Topics For Discussion
Acadiana Gas Measurement School

1) Principle of Operation
   The Electrolytic Principle
   How the cell works

2) Electronic Verification
   Basic field check procedure
   Cell simulation

3) Flow Calibration

4) General Troubleshooting
   Leak check
   Delta flow procedure
   Cell test

Electronic and Flow Test Procedures For
MEECO Standard Industrial and Natural Gas Moisture Analyzers
ISO 9000 Calibration Verification

1 PURPOSE

The following procedure determines whether the moisture analyzer indicates the correct moisture readings in relation to the electrolysis current from the cell. To perform the verification tests, you will need the soap bubble burette supplied with your analyzer or the MEECO Veriflow electronic soap bubble flowmeter (P/N F2100), a decade box or multi-turn potentionmeter and a 4 ½ digit ammeter with at least 3 decimal place resolution.

2 PROCEDURE

2.1 **Units should be returned to the factory every 12 months for re-certification. MEECO field services is an acceptable alternative.**

2.2 **In the interim, users may choose to perform the following "Electrical Calibration Check" and "Flow Meter Calibration" every six months.**

3 ELECTRICAL CALIBRATION CHECK

3.1 **With the Power Off, disconnect the cell leads from the electrolytic cell. Follow procedures as indicated in the analyzer instruction manual.**

CAUTION: Do not allow the cell leads to make contact with the chassis or ground, otherwise the cell fuse will be blown.

3.2 **Connect the decade resistor box or potentiometer and the ammeter in series with the cell leads.**

3.3 **Set the decade box or potentiometer resistance to the maximum value.**

3.4 **Turn the analyzer power on.**

3.5 **Adjust decade resistor box or multi-turn potentiometer to a value for a current reading on the ammeter within the range of your particular instrument, as shown below:**

Calibration Verification Values (ppm unite):

Analyzer Display	Ammeter Reading
1.000 ppm	13.1415 uA
10.00 ppm	131.415 uA
100.0 ppm	1.31415 mA
1000 ppm	13.1415 mA

Calibration Verification Values (lbs/mmscf unite):

Analyzer Display		Ammeter Reading
100	lbs/mmscf	28.300 mA
50	lbs/mmscf	14.150 mA
20	lbs/mmscf	5.660 mA
10	lbs/mmscf	2.830 mA
5	lbs/mmscf	1.415 mA
1	lbs/mmscf	0.283 mA

3.6 If the readings are within ± 1 of the least significant indicated value on the display meter, the calibration is satisfactory. If this is not the case, contact MEECO's Service Manager.

***Note:** Use of non-compliant test equipment can produce erroneous results.*

4 FLOW CALIBRATION PROCEDURE AT STANDARD TEMPERATURE AND PRESSURE

4.1 Power up the analyzer and connect to a gas source.

4.2 Make sure that the inside of the soap bubble burette is clean. To clean the burette, use warm water and rinse out all traces of soap.

4.3 Wet the inside of the burette with water, making sure to shake out any excess water.

4.4 Connect the flexible tube from the burette to the sample outlet of the analyzer.

4.5 Put one or tow drops of soap solution in the top of the burette and allow it to slide down the inside glass surface.

4.6 Adjust the sample flow indicator on your analyzer to the approximate 100 sccm setting for your sample gas. Note: for 10 sccm sample flow units, adjust flow to the approximate 10 sccm setting for your sample gas.

4.7 Depending upon the style of your burette, gently squeeze the bulb at the base of the burette or lightly pinch the tube until a single bubble forms and starts moving through the glass tube. Note: You may need to form several bubbles before one bubble will travel through the entire length of the glass tube.

4.8 Select a single bubble and time its passage from the "0" to the "100" or "10" marking on the burette, depending on the model of your analyzer.

4.9 Once you have timed the bubble, calculate the actual flowrate using the following formula.

Flow in sccm = 60 seconds x 100 cc/actual time

4.10 Adjust the sample flowrate on your analyzer until the time of passage is 60 seconds.

4.11 Make a permanent note of the flowmeter ball position for the specific gas tested. You will need to adjust your sample flow indicator to this position each time you run this gas.

4.12 Repeat this procedure for any other gases you will test with this analyzer.

DELTA FLOW PROCEDURE

A delta flow check is very useful to determine the unit's correct functioning while on-line. This feature verifies the cell's operation in accordance with Faraday's Law, which is absolute. Hence, there is no need for calibration versus an external moisture standard.

The delta flow, while a test of the sensor's correct operation, is not a true test of the moisture in the sample unless all residual moisture or sources of moisture are eliminated from the sampling system from the test point to the sensor. This is because. As with any moisture analyzer or transmitter, the unit has not way of distinguishing between the moisture coming from a leak or a wet regulator and the true moisture in the sample - thus the importance of a high-integrity, leak-free sampling system.

Normal Delta Flow Procedure:

Using a delta flow, the actual amount of water vapor flowing through the electrolytic sensor is reduced to half by lowering the sample flow rate from 100 sccm to 50 sccm. The instrument should respond by displaying a reading approximately half of that which is displayed before the flow reduction. Note that the water vapor concentration of the sample gas must remain constant during the time of this test for the result to be meaningful. It is also important to insure the readings have stabilized before recording them.

This procedure is as follows:

1. Let the unit equilibrate.
2. Record the readout of moisture at the 100 sccm flow rate.
3. Change the flow rate to 50 sccm.
4. Let the unit equilibrate.
5. Record the readout of moisture at 50 sccm flow rate.
6. Subtract the recorded 50 sccm readout from the 100 sccm readout.
7. Multiply the difference by a factor of two.
8. If the result is within the specified accuracy of the analyzer in relation to the reading in step #2, you have confirmation of the instrument's proper functioning. H If there is a large deviation, there is an instrument malfunction. Most likely the cell is contaminated.

If the sampling system is new and drying down, the moisture purged from wet components changes as the components dry. Therefore, the moisture in the gas entering the transmitter through the sampling system changes. A delta flow performed under these conditions will, of course, yield incorrect results, because the actual moisture in the sample is changing as the delta flow is being performed.

Often, after some period of purging, moisture from wet components or moisture from a small leak may be insignificant relative to the total moisture measurement on the

transmitter. In terms of your moisture specification, the possibility that a small leak is adding moisture to the measured sample may not be important as long as the measurement is within specification.