

Dan Spohn

From: ARM, Inc. <dspohn@arminc.com>
Sent: Wednesday, July 20, 2016 10:16 AM
To: dspohn@arminc.com
Subject: Gas Specs? Blenders and Catfish Sushi...



Advanced Research Manufacturing 719-538-5959
Innovative High Purity Gas Supply System Solutions

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Dear Dan,

June is almost over, and I've been so busy I almost missed "**Repeat Day**" on the 3rd, good thing it was on a Saturday, I got a 3 day weekend, and by repeating the 3rd I totally missed the 4th, "**Hug Your Cat Day**" as my cat hates me and I didn't want a repeat of all the scratches from last year's attempt!

On the 6th I enjoyed "**National Gardening Exercise Day**" and ended up on the 8th with a case of poison ivy, which coincidentally is also "**Name Your Poison Day**", I don't think it is what the organizers had in mind tho....

I took the 14th off, "**Monkey Around Day**" and stretched it to the 18th, "**Go Fishing Day**", which as it happens is also "**International Sushi Day**". There is a reason the Japanese don't sushi catfish... I unintentionally participated immediately after in the "**National Hollerin' Contest Day**" ... aaarrggghh.

On the 26th I went to get my haircut to celebrate "**Beautician's Day**" which gave me an opportunity to participate in "**Forgiveness Day**".....(it will grow out).

I'm waiting for "**Meteor Day**" on the 30th and only hope July 1st isn't "Kiss Your Bass Goodbye Day"! OK that last one I made up, for the others start your plans for next year at...
<http://www.holidayinsights.com/moreholidays/june.htm>

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ARM's New Micro-Bulk Purifiers

If your UHP gas demand is forcing you to consider parallel point-of-use purifiers, ARM has an alternative solution. We are releasing a line of "Micro-Bulk" purifiers specifically for moderate UHP gas demands. If your facility is a UHP weld shop where you are supplying multiple work stations from a single source, or if its an analytical lab with multiple instrument demand, or if your process is housed in a glove box type small environment, ARM has the solution.



Ambient operating vessels only, heated getter, or catalyst technology are all options, which one is best depends on your gas being purified and the impurities needing to be removed.

Watch out for the brochure on www.arminc.com it will be available soon.

If you send us and [e-mail](#) we will put you on the list to receive a copy as soon as it is available.

If your need is immediate, [send us an RFQ](#) including the gas to be purified, impurities to be removed, flow rate, operating pressure, and duty cycle, we will be happy to work with you to define and quote the appropriate system for your application.

Is My Gas Supply Spec Good Enough?

This month's technical article is contributed by Brian Warrick, VP of Technology at ARM Inc.

Just how clean is my gas and how pure do I need it? These are questions I've been asked many times throughout the years and the simple answer is that it's better than the manufacturers specification, but it's also inconsistent purity.

Over the next few months, we'll examine how gases are made and discuss why purification is important. This article will focus on atmospheric gases, specifically, nitrogen, oxygen, argon, and trace rare gases. Future articles will review hydrogen, hydrocarbon gases, carbon dioxide, helium, and sub-atmospheric and other specialty gases.

The air we breathe is not one homogenous mixture, but rather varies depending on location. In urban areas, contaminants such as NO_x, CO, SO_x, CH₄, etc. may be present in the air to such an extent that layers of smog are visible. In rural areas, the air may be pristine. Air is comprised primarily of nitrogen gas, followed by oxygen. These two elements comprise approximately 98% of the air we breathe. Other, trace compounds make up the remainder. In urban areas, the

pollutants discussed above may pass through the air separation process and end up concentrated in your gas.

How is Air Separated?

Three common methods of air separation are membrane use, vacuum and/or pressure swing adsorption (VPSA/PSA), and cryogenically.

Membrane style generators are simple, but can only create nitrogen with purity up to 99%. Another way of thinking of this is that in every 1,000,000 molecules of nitrogen rich gas generated, 10,000 molecules will be other components. That doesn't sound like very much, but in precision device manufacturing, the presence of even a few molecules of other gas may impact performance and yield.

