6½ Tips to Improve the Speed and Accuracy of Your BTU Analysis

SHIMADZU

Excellence in Science

TIPS TO IMPROVE THE SPEED AND ACCURACY OF YOUR BTU ANALYSIS

In a fast-paced environment like the midstream sector, it is important to complete your BTU analysis in a quick, efficient manner. And yet, due to the financial implications of this information, your analysis must also be as accurate as it is fast.

This eBook provides 6 ½ tips that can help you improve the speed and accuracy of your BTU analysis.

Creating a consistent and reliable BTU analysis starts with your sample handling technique. If your sample is not handled properly, it can compromise the accuracy of the entire analysis. It is important to first consider the elements you are dealing with. Liquid and gas samples require different techniques that should be used to produce more efficient and consistent BTU determination.

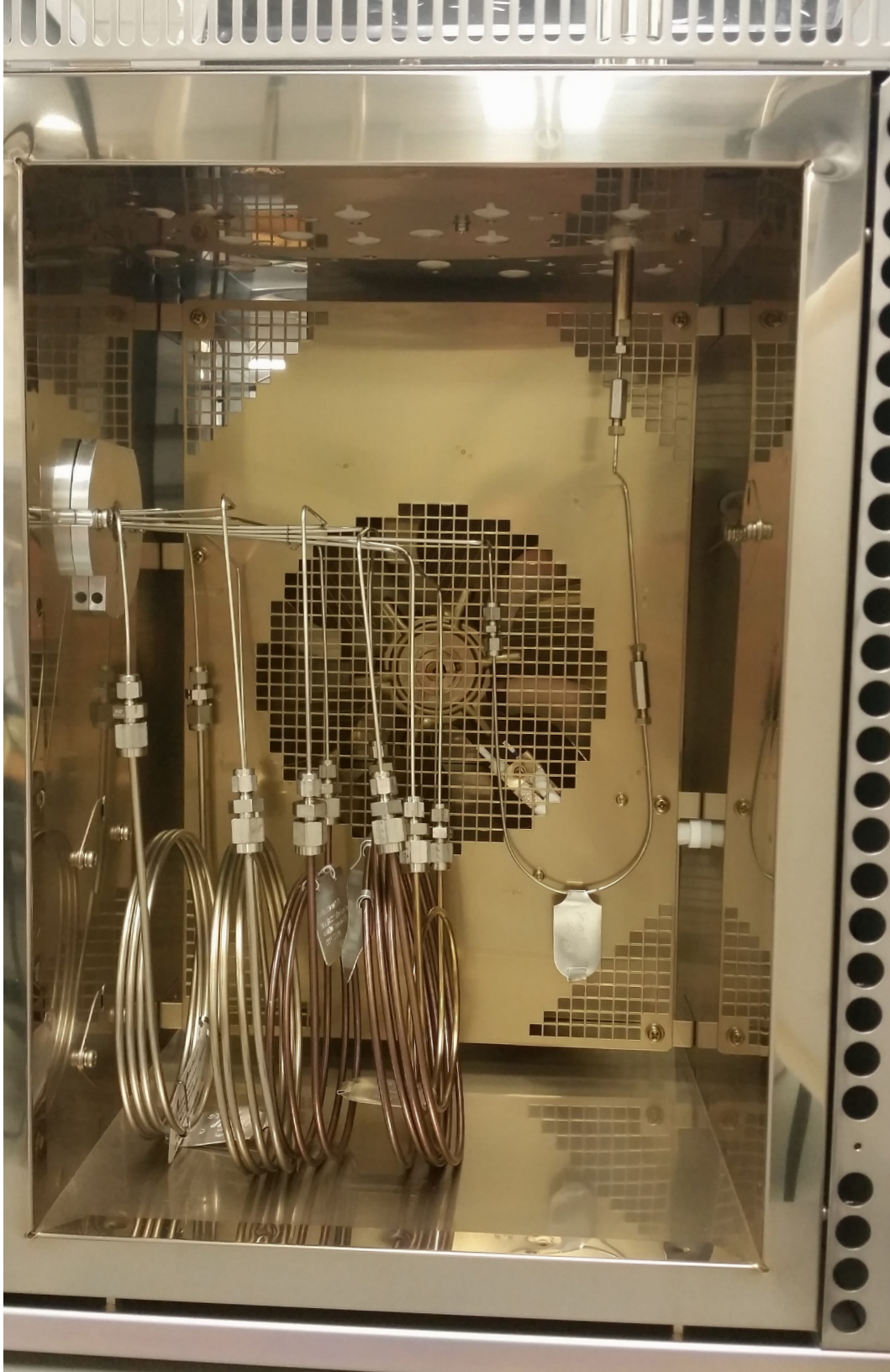
1 GAS SAMPLES
HEAT THE SAMPLE

This process is specifically for gas samples and mainly for extended analysis. Be careful not to heat a liquid sample; this will create bubbles in the sample and damage your results. Liquid and gas samples require different techniques that should be used to produce more efficient and consistent BTU determination.

Standard handling for gas sample BTU analysis is dependent upon the components in the sample. If your standard contains heavy components, the standard should be heated to prevent the condensation of the components. Additionally, all samples and standards should be heated to the same temperature for the same amount of time.

The temperature should be set above the boiling point of the heaviest component to ensure the sample remains in the gas phase. This is typically done by heating the samples either by cylinder blankets or heat lamps.

Shimadzu uses industry standard GC columns so your replacement *columns are not costly.*



2 CONSTANT SAMPLE PRESSURE

When it comes to injection samples, there are specific techniques you can use to improve your BTU determination.

Just like all samples must be injected at a constant temperature, they must also be injected at a constant pressure. When all the samples have the same pressure, it ensures that the same mass of sample is being introduced each time. For gas samples, this means using a rotameter or a bubbler to monitor the injection pressure. For liquid samples, this means ensuring the liquid cylinder is kept at a constant pressure.

