

Controlling risk of explosion (caused by dust)

Application background

Wherever large quantities of dust are stored, transported or mixed – in industries such as chemical, food, cement or water treatment – the risk of explosion has to be controlled. Mixed with oxygen from air the small particles can easily ignite. Although every plant is different, the fundamental safety requirements of controlling oxygen levels is the same.

Most operators prefer to have a complete solution for controlling and monitoring Oxygen (O₂) and Carbon Monoxide (CO), rather a set of separate analyzers. A complete packaged system is guaranteed to work efficiently and not all plants will have personnel who are sufficiently trained to operate and maintain different systems, or have the resources to deal with a number of manufacturers.

Case study: sewage sludge dryer application

Michell Instruments Systems Engineering delivered an integrated monitoring system for a water treatment plant in Europe. The customer operates a plant where the sewage sludge is dried with a combination of mechanical pressing and heated air. Both CO and O₂ have to be monitored in the silos where this process takes place.



Due to special site conditions the customer required a custom built monitoring solution. To meet the requirements Michell Instruments designed a system that combines the XTP601 thermo paramagnetic oxygen analyzer with a CO analyzer. The system combines all sample conditioning, filtering and alarms for both analyzers in a single package and was delivered, commissioned and on-site tested by Michell engineers.

Because the system was designed specifically for their application and plant, the operators did not have to compromise on instrumentation specification on one side and the operation modes of the plant on the other. Since Michell Instruments provided a complete turnkey service, there is one point of contact for all service and maintenance in the future. Subscribing to a maintenance programme the customer can be confident that the system will reliably function as specified for many years with a positive return on investment for plant instrumentation.

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Vertrieb für Österreich:

www.nbn.at

nbn Elektronik Handelsgesellschaft m.b.H.
Riesstraße 146, 8010 Graz | Tel. +43 316 40 28 05 | Fax +43 316 40 25 06



Customised analyzer packages

To ensure any gas analyzer's accurate and reliable operation an appropriate and competently designed gas sampling system is necessary. Michell Instruments has over 40 years of experience in providing custom-designed analyzer packages for humidity or oxygen calibration systems for their world-wide customers. Industries served include oil and gas transportation or treatment, petrochemical, industrial gas production, power as well as food and pharmaceutical.

A team of highly qualified design engineers, skilled technicians and field service engineers is capable to design and integrate not just Michell's own moisture and oxygen instrumentation but also various 3rd party products.



XTP601 Oxygen Analyzer

Key application facts:

- Dust particles must be below 500 microns to be able to be suspended in a dust cloud.
- The Minimum Explosive Concentration of dust is 50-200g/m³
- Typical temperatures in the drier are 350° to 550°C
- Carbon monoxide is highly combustible with an LEL of 12.5% and an UEL of 74% and the raw gas in a sewage sludge drier would typically contain 0.5% CO.
- The Limiting Oxygen Concentration (LOC) for sewage sludge gas is typically between 8-12% O₂, so to keep the process safe the oxygen concentration should be kept 2-4% below this level e.g. 4-6% O₂.
- By using a blanketing gas (typically nitrogen), the CO and O₂ can be kept below the LEL and LOC respectively to enhance the plant safety. By monitoring both components it is possible to control and reduce the amount of N₂ required saving money at the same time.

Reference: *The Fire and Explosive Hazards of Dried Sewage Sludge* – SJ Manchester. www.icheme.org/



Michell Instruments

48 Lancaster Way Business Park
Ely Cambridgeshire
CB6 3NW



Tel: +44 1353 658000
Fax: +44 1353 658199
Email: uk.info@michell.com
Web: www.michell.com

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