

Dan Spohn

From: ARM, Inc. <dspohn@arminc.com>
Sent: Wednesday, July 20, 2016 10:16 AM
To: dspohn@arminc.com
Subject: Visualize a PPB - High Pressure H2 - Yips!



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

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Dear Dan,

It's May, and the Internet is a wonderful thing. I did a search looking for a May holiday to open this newsletter with and found out the May is National Golf Month! I'd celebrate but it's kind of difficult finding a white ball in a fairway full of snow (I've seen snow here as late as June 2nd). It did spark my interest tho and I got into a deeper search and found out I am afflicted with something I've never heard of, the yips! You know you have the yips when you tell your body do one thing and it totally ignores you and does something detrimental to your stroke total, my golf game in a nutshell. Knowing now that I've suffered the yips for years, I searched 'how to cure the yips' and go figure, there were over 15,000 results. I've only tried a couple yet with no luck, but then I've the entire month of May to work through the other 14,998. If you do golf, yips or not, this is your month, enjoy.

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ARM's Advantage Series Bulk Purifiers

Bulk purifiers from ARM represent a departure in both design and flexibility from the traditional pre-engineered models available from other manufacturers. Gone are the days when you had to purchase more capacity than your application required simply because your flow and purity

requirements fit in between the available model design specs.

The Advantage Series bulk gas purifiers from ARM offer a wide variety of vessel sizes and media options that allow you to zero in on a capacity and purifier life that suit your requirements. Configurations for the various technologies include heated getter, catalyst-adsorber and dual column adsorber or getter.



The sub-frame with vessels and plumbing (at right) installed on the 60"W x 30"D base made easy by a removable enclosure frame.

To keep costs down, and prices affordable, ARM's enclosures are modular. We have taken a basic 30" x 30" footprint and by adding additional standard bases, framing components and panel/doors, we can provide larger volume purifiers in 30" x 60" and 60" x 60" footprints. All

panels and doors are universally mountable to any frame opening regardless of footprint configuration.



After electronics and vessel/plumbing sub-frames are installed, the enclosure frame is reinstalled.

Lead time is improved through this modular approach, and the use of internal frame structures to support the vessels and plumbing. Electrical/control assembly and vessel/plumbing assembly builds can progress simultaneously. Initial check out and testing of these sub-assemblies can be completed before being integrated with the modular enclosure for final testing.




After assembly and test, the panels and doors are installed.


[Send us an RFQ](#) for the next bulk purifier requirement you have and see what we can do in support of both your budget and your schedule.


PPM to PPB, what does that look like?

Typical gas purification technology can take a gas with PPM impurity levels to PPB purity levels, or PPB to PPT levels, sometimes removing specific impurities to below the lowest detectable level.

So what is a part per million, simply it's 1 of 1,000,000 of anything. One PPB is 1 of 1,000,000,000. And one PPT is 1 of 1,000,000,000,000. That is an awful lot of zeros. To put it into a physical description that one can fathom, let's use grains of sugar. A quick internet search finds that there is an average of 1000 grains of sugar in a ¼ teaspoon. Further searching finds there are approximately 894 teaspoons in a gallon. With 4000 grains in a teaspoon, a gallon holds 3,576,000 grains of sugar, a 55 gallon drum holds 196,680,000 grains of sugar.

 1 teaspoon = 4000 grains of sugar

 1 gallon = 3,576,000 grains of sugar

 1 55-gallon drum = 196,680,000 grains of sugar

To get a billion grains of sugar for a purifier analogy we will need 5.084 drums of sugar.....



Modern purifier technology can take an inlet impurity of 10 PPM down to 1 PPB. So what does that equate to in our 5.084 drums (just a bit shy of 280 gallons)? We need an impurity, I picked salt. Salt is a much smaller grain than sugar and another Internet search found that 10,000 grains of salt will fit into ¼ teaspoon, so let's assume there is 1/4 teaspoon of salt dispersed throughout our 5.084 drums of sugar. The concentration of salt grain impurity in our sugar is 10,000/1,000,000,000. Getting rid of a few zeros and it is 10/1,000,000 or 10 PPM.

So, what you are asking ARM to do when you call for a purifier to output 1 PPB gas with a 10 PPM inlet impurity at say a 10 slpm flow rate is akin to asking us to remove a 1/4 teaspoon of salt, one grain at a time, by sifting through 280 gallons of sugar at a rate of 2.2 gallons/minute and only let 1 of the 10,000 grains of salt get by.

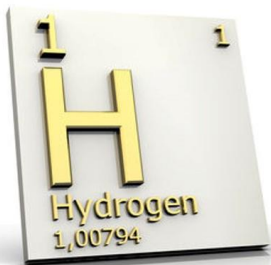
With modern gas purification technology, and state of the art designs, ARM can do that and much much more.

Latest Installation & Start-up!

ARM shipped an Advantage Series Model A-4009W-85-H2 high pressure bulk hydrogen gas purifier earlier this month. The purifier, rated for 2700 psi operation, was for a bottle filling application. The dual column high pressure, code stamped vessels, along with high pressure flow meter, 316L electropolished high purity stainless steel plumbing & components, and fully automated PLC controls will provide continuous flow of high purity, high pressure hydrogen.

Heated regeneration of the dual columns is fully automated providing 24/365 operation. The HMI allows the technician the ability to adjust regeneration frequency and monitor pressures and flows from the various transducers incorporated in the design.

2700 PSI



<1PPB H₂O

The system is housed in ARM's modular enclosure designed for installation in protected environments. The modular design allows for removal of any or all of the panels, doors and support framework for easy maintenance access when required.

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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