GAS GENERATORS RESOURCE GUIDE

VICI DBS®

Introduction

by Trevor Henderson, PhD

Laboratory gases serve a variety of purposes, from inert barriers for lab operations and instruments to consumption in analytical processes. In many laboratories, gas generators are quickly replacing traditional tanks, offering greater flexibility, convenience, safety, and cost-effectiveness. Gas generators offer the ability to produce on-demand supply and specialty blends of highly pure gases for various applications including chromatography, atomic absorption, organic carbon analysis, and dry glove boxes.

Questions to Ask When Buying a Gas Generator

by Ryan Ackerman

What is your application?

As the range of available gas generators continues to expand, consider what it will be used for. For example, Fourier transform infrared spectroscopy operates best in the absence of carbon dioxide so users will require a generator that creates CO2 -free gas.

What level of purity do you require?

The level of purity required will influence which style of gas generator is required. For those requiring a lower purity—95 percent or less—a membrane style gas generator would be the best fit. This style cannot provide the highest level of purity but is much more dependable and requires less maintenance. For highly pure gases—up to 99.9995 percent—a pressure swing adsorption unit should be used.

What volume of gas do you require?

Many instruments that require gas to run have a specific operating range. If the amount of gas generated cannot keep up with demands, it could result in costly downtime. Many companies offer a variety of solutions to ensure that the correct level of gas is being produced.

Are long-term cost savings important to your project?

Beyond convenience, gas generators save on shipping costs, time-related costs for changing tanks, and managerial costs for managing the safety and supply of tanks.

Is noise a factor in your lab?

Noise can be both bothersome and present a real health concern for those exposed. If low-noise is desirable, consider a gas generator with detachable or low-noise compressors.

What service proposition comes with the gas generator?

There are a number of options when managing a generator, whether that's getting an education in self-maintenance, knowing a service representative will be able to maintain the unit regularly or having the ability to send a unit back to the manufacturer.

5 Signs You Should Service or Replace Your Gas Generator

1. The alarms for leak detection are either not going off when there is a leak or are constantly going off even when there are no leaks.
2. You are moving into new applications and your current gas generator does not produce the gas or gases you need or isn't sized right for the systems you need to generate gas for.
3. The air filter in the zero-air gas generator is clogged.
4. The noise from the gas generator's integrated compressor is too loud.
5. Your current gas generator doesn't have all the features you need, such as the ability to capture performance data

Focus on Carrier Gases

by Angelo DePalma, PhD

Gas chromatographers who have been around for a few years remember the great helium shortage of 2012-2013. Kinks in the supply of that noblest of carrier gases caused price spikes, and many end-users had trouble getting their hands onto cylinders. Scarcity scares still arise occasionally, but rumors of helium's demise are grossly exaggerated.

Still, the great helium scare had two significant and related, if unintended effects: The price of helium remains high, and that caused chromatographers to look into alternative carrier gases. A lot of work has gone into looking into alternatives such as nitrogen and hydrogen, particularly for regulated methods.

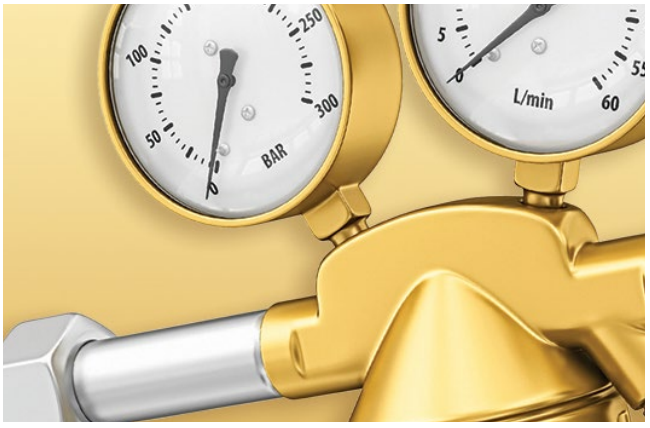
Substituting one carrier gas for another is far from straightforward. Hydrogen is a "fast gas" which, for a given temperature and pressure, flows about twice as fast through GC columns as helium. And while gases become more viscous on heating, hydrogen's tendency to do so is significantly less than helium's. This benefit is greater for heated GC runs. Hydrogen thus offers faster analysis and more-rapid throughput than either helium or the next most common alternative, nitrogen.

The linear velocities of hydrogen and helium through capillary GC columns can be made quite similar by judicious application of column heating. Furthermore, similar resolutions have been demonstrated for separating a panel of pesticides with hydrogen, helium, and nitrogen. But performance comes at the cost of retention time, leading some to question whether any lab manager would trade such a time penalty for nitrogen's advantages of non-flammability and low cost.

