

TECHNIQUES OF NATURAL GAS COMPOSIT SAMPLING

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A natural gas sample may be collected as a spot, composite, or as a continuous sample connected to a chromatograph. The most important things in taking a sample are where and how the sample is taken.

WHERE A SAMPLE SHOULD BE TAKEN?

A sample should be collected from on the longest run of straight pipeline available. Unfortunately, this is usually the meter tube used for custody transfer. This may be an acceptable location, but the location may cause the creation of swirls. This can cause the flowing stream to create aerosols from the liquid collecting on the walls of the pipeline. These aerosols then might be collected by the sampling system and thus cause a higher BTU reading and a different gas composition. This collected sample will not be representative of the actual gas being measured and collected.

WHEN A SAMPLE SHOULD BE COLLECTED?

Another problem is what time the sample is collected. Outside temperature can change the condition of the gas inside the pipe. An example: If the outside temperature is high, such as 100 degrees, liquids that travel on the walls of the pipe vaporize into gases causing the sample to be higher in BTU. The opposite occurs when the temperature is colder. This will also cause a non-representative sample. When a sample is collected from a gathering field care must be taken to insure that the gas flowing at the time it is collected is similar to the gas that is flowing during other periods. If the gas sample is collected from one well that is not normally flowing then the sample will not be representative of gas for the entire period.

SHOULD I USE A SAMPLE PROBE?

All samples should be taken through a sample probe. A sample probe is usually a valve with a piece of tubing welded to the bottom of it. There are many different probes on the market today. There are single flow probes, dual flow probes and hot tap insertion probes. See figures 1, 2, and 3. Whichever probe you use, the most important thing to remember is to make sure the tip of the probe is in the center 1/3 of the pipeline. Probes that are too close to the walls of the pipe can pick up liquids. When placing a probe on a multiple meter tube station, make sure you place the probe on the tube that will be flowing all the time. Do not use a probe on a header.

Headers create swirling gases and dead gas pockets; they are not a good choice for taking a sample. Now that you have placed your probe in the pipeline, you are ready to take a sample.

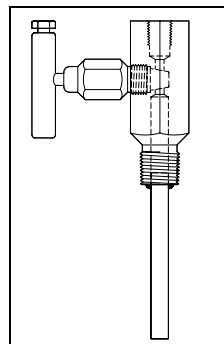


Figure 1
Single Flow

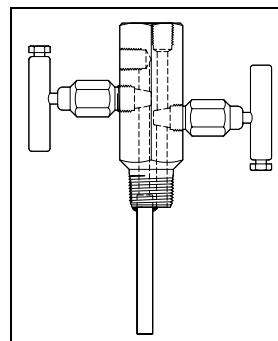


Figure 2
Dual Flow

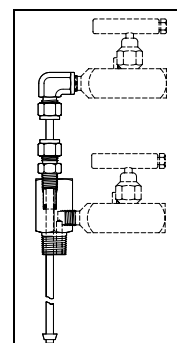


Figure 3

Hot Tap with Dual Flow

SPOT SAMPLING

To achieve a good spot sample you must follow either industry standards or company's procedure. Most companies have published the procedure that you will need to follow. An example: If you are using a spun-end bottle to take your spot sample you must purge the bottle of all air. Mount the bottle on the probe so that it is in the vertical position. The reason for mounting the bottle this way is if the bottle is mounted horizontally, heavies from the gas can collect in the bottom half of the bottle. This can cause the bottle not to purge properly. Another suggestion is to take at least three feet of 3/8" copper tubing, coil the tubing until it resembles a spring. Attach the tubing to the bottom valve of the sample cylinder. At the end of the tubing place a plug with a .177 hole drilled in it. When you open the cylinder valves the gas will purge through the cylinder at a slow rate. The coil will reduce the effect of temperature on the sample due to pressure drop. Allow the sample to purge for approximately 10 minutes. This method will usually yield a good spot sample. However, a spot sample is only representative of the gas that was passing while the spot was taken. Many companies have a written policy for when spot sampling will be allowed. This determination is normally a factor of daily volume.

COMPOSITE SAMPLING

Composite sampling is a more representative form of sampling. A composite sampler takes a small bite of sample from the pipeline and injects it into a sample cylinder. If the sampler is connected to a flow computer it is possible to take samples proportional to flow. This means that if the flow rate goes up the sampling rate will increase, if the flow goes down the sample rate will decrease. All composite sampling cylinders have internal mixing devices. Before installing the cylinder in the final position make sure that the mixer device is in the proper position. Insure, if so equipped, that the volume indicators are working properly. This will assist you in inspecting and troubleshooting of the sampler system.