Figure 1 demonstrates how a membrane generator works. Think of a membrane generator as a tube packed with rigatoni. If the tube of packed rigatoni is now filled with vodka sauce, some of the sauce will move through (or permeate) to the outer pasta wall and move to the opposite side. In this example, the portion of sauce which permeates through the pasta represents pure vodka. So, we start off with sauce entering one side of the tube and have pure vodka exiting the other. It's not the most efficient method, but it's not complex and relatively low cost.

In the same manner, air enters a tube packed with hollow fibers and nitrogen and oxygen are separated by the fibers. The remaining gas is swept away to vent. While the gas exiting the membrane contains some oxygen and other impurities, it is pure enough for applications such as: food packaging, beverage dispensing, tire filling, and general purpose inerting.

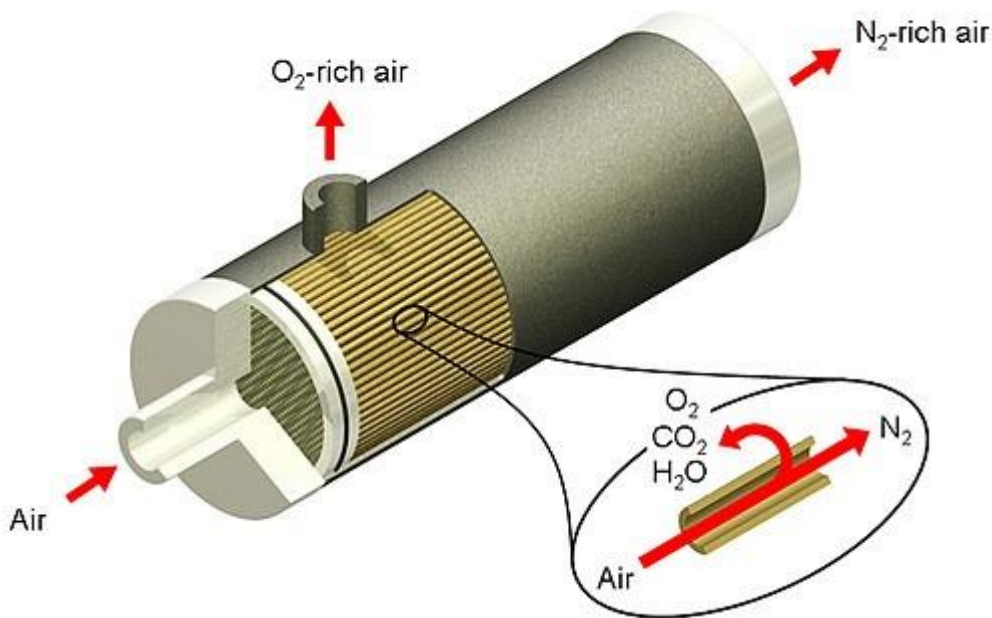


Figure 1: Membrane Separation

VPSA/PSA systems are more complex than membranes, but offer more improved pressure and purity performance. Some systems offer purity to 99.9%. Figure 2 shows us the PSA method of separation.

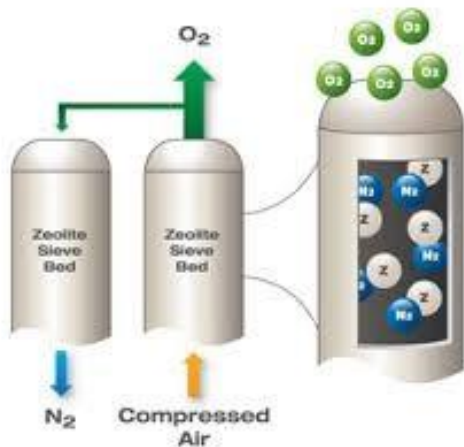


Figure 2: PSA Separation

Two or more packed beds are filled with a zeolite and operated in parallel. Air flows through one bed and oxygen or nitrogen is held-up or adsorbed within the zeolite. As the zeolite becomes full, gas flow shifts to another packed bed, while the first bed is regenerated. Regeneration is accomplished by rapidly reducing pressure and possibly introducing a vacuum within the bed. This style of separation uses alternating beds in which one or more are on-line while others are being regenerated.

