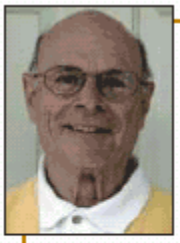

by Allen Mossman

Remembering Matheson: A Pioneer in Specialty Gases

The first products sold were mainly gas generators used in qualitative and quantitative chemistry

(The following account of the history of Matheson [Matheson-TriGas Corp] is based entirely on my personal reminiscences and memories of Matheson. Since I have no direct access to historical records that establish the beginnings of the company, I must rely on information that was provided to me during my early days at Matheson, and on the events that occurred during my 31 years as a Matheson employee. My recollection of dates and times have faded since my retirement in 1983; however, I believe that the sequence of events and the general placement of major events in time are reasonably accurate. Any errors may be attributed to my selective memory, which may have been altered by time, circumstances, and an eye for events as they might have been.)

The Early Days

The title, "Father of the Specialty Gas Industry," rightfully belongs to Adam Matheson, a chemist who established The Matheson Company in the late 1920s. That company's first customers were chemistry laboratories, as well as schools, colleges, and universities (lecture halls). The products offered were mainly gas generators (primarily for hydrogen sulfide), to be used in qualitative and quantitative chemistry, and the popular lecture bottles first used during class sessions that demonstrated the properties of a number of common gases.

A lecture bottle, an early product offering.

When Adam Matheson died in the early 1940s, The Matheson Company was acquired by the Ferris family of Hackensack, N.J., with George Ferris (a lawyer) assuming the position of President. His good friends, Dave Ross (accountant) and a later arrival, Cass Heinrich (comptroller), rounded out the executive staff. During World War II, Matheson supplied the U.S. Navy and the Army Air Force with small cylinders of compressed air for use in inflating life rafts. During that period, the Ronson Company invented the butane-fueled cigarette lighter; and Matheson was contracted to manufacture the original filling equipment for those lighters. For a short time, Matheson also filled the lighters until Ronson assumed that operation.

Up to this point, the only technically trained person on the Matheson payroll was Stanley Fischer, who had completed a few years of course study toward an electrical engineering degree in college. Stanley was in charge of all plant operations and possessed excellent mechanical and electrical skills.

The owners of Matheson thought of themselves as being in the reagent chemical business, with specialty gases comprising a line of reagents in gas form. It was natural for them to consider expanding into the area of providing liquids and solids. As a result they acquired The Royal chemical Company, a small independent, which had been owned and operated by William (Bill) Braker, a brilliant organic chemist who had worked at Squibb Pharmaceutical before heading out on his own. With this acquisition, Matheson established itself as a repackager and manufacturer of gas, solid, and liquid laboratory chemicals. A fairly large number of liquid and solid chemicals were synthesized, with most of the gases being transfilled. By 1950, Matheson was manufacturing one gas, nitric oxide, and had begun manufacturing gas mixtures.

Al Mossman (left) receives the Semi Award from Jerry Sanders during the early 1980s.

By 1952, Matheson was having difficulty keeping up with demands for more gas products and increasingly complex mixtures, many of which required gas analysis for certification. With their mixture business expanding, Matheson realized the need for additional technical help. At that point, I was recruited by doing development work at General Electric in and a former classmate of mine, who had married into the Ferris family, recommended me to George Ferris. I started work for Matheson on May 5, 1952. Since I held two master's degrees in chemical engineering, I was their first technically-trained college graduate.

A laboratory scene typical of the era when Matheson was founded.

My first assignment was a six-week crash course in all facets of Matheson's plant operations. This included gas filling, gas manufacturing (nitric oxide), gas mixture manufacturing, cylinder cleaning and hydrostatic testing, shipping and receiving, and working in the hardware department, which was designated "The R&V Department" (regulator and valve). William Dugan, Sr., and his two sons, William, Jr. and Robert ran this department. Dugan Sr. was a former employee of Hoke, a manufacturer of small specialty valves. He came to work for Matheson soon after George Ferris took over the company. The hardware operation assembled, tested, and shipped all of the regulators, valves, flowmeters, and other equipment associated with the line of compressed gases sold by Matheson. A small machine shop in the Bronx, Wolf Mfg., manufactured many of the hardware items.

Following my initial training, I was assigned a desk in the office, which consisted of an open area that housed all office functions, with no separators or partitions. Anyone on the telephone could be heard from any other part of the

office. Management's philosophy, in that era before voice mail, was that every person in the office should be able to learn, from incoming calls, what was going on in all areas of the business in order to better serve our customers. Calls had to be answered by the second ring, and you were obligated to call customers back as soon as possible with the correct information if you couldn't provide an answer right away. I was assigned the task of answering all technical questions. It was trial by fire, but a great way to learn what customers needed to know and what problems they were encountering with our products (or misapplication of our products). It provided valuable insight, and not only suggested the need for new products that could be added to the Matheson line, but also the type of information Matheson needed to provide to customers in order for them to understand how to use and handle compressed gases.

The open office structure resulted in a good interchange of information, but also proved to be as stressful as being on the floor of the Wall Street Stock Exchange.

Solving Technical Issues

I was soon assigned a number of projects outside of the office that required technical knowhow. The first was an emergency. Cylinders of carbon monoxide had failed at a few customer locations. To ascertain the cause of the problem, it became necessary to recall all carbon monoxide cylinders in order to examine them. Fortunately, Matheson maintained excellent records of all cylinders, and had the ability to trace them by customer and individual cylinder serial numbers. All were recalled.