SAMPLE CYLINDERS

There are two types of sample cylinders on the market today. These cylinders can be a spun-end bottle or a constant pressure cylinder. See figures 4 and 5. The spun-end bottle is made of stainless steel or aluminum.

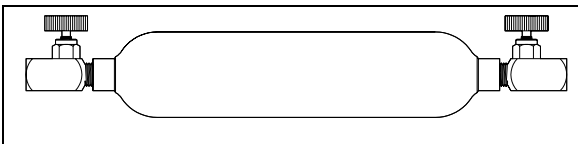


Figure 4
Spun-end Bottle

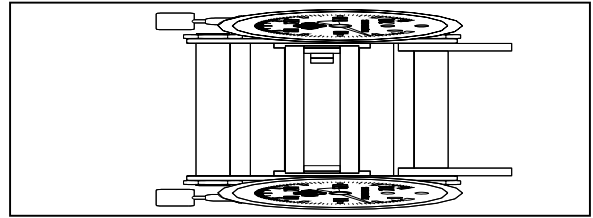


Figure 5
Constant Pressure Cylinder

The bottle usually has a 1/4" NPT connection at each end for valves. If the bottle is longer than twelve inches or greater than four inches in diameter, DOT requires a relieving device be installed on the cylinder. This is to protect the bottle from excessive over-pressuring. When sampling into a spun-end bottle it is recommended the bottle is placed in the vertical position. This will prevent the settling of heavy gases during the purging process. Purge the cylinder by using the procedure stated in Gas Processor Association, GPA 2166-68, "Methods for Obtaining Natural Gas Samples for Analysis by Gas Chromatography".

1. Remove plug or cap from outlet valve or cylinder.
2. Close sampler bypass valve.
3. Slowly open outlet valve and observe decrease in pressure on sample gauge.
4. Close outlet valve on sample cylinder just before pressure reaches zero.
5. Open sampler bypass valve, allowing cylinder to be filled with line pressure.
6. Repeat steps 2 - 5 the number of times shown on the table below, depending on the pressure used for purging the cylinder.

<i>Pressure used for Purging Cylinder</i>	<i>Number of Purge Cycles</i>
15-30	13
30-60	8
60-90	6
90-150	5
150-500	4
> 500	3

7. On the last purge cycle, do not fill sample cylinder again. Instead, leave it pressurized a little above zero.
8. Install plug or cap in outlet valve of cylinder.

After completing the purging process, you will need to place the sampler into service. If the BTU value is greater than 975, you may want to consider using a constant pressure cylinder. If your BTU IS 975 or greater, and you are injecting into a spun-end bottle, you

may be having a flashing problem. If you begin with atmospheric pressure in the cylinder and build to pipeline pressure flashing might occur. The chain of molecules can change at different pressures; we call this flashing. When building pressure in a sample cylinder that starts at atmospheric pressure, it is possible for some of the molecules to change state (flash) as the pressure builds. Because this happens the sample may not be representative to the pipeline gas. By using a constant pressure cylinder the gas in the cylinder, as well as the gas being sampled, will stay at pipeline pressure. This will keep the gas from flashing or changing phase.

ANALYZING THE SAMPLE

After the sample has been collected it will be transported to a lab for analyzing. Remember all samples being transported under pressure must meet and comply with DOT certification. When preparing the cylinders for drawing off the representative sample there are some things to consider. When using a spun-end bottle you will need to heat the cylinder so that any hydrocarbons that might have liquefied will turn back into a vapor. When using a constant pressure cylinder you will need to apply pressure to the precharged side equal to the bottle pressure, so that when the sample is being drawn off the pressure will remain at pipeline pressure. The other thing to consider is your lab. If you are using your own lab, you are probably using a calibration standard that is close to your pipeline gas. If you are using a contract lab it is recommended that you check their standard. If the calibration standard is missing some of the properties that are present in your gas, you may not get a representative BTU of your pipeline gas. By using the procedures above you have a good chance of obtaining a representative sample of your pipeline gas.

Conclusion

When obtaining a natural gas sample make sure you follow Industry standards or your company procedures. These procedures are written to insure the most accurate analysis can be performed on the gas. This analysis will intern be used to calculate the heating value of the natural gas your company is selling or purchasing. The sample should be obtained in a manner that allows your sample to be a representative collection of the natural gas passing the measuring station. Always collect the sample from a location that is not effected by piping, installation of probe, and non-representative liquids and aerosols. Purge all line, collection cylinders, tubing thoroughly before collecting your sample or starting an on-line chromatograph. Remember, this sample will be used with all the importance of your volume measuring meters and have a direct effect on your company's profits.