

Emissions Gas Monitoring Applications - How the Right Sensor Can Improve Accuracy and Reduce Service Costs

Honeywell company, City Technology - a World leader in gas sensors for industrial safety and emissions applications - has over 25 years' experience pioneering flue gas analyser sensing solutions. City Technology's Tom Gurd, Product Marketing Manager, highlights emissions analysis application needs, trends in the global marketplace and how analyser manufacturers can benefit from the latest sensing technologies and add real-world value by enhancing measurement reliability, accuracy and reducing operational costs.

“When it comes to reliable performance stability, testing – both life cycle and field tests – provides the peace of mind that a sensor really is up to the job of emissions monitoring. Always ask to see test data that can prove that what a sensor claims it can do is accurate.”

What are the gases flue gas analysers detect and why is detection important?

The main products of incomplete combustion are usually CO₂, CO, H₂ & NO; to ensure safe combustion we measure CO and the remaining O₂ after combustion to calculate a CO:CO₂ ratio – the accepted benchmark of performance. Of course there is much more to understand regarding efficiency or environmental emissions. CO sensors are also sensitive to H₂ so in our more demanding markets, we measure the H₂ to compensate the CO reading.

The combustion process is complex, requiring the right mix ratio, turbulence, temperature and time for reactants to combine. Poor fuel mixing or too little air produces carbon monoxide (CO) and soot. If the flame temperature is too high, nitric oxide (NO) and nitrogen dioxide (NO₂) are produced. A fuel containing sulphur will produce sulphur dioxide (SO₂) - all these gases are toxic and indicate inefficient combustion, which is both dangerous and costly in terms of fuel consumption. Oxygen (O₂) is essential for combustion so the gases detected by a typical flue gas analyser are O₂, CO, H₂, CO₂, NO, NO₂, SO₂ & H₂S.

Why is the gas sensor used so important?

There is a lot of focus on the analyser specification itself, but it's also important to remember that an analyser is only as effective as the sensors it uses. Because of the risks associated with combustion emissions, safety and reliability are critical. Due to the nature of the typical toxic gas sensor used in a flue gas analyser, emissions gases and products of combustion can produce cross-sensitivity issues.

Field failures can be dangerous and costly and lives depend on a good sensing technology. What is less widely recognised are the other economic benefits a gas sensor can bring, by reducing an analyser's servicing needs and operational costs. Our long life oxygen sensors for example are designed to work as long and hard as a typical analyser, compared with a standard O₂ sensor with a two year life expectancy that must be changed 2-3 times in the life of an instrument.

In a real-world context, a combustion check can take up to 15 minutes and is typically carried out up to 8 times in each working day. With improved response times our new sensors can allow the same combustion check to be carried out in half the time or less. This means much less time waiting for the reading to stabilise – and ultimately a valuable opportunity to carry out more services in the field. Faster response is what engineers really value as they have to wait less time for the reading to stabilise which can lead to more accurate readings as they are less likely to take the reading too quickly.



You mention adverse conditions that can affect sensor performance – what are these and how do benchmark sensors overcome such problems?

Flue gas analysis in domestic and light commercial boilers can present a challenge for sensors; they are subjected to high humidity, temperature and pressure changes, corrosive and acidic gases, and cross-sensitivity from emissions gases. This can cause field failures, compromise sensor integrity and create considerable servicing needs. Every component in a sensor should be built to a high specification using ultra resistant materials, so they can work effectively in these adverse conditions without affecting accuracy and reliability and deliver the fast response times. Sensor design is essential in achieving this. Our long life oxygen sensors are built using “electrochemical pump” technology which is proven in the field for 4 years and provides a viable lead free replacement.

A high range CO monitoring application, which traditionally

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requires a second sensor under EN50379-2, benefits from the use of a robust, high sensitivity solution like our new A5F+ CO sensor, which can monitor up to 20,000ppm. The combination of high capacity filtration to remove SOx and NOx and auxiliary electrodes to compensate for hydrogen, provides the highest reliability.

What should an analyser manufacturer or engineer look for when selecting a sensor manufacturer? What is it about City sensors that set them apart?

It's important to work with a manufacturer who is a recognised expert in the field of emissions monitoring. City Technology is a World leader in gas sensing with 25 years' experience meeting the specific needs of emissions monitoring applications. Our 5 Series range (designed for use in high-end analytical flue gas analysers), was recently extended with the addition of the 5OxLL long life O₂ and the A5F+ CO sensors, and is used prolifically in the World's most stringently regulated regions, like Germany, Austria and Switzerland, where only the best performing sensors can be used. Our products are also widely used in the Americas and Asia Pacific.



The ability for a manufacturer to achieve dependable repeatability should also be a key consideration. At City we use Six Sigma driven design, state-of-the-art automated manufacture and pioneering cell design innovations. Not to mention compliance with the latest standards. Our new 4 Series range is designed to meet the needs of EN50379-3 compliant analysers and features a long life solutions.

How does the right manufacturer back up such claims?

Marketing claims must be substantiated. Ask to see comparisons that back up "best in class" claims; data speaks for itself - a good manufacturer will be keen to show you how their products shape up to contemporaries.

When it comes to reliable performance stability, testing – both life cycle and field tests – provides the peace of mind that a sensor really is up to the job of emissions monitoring. Always ask to see test data that can prove that what a sensor claims it can do is accurate. At City, extensive testing is an integral part of the design process, highlighting performance and sensor robustness. The measure of how good we are is how consistent our sensors are when they get to our customers.

About City Technology

City Technology, owned by Honeywell, is the world's leading manufacturer of gas sensors and the brand of choice for the emissions monitoring industry, with over 25 years' experience innovating pioneering solutions that set the standard for combustion analysis sensing. City Technology manufactures 4.5M sensors every year, designed for use in flue gas analysers, personal protective equipment, industrial safety systems and residential detectors throughout the world. Over 300 sensors, based on electrochemical and other technologies, respond to 28 common and exotic gases with outstanding stability, excellent linearity and high immunity to cross-contaminants. www.citytech.com

About Honeywell

Honeywell International (www.honeywell.com) is a Fortune 100 diversified technology and manufacturing leader, serving customers worldwide with aerospace products and services; control technologies for buildings, homes and industry; automotive products; turbochargers; and specialty materials. Based in Morris Township, N.J., Honeywell's shares are traded on the New York, London, and Chicago Stock Exchanges. For more news and information on Honeywell, please visit www.honeywellnow.com.

About the Author

Tom Gurd has worked for City Technology for the past 10 years as a Product Manager, specialising in emissions, environmental and industrial safety gas sensing. With a BEng (Honors) Degree in Mechanical Engineering, Tom spent the early part of his career designing and developing military and aviation products. Since joining City Technology in 2004, Tom has developed a wide ranging expertise in the field of gas sensing. Combustion analysis products developed by City Technology help to reduce pollution and save the lives of thousands of people every year.



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ATEX and IECEx NDIR Certified Gas Sensor Heads including NDIR Sensors

N.E.T. (Italy) is offering full conformity Ex certified heads containing the complete range of N.E.T. NDIR sensors. Two dimensions of heads are available; one small

disposable head for 20 mm size sensors and one larger decomposable head, fitted with a 32 mm sensor that can be substituted if needed.

The stainless flameproof heads are available with "Genius", IRNET, IRPELL, IREF sensors. All sensors are SIL2 (TUV approved). Intrinsically safe barrier is available on request.

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