analysis by Gas Chromatograph
- GPA 2172-Calculation of Gross Heating Values, Relative Density and Compressibility factors

The purpose of this discussion is to point out the need for consistency from the contract, including Gas measurement, proper sampling practices, the lab or online analyzers and groups. Finally, with the frequency of litigation, it is important that all groups associated with gas measurement, have knowledge of the standards associated with compiling with the contract.