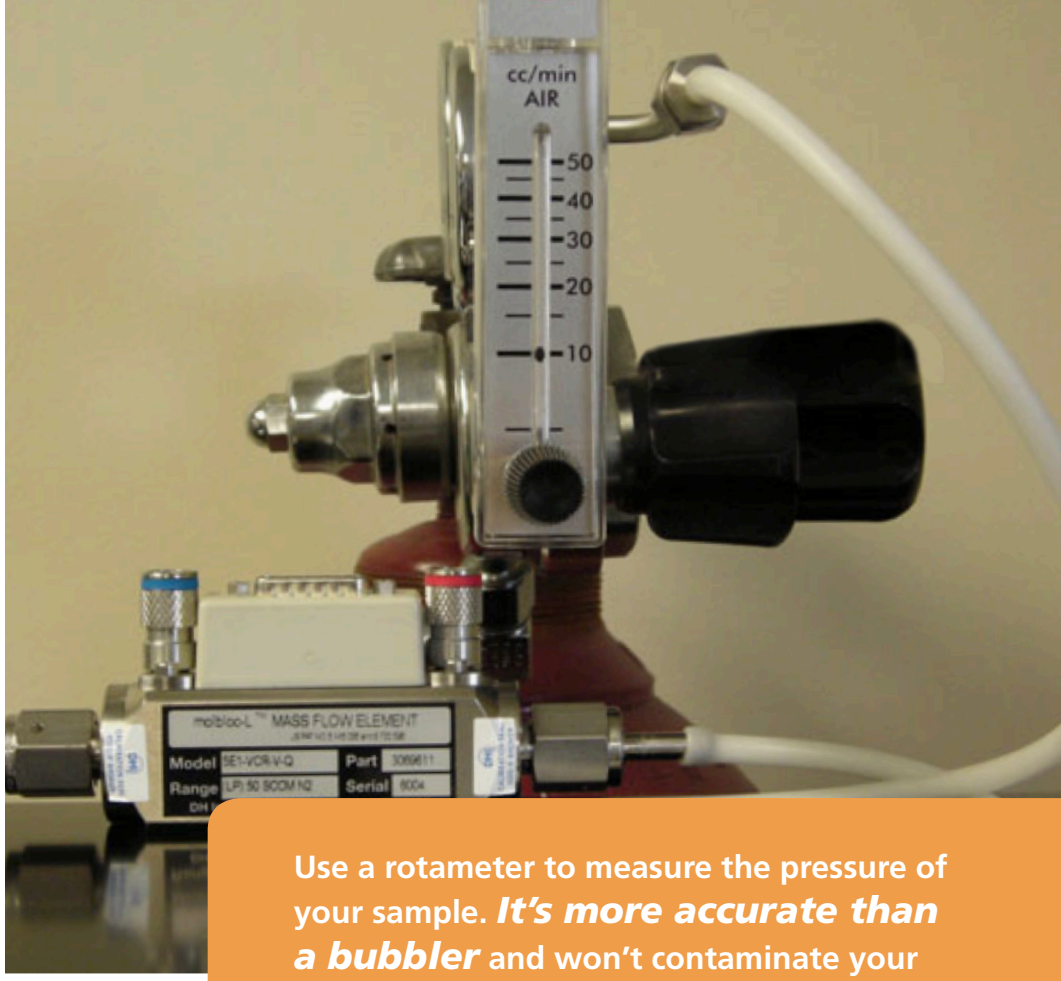
MAINTAINING CONSTANT PRESSURE FOR GAS ANALYSIS

Many analysts use rotameters to make sure their gas samples are injected at the appropriate pressure. Connecting a rotameter to the loop outlet allows you to see when the sample has bled down to atmospheric pressure. When the pressure inside your apparatus is greater than your lab's atmospheric pressure, excess gas will flow out of the tube and through the rotameter vent.

Some people use bubblers to monitor pressure, but this is not recommended. Bubblers are typically filled with mineral oil or water and in extreme cases, the liquid can be sucked up into the sampling valve causing substantial contamination.

MAINTAINING CONSTANT PRESSURE FOR LIQUID ANALYSIS

When handling liquid samples, using floating piston cylinders instead of traditional liquid cylinders can help improve your analysis.



Use a rotameter to measure the pressure of your sample. *It's more accurate than a bubbler* and won't contaminate your sampling valve.

Floating piston cylinders are designed to handle liquid hydrocarbon samples, like liquid natural gas and liquid petroleum gas, at high pressures. These sampling vessels help to ensure that the pressurized liquid petroleum gas remains in the liquid phase during the sample load process. If bubbles occur in the sampling line, the sample mass is reduced, diminishing reproducibility. Some instruments use PTFE tubing on the outlet to view bubbles.

The burst pressure of the tubing must exceed the liquid sample pressure.

3 PURGE THE SAMPLE

The sample should be consistently purged through the sample loops prior to injection.