The nitrogen carrier is also less versatile than helium or hydrogen, or even the more esoteric gas blends incorporating argon and methane. Nitrogen is unsuited to mass detection and its physical/mechanical properties provide merely adequate resolution, even when columns are selected specifically for that carrier gas. Still, nitrogen enjoys a significant following.

Gas Supply Options

by Trevor Henderson, PhD



Traditionally, most specialty gases have been supplied in compressed gas cylinders. These cylinders are typically 4 feet tall and weigh between 75 and 80 pounds with their contents pressurized to around 2,000 pounds per square inch (psi). While compressed cylinders are still by far the most commonly used method for supplying analytical gases, they do present a number of limitations. Specifically, they present risks to worker safety, require specific storage and handling equipment, and may have cylinder-to-cylinder quality variations that make sensitive analyses difficult.

Alternately, the adoption of point-of-use gas generators to produce a continuous supply of compressed gasses such as zero air, nitrogen and hydrogen has become popular for a broad range of instrumentation. As examples, zero air is used for liquid chromatography (LC) and gas chromatography with flame ionization detection (GC-FID); nitrogen is used with GC-FID, thermal analysis (TD), inductively coupled plasma spectrometry (ICP), Fourier transform infrared spectroscopy (FTIR), and liquid chromatography with mass spectrometry (LC-MS); and hydrogen is used both as a combustion gas for multiple purposes and as a carrier gas for gas chromatography (GC), where it offers increased speed, resolution, and sensitivity over helium (especially when used with FID). On-demand laboratory gas generators are available in a variety of configurations and output capacities suitable for supplying single or multiple instruments. Gas generators offer a number of safety, reliability, and convenience, and cost-related benefits to the user.

Cylinders vs. Generators

Maintenance

A cylinder with a limited supply of gas to support a process or an instrument in a laboratory needs to be monitored and tracked, replacement gas needs to be ordered, the gas needs to be received by someone, and then it needs to be moved and installed in the laboratory space. Each cylinder also requires a gas regulator, which must be inspected annually and should be replaced every five years. A gas generator, on the other hand, requires only annual preventive maintenance consisting mainly of of changing air filters, if it's a nitrogen or zero air gas generator, or changing water filters or gas filters in the case of a hydrogen gas generator. The maintenance cycle, no matter how big the unit is or what gas it's producing, is roughly one or two hours on an annual basis.

Safety

Gas cylinders are heavy and cumbersome to transport. Because they contain gases under high pressure, cylinders that are dropped or strike hard surfaces could explode, endangering laboratory staff. Leaked hydrogen gas from the cylinder can spontaneously ignite, potentially causing a fire. A gas generator, on the other hand, stores a low volume of gas at low pressure so if damage occurs, minimal gas will get released. Generators can also be programmed to shut down if there is a deviation from standard operation.

Cost

With gas cylinders, the costs can quickly rack up as they are subject to delivery charges, pallet rental costs, maintenance fees, energy and fuel surcharges, and unpredictable price increases. The cost of operating an in-house gas generator is extremely low, since the only raw materials are air and electricity. Running and maintaining a gas generator system typically costs only a few hundred dollars a year. Return on investment takes about 12 months, depending on the specific usage and required purity. This is a significant ongoing savings compared to the recurring costs of cylinders.

LINDA Says...

Gas generators require some care to maintain optimum performance and reliability. Depending on the type of gas generator used, it may require replacement of filters or desiccant cartridges on a semi-annual basis as well as replacement of valves, sensors, heaters, or thermo-couplers every couple of years. Complete knowledge of the maintenance requirements and the associated costs is important when purchasing a gas generator.

Meet LINDA

LINDA is a lab manager. Her job is to balance the scientific needs of her staff with the business needs of her lab. LINDA stands for:

Leadership
Informed
Negotiator
Decision-Maker
Accountable

Product Spotlight

FID Tower: On-Demand Hydrogen and Zero Air Gas, Saves Valuable Bench Space

Continuous GC gas supply provides up to 3,000 liters of H2 before a water refill is required; while Increasing GC performance and sensitivity.

Ultra high gas purity without the use of desiccants, caustics or palladium H2 capacity up to 1 liter/ minute with purity to +99.99996 and Zero Grade Air up to 5 liters/ minute withless than 0.1 ppm total hydrocarbons, can supply multiple instruments with pure gases.

Unique touch-screen control with state-of-the-art Titanium cell technology
Highly sophisticated, easy to use software control with safety alarm capabilities.