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WITNESSING ORIFICE GAS MEASUREMENT AND FIELD TESTING

Class No. 4160

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INTRODUCTION

The natural gas industry is an ever changing field. While the basic concept of orifice measurement remains the same, new methods of obtaining and storing data are constantly being introduced. Because of this, the need for witnessing orifice gas measurement and field testing is more important than ever.

REASONS FOR WITNESSING

The most important reason for witnessing measurement tests is to assure the accuracy of the equipment being used so that all parties involved receive the maximum benefit from the transaction. This is also a good time to verify that the guidelines set forth by the American Gas Association are being met as well as any contractual obligations. The volume recorded at the meter and the BTU and gravity determined from the sample are a few of the main factors involved.

Witnessing can be done on routine bases to help raise awareness in the field and show concern for your company's interest. These are usually done at the pipelines convenience as they become due on the regular test schedule. At some point an immediate test may need to be requested if a serious discrepancy is suspected.

PREPARATION

A good witness needs to have a complete understanding of orifice measurement and be able to perform all the aspects of the test that is being conducted. They should also be responsible, trustworthy, consciences and able to interact well with others. It is a good idea for a witness to carry all the necessary equipment needed to perform a calibration test. These should include but are not limited to:

- 1) Differential Pressure Tester
- 2) Deadweight or Pressure Gauge
- 3) Thermometer
- 4) Micrometer and Straight Edge
- 5) Sample Cylinders
- 6) H₂S and Dew Point Tester
- 7) Copy of AGA 3 Handbook
- 8) Laptop Computer
- 9) Hand Tools and Volt Meter
- 10) Test Charts
- 11) Meter Inspection Test Report Form

Scheduling tests can be one of the most difficult parts of the job. The custody transfer party should notify the witness or producer by mail, email, or verbally, with a schedule of when their measurement station facilities are being tested. When scheduling, try to be as flexible as possible in order to accommodate everyone's schedules. If a scheduled test must be cancelled, a new date should be decided upon as soon possible. Once the test is scheduled, be sure of the date and time as well as the location so as not to be late or miss it completely.

OBSERVE CURRENT CONDITIONS

Upon arrival at the test site, observe the current flowing conditions. It may be beneficial to notify operations personnel ahead of time to be sure gas is flowing at as close to normal conditions as possible. Failure to do so

may cause certain parts of the test to be inaccurate and delay completion. Dehydrators, compressors, chemical pumps and check measurement are a few of the items to consider.

SAMPLING

If everything is operating normally now is a good time to secure the gas sample. This may be done with a sample bottle to be analyzed later in a lab or with a portable chromatograph installed in the technician's vehicle.

When a sample bottle is used it should be heated at or above the temperature of the gas being sampled. When using a chromatograph the sample line from the sample point to the analyzer should be heated in order to keep the gas from cooling before being injected for analysis.

Whichever method is used it is important to take the sample from a sample probe which should be in the center of the gas stream. If a probe is not available a joint decision should be made to use a place where the gas is least susceptible to free liquids.

It may be helpful for the witness to obtain their own sample if the sample point, procedure or equipment of the technician is in question. The BTU and gravity are one of the most important aspects of measuring and marketing your gas. A BTU swing of only two or three points can add up to a lot of lost revenue on a high volume sales point. The gravity factor can be one of the largest corrections made to the volume calculation and could also cause significant errors.

Moisture content or dewpoint might also be taken. A sample probe for the dewpoint test is extremely critical as liquids crawling along the inside edge of the meter tube could cause readings to be significantly higher than they actually are. This is usually performed with a stain tube or an electronic analyzer. Stain tubes are quick and easy but also subject to interference from a few chemicals that might be being injected upstream. If uncertainties arise an electronic analyzer should be requested if possible.

METER TEST

The secondary measurement device is often referred to as the meter. It is actually only a recorder that is making a log of events occurring inside the metering device or meter tube. This may be done with a bellows type recorder utilizing a chart or an electronic recorder storing data inside a computer.

The recorder should be tested in an as found condition before any adjustments are made. This will allow for the ability to document any existing errors. Differentials should be checked at five or six points including the average operating range and zero under pressure. Statics need to be tested at line pressure, zero, and full scale if possible. Be sure to note whether the pressure is being recorded in gauge or absolute pressure and if it is taken on the upstream or downstream tap. Absolute pressure will vary in different parts of the country. Temperature should also be tested at its operating point and possibly one other place above or below that. The thermowell should have some sort of liquid in it to ensure a more accurate reading.

If a chart is being used it should be observed for several conditions. Actual recorder ranges, station number, lease name, run and plate size, should be written or stamped on it. Be sure all this information is correct. If a differential or static is running low on the chart (typically below 10%) or on top of each other, steps should be taken to correct them by making plate changes or range changes. Look for proper gauge line slope as to prevent any fluid traps. If the recording device is electronic you will need to verify that all of the AGA data has been loaded correctly and that all calculation factors are being used.

In the event that a recorder will not calibrate within tolerance or is broken beyond repair, plans should be made to replace the equipment as soon as possible.

METER TUBE AND PLATE INSPECTION

The primary measurement device is the meter tube and orifice plate. These two items are the most important part of the measurement equipment. If the data being generated at this point is wrong all of the volumes will be incorrect.

The orifice plate should be inspected to ensure that it meets the AGA specifications. Flatness, thickness, and bore sharpness should all be taken into consideration. Also be sure that it is the correct size. A micrometer should be used for this purpose. Never assume the numbers stamped on the plate to be correct. Certain size plates are required to be beveled. These have to be installed with the sharp side of the bore against the flow of gas. Plates installed backwards will cause a significant error.

The meter tube should also be checked against AGA specifications. The use or absence of straightening vanes should be observed and be in proper place. Try to look inside the tube as much as possible for buildup or foreign objects that might be against the plate. Purging a small amount of gas through the run without the plate installed may be beneficial. If serious discrepancies continue to exist it may be necessary to dismantle the run for a thorough look inside. Extreme buildup, roughness, tap hole obstruction and vane placement are a few things that should be looked at.

DOCUMENTATION

Remember that the meter test ticket is a legal document. Volume corrections will most likely be based on the information contained in it. All interested parties that are present should sign it. As they will all differ from company to company be sure to read it carefully first. Any questions about the content should be discussed and dealt with at this time. Be sure to get a copy and request that the gas analysis also be sent to you as soon as it becomes available. It might be a good idea to have your own test tickets to further document findings.

CONCLUSION

The witnessing of orifice gas measurement is extremely important and can be very rewarding. Always follow up on any problems to be sure that they are corrected. A good witness can help to keep measurement errors to a minimum by staying informed and knowledgeable about gas measurement and heading off problems before they occur.