This technique purges the sample loop of any sample carryover from the previous injection. It ensures that your sample is free of contaminants that may have been taken during extraction. Purging also helps ensure that a representative sample is introduced into the analytical stream. We have designed the system to eliminate unwanted co-eluting components. When purging gas samples, the sample purge should be a minimum three times the injection volume to ensure repeatable results. When purging liquid samples, the sample should be purged until all bubbles are removed.

4 LIQUID SAMPLES
INVERT YOUR SAMPLE

If you are using a liquid cylinder or floating piston cylinder, samples should be physically inverted multiple times to ensure they are adequately mixed.

To guarantee proper mixing in the cylinder, be sure to mix the sample prior to injection. Natural gas liquids can settle and require mixing to ensure a homogenous sample. It is recommended to invert your samples once a day so the heavier components do not settle out.

5 MAINTAIN YOUR FILTERS

In-line filtration must be in place when using liquid sample valves.

This is because all pressurized liquid samples contain particulates that will enter your gas chromatograph. These particulates can clog lines, damage valves, and cause instrument contamination. Because of these potential issues, your sample filters must be changed regularly.

Depending on your operation, it is recommended to use 40 µm, 15 µm, or 7 µm in-line filters for liquid samples. It is common practice to use at least two in-line filters with different mesh sizes, such as 40 µm and 15 µm or 15 µm and 7 µm, and place the filters in descending size order from the sample inlet to the valve. This will ensure a more filtered sample and, ultimately, a more reliable analysis.