The literature indicated that gases containing carbon monoxide, such as manufactured fuel gas, could result in stress corrosion cracking. Such gases can retain a high moisture content, as well as impurities that give rise to acid-forming compounds, such as hydrogen sulfide, carbonyl sulfide, hydrogen cyanide, and carbon dioxide.

The carbon monoxide delivered to customers by Matheson at that time was manufactured by a supplier who produced it from coke and carbon dioxide. Gas analysis of this product revealed impurities of the type that could cause stress corrosion cracking. Since Matheson had been selling 1,000 psi carbon monoxide for many years with no problems, the pressure was increased to 2,000 psi to increase cylinder capacity. Approximately one year later, problems began to occur. We learned that other companies supplying carbon monoxide had also experienced the same problem.

Matheson had been purchasing all of its cylinders for carbon monoxide service from Harrisburg Steel Co. (Harsco), and enlisted their aid in solving the crack detection problem. A procedure (hydrostatic testing) was developed, and it was instrumental in identifying those cylinders that were defective and needed to be removed from service.

After the cause of cylinder failure had been identified, Matheson began to manufacture its own carbon monoxide, under a process patent that I obtained. The process produced CO that was dry, had a high purity, and was free of those

impurities that had been pinpointed as initiators of stress corrosion. Following a five-year period of satisfactory performance, with no detectable cylinder defects, cylinders were placed back onto their normal five-year periodic hydrostatic test schedule.

Another early problem, to which I was assigned, yielded insight into diffusion rates in cylinders filled with gas mixtures whose components possessed disparate gas densities. It was assumed (erroneously) that complete mixing occurred in the cylinder within a few days of manufacture. Since complete mixing did not occur as soon as believed, some procedure had to be developed that would speed up the process. Initially the bottom of the cylinders were heated by immersing them in hot water, while simultaneously cooling the top with cold water to accelerate the diffusion process. Once the mixing problem was solved, the mixtures proved to be consistently good. Subsequently all mixtures requiring mixing prior to shipment, including all that were to be certified by gas analysis, were mixed on cylinder rollers. Experiments were also conducted to see if mixing could be accelerated during manufacture by inserting eductor tubes of various designs into cylinders. Success was achieved with some mixtures; but not across the board.

Another technical problem was the need to develop gas analysis techniques to meet the demand of customers who required certified mixtures with known compositions and close tolerances. The only reliable gas analysis instrument at the time was the Orsat Analyzer. Its operation was based on the principle of inserting a known volumetric sample into a graduated glass burette and passing it through a gas absorption bulb filled with a chemical solution. In this process, the solution reacts with, and removes, a component of the mixture. The remaining gas is returned to the sampling burette where a reading on the volume of gas remaining can be obtained.

The Orsat was a cumbersome and slow analytical tool; and, a combustion technique used for determining the concentration of flammable gases, if not handled properly, could result in an explosion that destroyed most of the apparatus—an embarrassing situation, as well as dangerous. In time, Orsat analysis techniques were refined and the equipment was customized to allow for faster, safer, and more accurate results. There were, however, cases where analytical requirements exceeded the ability of the Orsat, and gas samples needed to be sent out for analysis to labs specializing in mass spectrometry..... SGR

The Way it Was—*by Bob Beaudreau*

The speciality gas business has changed in so many ways since the days I was in the industry as plant manger of the Newark, Calif., location of The Matheson company in 1959.

Nowadays there are so many new hardware products, types of gases, and grades of gases, it is difficult to comprehend.

The advancement in the manner of processing orders, using computers, and sales

procedures, are much different than the methods we used in the early days of rare and specialty gases.

After I was hired by Matheson, I spent six weeks at the main plant in East Rutherford , New Jersey. At that time, Matheson was the main supplier of specialty gases. Air Reduction Company was solely into the rare gases. Air Reduction sold some rare gases directly to customers, but Matheson was Air Reduction's biggest customer.

During my six weeks in East Rutherford, I was trained in gas filling, gas mixing, cylinder testing, gas handling equipment, and taking gas and equipment orders from customers. What impressed me was that when all the order clerks were busy, the switchboard operator transferred calls to anyone whose phone line was open. That included some of the management people, and they all knew how to take a product order.

For about the first three or four years with Matheson, the sales force consisted of a vice president of sales and one outside salesman. The office people in the plants made up the rest of the sales force. During the early sixties, Matheson had its main plants in East Rutherford, Joliet, Ill., and Newark, California.

During the early sixties, an outside salesman was hired for the Joliet and Newark areas. Our salesman spent four weeks in the plant to learn gas filling procedure, hardware, and order taking.

When new office employee were hired, they were trained to take product orders, type orders, and fill. They became familiar with the gas catalog and gas data book. Those two items were our main sales tools. We developed a personal relationship with our customers and service was the utmost goal toward which we strived.

Once an order was typed up, a copy was sent to the plant for filling, and the product was shipped by common carrier. Our plant shipped product to Washington, Oregon, Arizona, Utah, Nevada, and California.

Every time Matheson came out with a new catalog, sales seemed to increase. The gas data book was a most valuable sales tool. An example of its importance was confirmed when a customer in Southern California called one day and hastily related that one of its employees inadvertently entered a pit filled with carbon monoxide, inhaled the gas, and was in bad shape. They asked what should be done to ensure his safety. The gas data book had the answer in its first aid section, and the lifesaving information was quickly relayed to the caller— just in time to save the victim.

Every customer was important to us and we bent over backward to keep the customer satisfied. Our customers were at the forefront of our operation. I stressed to all the employees that the customers are the people who pay our salaries, and if we don't take care of them, we are not going to be in business very long. And that's the way it was.

The history of Matheson continues in the Fourth Quarter issue of SGR)
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