GOW-MAC Instrument Company

Where Customer Involvement Drives Product Development in the Business of Gas Analysis

A CryoGas International Company Profile

GOW-MAC's custom configured gas analyzers and complete gas systems have been providing solutions for a wide range of applications since 1935.

For over 75 years, GOW-MAC® Instrument Company (*www.gow-mac.com*), Bethlehem, PA, has been a leading provider of gas analysis solutions. GOW-MAC designs, engineers, and manufactures gas chromatographs, gas analyzers, and gas detectors for use in chemical, industrial gas, laboratory, and educational applications. The Company's instruments are suited to routine analysis, research tasks, and online analysis in Supervisory Control And Data Acquisition (SCADA) roles.

Over the years, GOW-MAC has relied on customer involvement to drive the direction of product development. Current applications evolve, and new applications emerge. For any instrument developer, there are opportunities that arise from communication with customers, responsiveness to their needs, and when possible, anticipation of the next requirement. It is this philosophy that has helped GOW-MAC become a leading supplier of high performance laboratory and process analytical instruments.

Gas analysis can involve a variety of analytical challenges. Typical challenges may be in speciation, sensitivity, or conditions that pose issues with toxicity, flammability, or corrosion. The development of a suitable customized response might involve the modification of a standard system, or the end-to-end engineering of a complete solution. GOW-MAC has over 75 years of gas analysis experience in all categories of applications. The Company's technologies can be applied in laboratory sample analysis or in online continuous monitoring.

Custom, 3-Bay Analytical Package Lab System

In the Beginning

The first few years of a new enterprise often establish the permanent path of that company's evolution. GOW-MAC would be no different.

William Gow and James McFadden established GOW-MAC Instrument Company in 1935 in Newark, NJ. Gow had developed an automotive engine analyzer; the new Company would manufacture and market it. The analyzer utilized a thermal conductivity detector (TCD) to measure the CO_2 content of engine exhaust gas. This first product, in turn, led to the development of a variety of TCDs and binary gas analyzers, such as those for the analysis of air in H_2 and the comparison of natural vs. manufactured gas.

The Company incorporated in 1942 and began supplying instruments to the US Navy during World War II. Among the instruments manufactured were a ventilation tester for measuring hydrogen build-up in submarines and a portable inertness analyzer for monitoring the atmosphere in the headspace of aviation fuel storage facilities on aircraft carriers.

After the war, the Company expanded into broader commercial markets, but remained rooted—as is still the case today—in the business of gas analysis. The varying requirements of different applications furthered GOW-MAC's development of the TCD, while also driving the development of detectors and systems based on other technologies.

Today's Products

Gas Analysis

The GOW-MAC line of gas analysis solutions is extensive. Depending on the targeted application, GOW-MAC Gas Analyzers may use TCD, PID (PhotoIonization Detection), FID (Flame Ionization Detection), FPD (Flame Photometric Detection), HFADD (High Frequency Argon Discharge Detector), colorimetric, or electro-optical detection. GOW-MAC Gas Analyzers may be used on the benchtop. To facilitate the simultaneous operation of multiple analyzers, they are also designed for 19-inch rack mounting. Portable binary gas analyzers are also available.

Due to their fast response, sensitivity, simplicity, and robustness, TCDs are ideal for

binary gas analyzers. TCD binary gas analyzers such as the GOW-MAC 20 and 50 Series offer a fast and cost-effective means of providing reliably accurate quantitative analysis of binary streams of industrial gases in gas blending, cylinder identification, and atmosphere control applications—on a continuous and/or non-continuous basis. Specific applications are wide-ranging. Examples include lamp bulb manufacturing (fill gas monitoring), annealing furnace operation (blanketing/inerting gas monitoring), and gas reclamation systems. Where corrosive samples are a problem, corrosion-resistant materials are used for manufacture of flow and detector systems.

When special requirements prevail—such as sensitivity in trace analysis, or specificity in mixture analysis—other detection technologies are used. Over the years, in addition to TCD-based analyzers, GOW-MAC has developed specialized products that fit niche requirements.

As an example, BTEX (benzene, toluene, ethylbenzene, and xylene) contamination of carbon dioxide is of great concern to the beverage industry, with benzene of particular interest. (*See discussion of benzene levels in beverages in "Gas Chromatography—Mass Spectrometry," by Stephen Harrison, CryoGas, August/September 2011, p. 66.*) Monitoring BTEX in CO_2 is a high priority for both the gas supplier and the gas user. The application requires an analyzer capable of unambiguously speciating and quantitating the benzene impurity, with the option of identifying toluene, ethylbenzene, and the xylenes. Further, the instrument should function as a standalone system, be easy to operate, and have the ability to run on a continuous basis. Analysis time must be fast, and the price within reach of bottlers and CO_2 suppliers.

This set of requirements led to GOW-MAC's development of an entirely new line of gas analyzers for the beverage industry and suppliers of beverage-grade CO_2. In the end, the 200 Series of gas analyzers encompassed not only BTEX analysis, but also the determination of other impurities in beverage-grade CO_2, including acetaldehyde (FID), and sulfur (FPD).

As technology and customer needs advanced, GOW-MAC added process gas analyzers to the product line in the mid-2000s. These analyzers include trace impurity analyzers for argon, N_2 in argon, N_2 in helium, and moisture in argon.