A third method of air separation is cryogenics. Figure 3 is shows the inner working of a cryogenic plant in which feed air is sufficiently chilled to liquefy oxygen, nitrogen, as well as argon. Liquid gases are typically 99.9% and higher purity. This style of separation relies on the boiling point, which is the temperature at which a gas changes phase to a liquid. Within a cryogenic separator, liquid nitrogen flows down a tall packed column while air passes up through the column.

Since air is comprised of many gases, it stands to reason that the gases which makeup air will liquefy at different points along the column. Industrial gas suppliers use this principle to separate nitrogen, oxygen, and argon from air and store these in large containers (see Figure 4). The cryogen is then delivered to end users.



Figure 4: Merchant Style Plant

efficiency. Therefore, the purity of product delivered to your tank may vary with every delivery. While product delivered will meet your specifications, the product in your tank will likely have inconsistent purity over time.

Your industrial gas supplier likely has many air separation plants throughout the country. Some plants are located in heavy industrial areas and others in rural locations.

We opened this article by asking "how pure is your gas". We now know that there are varying separation methods for nitrogen, oxygen, and argon and that purity may vary from method to method. Purity will also vary from cryogenic plant to plant. Nitrogen from plants in highly urban areas will have higher levels of carbon monoxide than rural areas and oxygen levels will vary with plant

Laboratory, pharmaceutical, and electronic manufacturers typically require 99.999% purity or higher and many of these applications use liquid gases. In many of these applications, product consistency is the key to ensuring their manufactured product or report is accurate. Inconsistencies in gas can impact device performance and yield, which directly impacts profit margins and shareholder expectations.

Purification is a solution for inconsistent gases. ARM offers a wide range of media specifically selected for your applications. From reducing moisture in a gas stream to trapping krypton and xenon in argon, ARM has a product to fit your needs.

Tune in next month as we'll dig deeper into cryogenic separation and focus on the boiling point of individual gases as opposed to this month high level view.

Questions/Comments? Contact Brian at 719-538-5959 or bwarrick@arminc.com

Latest Installation & Start-up!

ARM has shipped a PreciMix gas blender for mixing analyzer calibration gas. Mass flow control via MFCs and mixing via an IDEC PLC with touchscreen HMI. The PLC was programmed for selecting between 2 preset blend ratios, and included the ability for the user to vary the blend ratio as desired from 0-100% for either gas.



Operating off AC input power, the DC required is supplied by the included AC/DC power supply. A back-pressure regulator controls delivered gas pressure and vent flow is easily read from the front of the unit via a rotameter.



ARM's PreciMix high precision and purity gas blending systems can be provided as simple two gas mixture systems (as shown above) to complex multi-dilution blending systems for UHP products, ARM has a PreciMix product to meet your requirements.

Applications of blenders include forming gas, precision mixtures for photovoltaic and LED applications, pure air generation, and calibration gases for pharmaceutical and laboratory analyzers. ARM's expertise in high precision gas blending spans decades, with installed equipment located around the world. ARM manufacturers blenders designed with end user control systems as well as local PLC control of pre-defined and custom blends. Choice of MFCs and components are up to the end user, with ARM's recommendations available.

Send us an [e-mail](#) or call 719-538-5959 for additional information on this or any of ARM's UHP solutions.

Thanks for reading this far!

We understand that there is very little time in the day to read all the newsletters that make it to your inbox. We will strive to not be 'that company' spamming the world with useless information seemingly every other day for no better reason than some webinar told them that is what they should do.

As noted above if you opt out we will honor your request. If you do tho, you may want to like us on Facebook or follow us on LinkedIn so you can keep your inbox clear, but still keep in touch with what is going on with ARM Inc. in the gas world.

Sincerely,

Dan Spohn
ARM, Inc.



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