Hi Everyone

I have had 50+ years of experience in the Electronic Specialty Chemicals Industry. During this time I learned a lot and want to make sure this knowledge is passed along.

I started as a laborer cleaning compressed gas cylinders in 1972 for a very small family-owned compressed gas company, Precision Gas Products. They gave me the foundation and knowledge to build a successful career as Herb Gill the owner believed that every employee had to learn every task in the company. I filled cylinders, hydrotested them, valved them, made traceable gas mixtures, analyzed them, made arsine, etc. I then went onto a successful career building Specialty Gas Facilities for Matheson Gas Products, finally becoming a Vice President with Solkatronic Chemicals in 1989. I built this into a renowned worldwide Semiconductor Gas Company that was acquired by Air Products in 1998. After my early retirement in 2009, I had an extremely successful career as a consultant with Chemically Speaking which continues today.

During this time the industry has undergone tremendous change with cylinders, valves, gas purities, packages, etc. Unfortunately, the history of the development of these devices or the root causes of the many incidents have not been formally captured and passed along to train people entering the field as to why certain decisions were made and why. For example, major incidents have occurred that forced the industry to change procedures or fill amounts to eliminate the hazard. The basis for why these have been done are rapidly being lost, the institutional knowledge is disappearing as “old timers” like myself are retiring or passing. These lessons learned are being forgotten or never learned. I am very concerned that mistakes will be made simply because the user was not aware of prior incidents. This almost happened in 2004 when the UNTDG tried to pass increased fill densities for germane.

In my career, I have been extremely lucky to have management or customers that have happily given me time as well as funds to satisfy my curiosity. Even today they have paid for many research studies on systemic problems that individual companies would not speak about issues with a new chemical. I convinced 2 companies to found 2 years of research into hexachlorodisilane which has become invaluable with Safety and ER.

For the last few years, I have committed myself to capturing the learnings of my 50 years in the Specialty Gas Industry in my many hands-on roles. I have repeatedly reached out to many of the industry veterans to review these articles and there has been a tremendous response.

Comments from Jack Wert, 40+ years in the Specialty Gas industry, BOC and Linde and CGA on the article, “Development of a Cylinder Valve Restrictive Flow Orifice”.

> Wow did this bring back memories! This article was well written and very comprehensive.
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> The chronology, as you present it, is just as I remembered. You identified silane as the initial and overriding driver to develop RFOs. You also explained how the RFO expanded to other gases.

You covered the need and conception of the RFO as well as the trials and tribulations of development and what the industry finalized on. This included filters/no filters, gaskets/no gaskets, flow rate calculation formulas, even the significance of flat plate vs orifices with a given thickness. All of this with rationales for each decision. The article is well supported with references.

You also identify technical associations and regulatory references that have adopted the use of RFOs (in me cases making their use a regulatory requirement) to provide for the reader's further guidance.

Eugene, this article will provide a solid reference for "how we got here" for anyone who reads it.

Electronic Specialty Chemicals have many unique hazards, packages, etc that can be the cause of incidents. Due to the extensive security surrounding any Fab event these are not shared with the public. For some where I see systemic problems, I have been able to secure R&D contracts to test these and to reveal the findings. (HCDS and Disilane were some of these)
My articles are not comprehensive summaries of the gas or gas systems I am listing unique issues or incidents related to those. To make users aware. Most incidents have been sanitized as to company and exact location as they have no bearing on what happened. These are 2 page or more than 25 page summaries in length. In these I want the reader to understand the reasons for the design and/or rejection.

Learn and be safe!

I have been fortunate to have 3 key websites create a section to allow you to view and download these.

1. Dr. Christina Baxter, Hazard 3, created a space on their website https://hazard3.com/
   Eugene's Corner this will reach the Emergency Responder/HazMat audiences.
2. Semiconductor Environmental Health and Safety Association (SESHA) website https://sehsa.org/
   called Eugene's Corner, this will reach the Semiconductor User audience
3. Lynne Kilpatrick, HMEx, https://hmexassistant.com/
   This will reach the regulatory standards and code enforcement audience

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