Gas Chromatography

As Gas Chromatography (GC) emerged in the 1950s as a commercially viable separation technique, GOW-MAC pioneered the science of detector technology. The early developments in detector technology led to a series of innovations in the years that followed.

Thermal Conductivity Detectors (TCD). GOW-MAC stands today as the major developer and supplier of TCDs and detector elements (filaments) for GC manufacturers around the world. GOW-MAC holds several TCD patents.

Discharge Ionization Detector (DID). In 1990, a revolution in the industrial gas industry took place. GOW-MAC introduced the Series 590 DID Gas Chromatograph, which allowed gas manufacturers to test gases at purity levels of six nine's, aka 99.9999%, aka 1 ppm. The Company's patented DID is a universal, non-radioactive detector capable of performing trace gas impurity analyses in the part-per-billion (ppb) range. Access to the trace-level-capable GOW-MAC Discharge Ionization Detector transformed the industrial gas business by enabling gas manufacturers to definitively quantitate ultra high purity gases and specialty gases. At the 1 ppm impurity level, the gas provider now had a tool that allowed 1% RSD (relative standard deviation) of atmospheric impurities in base gases. The Series 590 became the analyzer of choice used by gas producers.

Beyond the gas suppliers, the DID caught the attention of gas users as well. Companies that manufacture semiconductors, such as IBM and others, began using GOW-MAC analyzers to verify the purity of the gas they were being provided.

Today, gas manufacturers and users around the world have come to respect and trust the GOW-MAC Discharge Ionization Detector for performing low ppb to ppm level trace gas analysis. The DID's performance, precision, and sensitivity are unsurpassed, making it the industry standard.

Medical Gas Analysis Systems. Two GOW-MAC medical gas chromatographs—the Series 580 MGA and the Series 400 MGA—are expressly engineered to meet the new requirements of the US Pharmacopeia (USP) "Chapters" (formerly known as monographs). These medical gas GCs perform rapid analysis, quality control, and validation of medical gas assays and identity tests on medical N_2, helium, CO_2, and nitrous oxide; as well as lung diffusion mixtures, anaerobic

5100 Series Continuous Binary Gas Analyzer

Series 200AHC Aromatic Hydrocarbon Gas Analyzer

Series 1200 Trace N_2 in Argon Analyzer

Series 590 Discharge Ionization Detector (DID) Gas Chromatograph

Series 110TCD Gas Chromatograph

Series AR710 Argon Analyzer

gas mixtures, and clinical blood gases.

GOW-MAC medical gas analyzers are designed, manufactured, serviced, and documented to support conformity with cGMP (current good manufacturing practice) standards as required by 21 CFR 211.22. (*For more on medical gas regulations see "Regulatory Momentum and the Gases Industry," by Bob Yeoman, CryoGas, November 2011, p. 38.*)

Gas Chromatography Systems. GOW-MAC offers a range of complete GC Systems, including instruments based on TCD, PID, FPD, FID, or HFADD detection technology. Models range from basic single column isothermal systems to multi-column systems with temperature programmability.

Gas Analysis Accessories. GOW-MAC's TCD-based Gas Leak Detector is widely known and accepted as best in class. The Company also manufactures purifiers, hydrogen separators, and oxygen traps, generally used as GC add-ons for specialized analyses.

Export Growth

In November of 2011, GOW-MAC was recognized by the US Department of Commerce for its export successes. GOW-MAC officers Jeffrey B. Lawson, President, and Kenneth B. Fincke, Vice President, were presented the US Department of Commerce's Export Achievement Certificate (EAC) at Company headquarters in Bethlehem, PA. The award recognizes companies that have expanded their international sales into new foreign markets and exhibit good financial stewardship. Among manufacturers in the Commonwealth of Pennsylvania, GOW-MAC and only three other companies received this award in 2011. (*See "GOW-MAC Honored," CryoGas, January 2012, p. 12.*) Export growth is important not only for GOW-MAC, but also for our local, regional, and national economies.

Export growth is strengthening the Company's global representative and distributor network. GOW-MAC has successfully developed new markets or increased exports to regions, such as Europe, Africa, and South America, and countries like China, South Korea, India, Turkey, and Russia.

Foreign sales and support offices were recently opened in Hsinchu City, Taiwan and Beijing, China. The staff at these locations provide technical support and service to sales agents and end-users along the Pacific Rim and China.

Requirements Continue to Motivate

Sales and Marketing VP Kenneth Fincke (himself a long-time GOW-MAC employee with over 40 years of analytical experience) says, "Our custom configured gas analyzers and complete gas systems have been providing solutions for a wide range of applications since 1935. We continue to partner with the compressed gas industry in working to address the requirements of quality assurance while also working to maintain overall laboratory throughput. All of our instruments are fully engineered systems that are industry proven, rugged workhorses, and easy to use. Our skilled team of engineers works very closely with our customers to ensure that the gas analysis instruments we design for them will be the most efficient solutions for their specific applications. It is their requirements that continue to motivate us." ■

For more information on GOW-MAC Instrument Co. products contact GOW-MAC at 610-954-9000, sales@gow-mac.com or www.gow-mac.com.