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6 RUN STANDARDS REGULARLY AND DOCUMENT INSTRUMENT PERFORMANCE

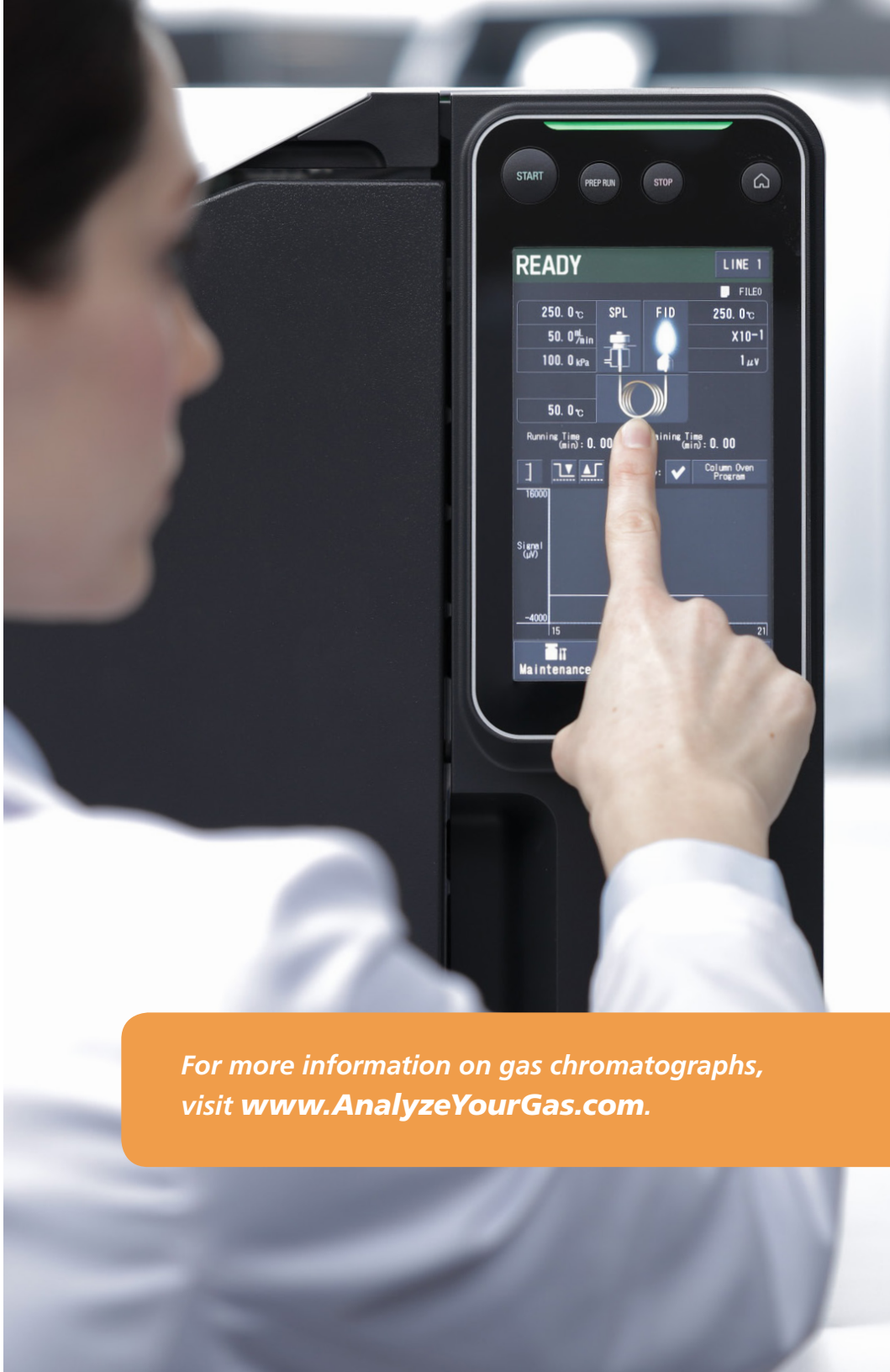
It is important to monitor and check the standards in your BTU analysis on a regular basis.

A standard is a material containing a precisely known concentration of a substance. Running the same standard once every day helps you verify that your instrument's calibration is accurate and running appropriately. Additionally, a test analysis allows you to pinpoint if and when a problem occurs. This is important because in the long run, it is much faster to repair an instrument if you know exactly when performance started dropping off. When running a standard, make sure to use fidelity plots to identify if the standard is consistent and correct.

6½ USE COMMON SENSE

It may seem obvious, but using common sense when operating an instrument is crucial. Keep logs of what different sample lines contain.

If something doesn't look right, run the sample again. The sample may not be bad; the issue may be poor sample handling that causes carryover or a poor injection technique that gave invalid results. Remember, all analyses require human interaction and sometimes humans make mistakes. Using common sense and good judgment can help improve BTU analysis every step of the way.



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7102 Riverwood Drive, Columbia, MD 21046, USA
Phone: 800.477.1227 / 410.381.1227
www.ssi.shimadzu.com