Trends in gas analysis instrumentation

A perspective from GOW-MAC

In the last 10 years, methods of acquiring chemical data from systems and environments have changed dramatically. One trend in today's instrument solutions is an increase in the sophistication of the MMI (man machine interface), data acquisition systems, and in the communication and transmission of the data that is gathered. Systems are more highly integrated, with greater emphasis on manufacturing quality assurance and control of the manufacturing processes.

Of growing interest in the gas analysis market are Process Analytical Technology (PAT) and online analysis. The goal of PAT is to understand more fully, and to control more completely, the manufacturing process. By definition, PAT encompasses manufacturing design, process analysis, and process control – in a closed loop of analysis and control. In the field of gas analysis, PAT has seen rapid growth and has been embraced by the gas manufacturing sector.

Sometimes integrated with PAT, and other times apart from it, online analysis methods may be used for quality control or for process monitoring/documentation – and may often target specialized measurement requirements. The realization of specialized goals requires a true and open customer/vendor relationship, where requirements are disclosed openly and constraints are shared realistically. Analytical instrument manufacturers can be a valuable resource for application development and support. For example, at GOW-MAC® Instrument Co., we can provide the services of an application laboratory and a custom design team in a multi-disciplinary approach to gas analysis problem solving. In fact, total support is a trend unto itself: instrumentation vendors are being called upon more and more for solution development aimed at the plant floor – and at the laboratory.

At the control end of these systems, highly integrated SCADA (Supervisory Control And Data Acquisition) systems are becoming commonplace. Dedicated, integrated SCADA systems gather data, transmit that data back to a central site, monitor for process events, carry out the necessary analysis and control, and display the information in a logical and organized fashion.

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GOW-MAC uses SCADA systems to control various process and analytical instrumentation. Basic parameters include, but are not limited to:

- System configuration
- Online measurements frequency
- Required range of impurities measurement
- Maximum permissible concentrations of impurities
- Set-points for alarm and warning signals
- Calibration check on-demand function

Another trend of significance is the increased attention to environmental issues. Given the public's heightened awareness and anxiety with respect to environmental concerns, the demand for environmental instrumentation will grow. As environmental testing expands, the need for EPA Standards will increase – along with the instrumentation required for compliance.

In the measurement and analysis business, one trend that will never go away is the constant demand for advances in precision and accuracy. Nowhere is this more true than in the electronic and specialty gases business, which calls for sensitivities down to the parts per billion and lower range(s). End-users such as semiconductor fabricators drive the demand for higher purities, which in turn drives the demand for more sensitive analysis.

Newer detector technology is emerging to address the demands of sensitivity. For example, GOW-MAC Instrument Co. has seen online instruments and application-specific instruments incorporate specific detectors that are ideal for trace level detection of toxics and contaminants. The response profiles of new detector technologies can also help instrument designers create automated systems that are not only sensitive, but are also specific for the conditions of the application.

Specialty gas and compressed gas laboratories are also demanding faster analyses and more automation. Analyses that previously might have been multi-step and managed by hand (sometimes by many hands) are now the 'system's responsibility'. The end results

of the analyses remain of utmost important, of course, but system integration and automation are today of equal focus. The trend is to rely on a manufacturer to compile all aspects of the analysis in a package that meets all customer requirements.

Although the instrumentation design and software are becoming more complex for the instrument suppliers, user-friendly software and streamlined instrument design are helping customers with ease of use and maintenance of instruments. The ultimate market force is the customer. End-users continue to demand:

- Speed of analysis
- Higher sensitivities
- Reliable instruments
- Robust instruments
- Ease of use, with minimal training requirement
- Low operation and maintenance costs
- Customized, automated solutions
- Integrated analytical systems
- Excellent vendor support and communication

It is the responsibility of the supplier to engineer, build, and install these systems, as well as train end-user personnel. To accomplish the full scope of analysis, a multi-disciplinary approach must be taken and may include components from other manufacturers in the analytical package.

GOW-MAC provides unique solutions for bulk and specialty gas manufacturers to meet these demands. Custom 'analytical solutions' are designed to meet the specific requirements of the individual gas facility. In spite of similarities, no two customers are alike – each facility's analytical goals and requirements differ by varying degrees.

The market wants to see product innovation coupled with advanced research concepts in each instrument. Advances in sensitivity, integration, automation, cutting-edge performance, and sophisticated (but simple) control systems are trends that won't be going away anytime soon. SGR

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