

Dan Spohn

From: ARM, Inc. <dspohn@arminc.com>
Sent: Wednesday, July 20, 2016 10:13 AM
To: dspohn@arminc.com
Subject: Getter, catalyst, adsorber, what's the difference?



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Dear Dan,

Below is our August issue, thanks for opening and taking a look.

Summer is a time most industries slow down with vacation time usage typically high. An interesting fact, the United States, along with Tonga, Sri Lanka, Palau, Nauru, Micronesia, Marshall Islands, Liberia and Kiribati, are the only countries on the planet that do not have statutory minimum vacation days. The minimum vacation days of countries that do have statutory minimums range from China, Mexico and Thailand at 5 days, to Andorra, Kuwait, Libya and Panama at 30 days. 42 countries mandate a minimum of 20 days per year and 23 countries mandate 10 days minimum. (see https://en.wikipedia.org/wiki/List_of_statutory_minimum_employment_leave_by_country)

Even though the US does not have a statutory minimum, 98% of US employers offer some vacation with 86% offering between 6 and 20 days per year.

We hope you all have had a good summer and take some time off to enjoy it.

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What's new?

Getter technology is well known for gas purification. Getter purifiers can be operated heated or unheated based on the gas being purified and the impurities being removed. Getter purifiers all have a finite life, essentially a limit to the amount of impurities they can remove from the gas stream.

Lifetime is typically derived from a calculation based on the input impurity level and flow rate of the gas being purified. Purifiers are typically designed and sized to provide 1 year of operation based on these parameters before needing replacement or regeneration.

But what happens if the flow rate was unknowingly more than average causing a shorter than calculated lifetime? The logical assumption would be premature impurity breakthrough, which in the best case would be identified by decreasing process performance, and in the worst case, damage to products/equipment. There is anecdotal evidence that other things could happen. From breakdown of the gettered impurities and subsequent release into the gas stream, to cyclic burst releases of larger quantities of specific impurities.

ARM Inc. is investigating! We are scheduling end of life testing of specific purifiers and will be writing and releasing a paper on the results, these results will also be reported in this newsletter, watch for it in the coming months.

Semicon West Update

ARM Inc. engineers attending Semicon West in San Francisco last month reported:

- Forecasts for the overall market are expected to decrease as the year progresses.
- The drive for sub 14nm manufacturing capability is still strong due to the lower power consumption, targeting the mobile device markets. (This could drive requirements for higher purity levels in process gases)
- Summarized from the Keynote panel... there is still a lot of room to produce more efficient, higher performance devices but it is getting harder and more collaboration is needed. (ARM Inc. is ready and willing to collaborate on developing higher purity capable technology)

An interesting growth area for device usage may be attributed to the baby boom generation and the Affordable Care Act. Seems the baby boomers are 'aging in place', staying in their homes vs. care facilities which are typically a more costly solution. This is driving a need for more small economical health & home monitoring devices which could lead to a surge in device demand similar to the smart phone driven surge.

Getter/catalyst/adsorber, what's the difference?

You have a purifier, do you know what type it is and why? What follows is just a basic description of the 3 main purifier types. Which type to use, and in some cases multiples are used in series, is based on the gas stream, the level of inlet impurities, and the outlet purity required. Contact ARM Inc to discuss your pure gas requirements and the options available to get the purity you require.

GETTER

A getter is typically a metal and/or metal alloy that can chemically sorb or trap impurities from a gas stream. Getters have a specific capacity or adsorption limit for different

impurities so once the getter has reached its capacity, it will need to be replaced. The capacity is not determined by the total impurity content in the feed gas stream, but rather by the first breakthrough impurity. Getter has a much lower capacity for removing nitrogen and carbon than oxygen and as a result, nitrogen and methane break through earlier than oxygen and moisture. Sizing a getter purifier then is based on the first breakthrough impurity. Getter based Gas Purifiers are typically operated at elevated temperatures to remove all impurities from a gas stream. Getter purifiers are typically used with non-reactive gases such as inert and noble gases. Although getter purifiers are a bit more expensive and have a higher cost of ownership, getter purifiers are the purifier of choice when all impurities require removal to provide Ultra High Purity Gases.

CATALYST

Catalyst is a media which consists of a substance, primarily a base metal, typically distributed on an inert support, enabling chemical reaction and/or chemisorption. A very common catalyst purifier is the catalytic converter used on nearly every automobile sold in the US (exceptions - the classic in your garage or the all-electric recently purchased). This catalyst purifier converts the CO, VOCs (volatile organic compounds - hydrocarbons) and NOx (nitrogen oxides) from the combustion process into more environmentally acceptable CO₂, N₂, H₂O, and O₂. Catalytic gas purifiers used in the pure gas industry can operate at ambient temperature or at elevated temperature, (like the one on your car), depending on the catalytic reaction required, and can have a lifetime of >10 years. Catalyst purifiers have a lower overall capacity and range of impurities removal compared to heated getters. Certain catalytic media can be dangerous when used in elevated oxygen (> 500 PPM) gas streams. Your purifier supplier will be able to advise you of the best catalyst for your specific application.

ADSORBER

The term adsorber includes many different types of media, including activated charcoal, zeolites, sieves, and activated alumina, which adsorb a variety of impurities in such processes as gas drying, purification, and separation. These different types of media are used individually, in multi-sorbent media beds, as well as in conjunction with catalyst and/or getters. Adsorption, also known as adsorptive separation, is an ambient temperature operation for the removal of impurities and requires regular regenerations. Adsorber purifiers can have a lifetime of >10 years. They have lower overall capacity and range of impurities removal compared to heated getters.

It is important to note that the media used in all three purifier types has the potential for producing an exothermic reaction when high levels of certain gases are inadvertently introduced (ex: >500ppm O₂ in certain catalyst purifiers). Operators must have a complete understanding of the products and processes to prevent potential personal injury and equipment damage. Look for articles in future issues on what can go wrong with a purifier and how to prevent it.

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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