A BREATH OF FRESH AIR IN OXYGEN MEASUREMENT

The sensitivity of the Magnos28 analyser means refiners can detect and act on the slightest deterioration in oxygen supply purity

Analytical instrumentation for the measurement of oxygen in process control has just taken a leap forward, thanks to innovations included in ABB's Magnos28 analyser. **Stephen B. Harrison**, principal, Germany, Nexant Energy & Chemicals Advisory, explains...

The oxygen molecule has magnetic properties which allow it to be measured using the paramagnetic technique. The operating principle of a paramagnetic oxygen analyser has traditionally relied on a dumbbell, with two glass spheres that contain nitrogen, which is suspended on a fine wire.

Compact electrochemical cells are often used in oxygen gas detectors, but they have a finite life and are prone to drift and various interferences which make them unsuitable for high precision measurement applications. Zirconia sensors are increasingly used for oxygen analysis in combustion applications. Tunable diode lasers (TDL) are also gaining popularity for the measurement of oxygen in flue gases. Despite these alternatives, the paramagnetic method has remained one of the favoured analytical methods due to its linearity and robust operating principle.

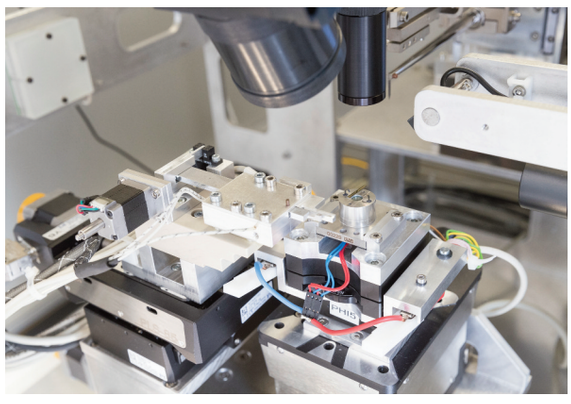
One of the reasons that the paramagnetic technique for oxygen measurement lost ground to the zirconia and TDL systems in refinery combustion flue gas applications is its vulnerability to interference from matrix components such as nitric oxide and nitrogen dioxide, which are both generally present in flue gases. A limitation in some chemical process streams was the risk of physical damage from corrosive gases in the matrix.

Some of these issues have now largely been overcome through various innovations from ABB, which have been incorporated into its Magnos28 analyser. One development is to remove the traditional nitrogen gas-filled dumbbell

The Magnos28 analyser family is fit for purpose, and represents good value for money

and replace it with a solid state electronic microwing: digitalisation, in its most fundamental form. The microwing sensor reacts quickly and accurately to oxygen concentration changes due to its low mass, high width-to-thickness ratio and optimised magnetic field distribution. The influence of moisture in the measurement matrix is also reduced.

The avoidance of lead solder and the use of advanced coatings mean that the internal wetted parts of the Magnos28 oxygen sensor are not subject to damage from the majority of common solvents and corrosive gases. With this in mind, an application where the Magnos28 has excelled has been the measurement of oxygen concentration in flue gas immediately prior to refinery de-sulphurisation units. In this location, the sample is often loaded with SO_2 at more than 5g/Nm^3 and the potential to form SO_3 is therefore high. This means that a robust and corrosion resistant oxygen measurement technology is key.



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Micheal Moede, product manager at ABB Automation in Frankfurt, Germany explained: "When we developed the Magnos28 microwing paramagnetic oxygen analyser one of our ideas was to apply the instrument in refining process control strategies. We can manufacture the instrument with various measurement ranges and an area of specific interest for oxygen measurement to the FCC catalyst regeneration equipment or gasification plant is the 98 to 100% range. Imagine that we have compressed all the data that would normally be gathered in a 0 to 100% measurement range and crammed it into that tiny 2% band between 98 and 100%... that's how ultra-sensitive the Magnos28 instrument can be. That means that refiners can detect and act on the slightest deterioration in oxygen supply purity before it becomes an impediment to the process."

High sensitivity is not the only technical advantage. Moede continued: "The use of a suppressed measurement range is enabled by the introduction of a pressure sensor in the instrument. This compensates the oxygen concentration reading and means that we can minimise the effects of air pressure changes on the sensor sensitivity to almost zero. Furthermore, the very low drift on the instrument also reduces the calibration frequency which minimises the cost of ownership."

ABB has also announced that it is now possible to mount two Magnos28 oxygen sensors in one instrument, contained in the ABB EL3000 series. With multiple requirements for oxygen measurement at various concentration ranges on the refinery, this means instrumentation capital cost and space savings.

Moede again: "Technical innovation is driving us forward at ABB and we are delighted when this can be combined with commercial benefits for our customers. We're excited with the market feedback which tells us that the Magnos28 is absolutely fit for purpose and represents the best value for money in the market today."

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