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Application note

Oxygen in reactivation of active carbon

Application specifications:

- Application: 0% - 21% O_2 in N_2 (typically less than 2% O_2)
- Temperature: 800°C - 900°C
- Pressure; Atmospheric

Benefits:

- Robust measurement with no moving parts in the XMO2 analyzer
- Single solution offering including sample handling system
- Easy calibration of the XMO2 unit
- Reduced maintenance costs compared to other dumbbell type paramagnetic sensors susceptible to liquid/ particulate carry over

Summary

Active carbon has many uses including decolorizing sugar, solvent recovery, waste treatment, SO_2 removal in stack gases or clean rooms and in water or air purification systems.

Active carbon is characterized by high absorptivity for many gases, vapors, and colloidal solids. The activated carbon is charcoal which is treated with oxygen to open up the pores in the material and heated to 800°C-900°C with steam or carbon dioxide. The resultant material has a highly porous structure with one pound (450g) of activated carbon containing approximately 100 acres of surface area. It is within this porous material that contaminants are captured.

Application

Oxygen is measured in the hot gas before and after the carbon reactivation reactor. This measurement is vital for both safety and product yield considerations.

The activated carbon is an extremely dusty material which is also flammable. Exposure to high heat and in the presence of oxygen is therefore likely to lead to explosion. To mitigate this risk, oxygen levels are maintained below 2% to avoid explosion with this content being continuously monitored.

Excess oxygen presence can also lead to a reduction in yield. The oxygen reacts with the carbon to form carbon monoxide and carbon dioxide. This can have significant effects on the lifespan of the carbon as it is depleted in the chemical process.

Challenge

The application is especially challenging given the considerable amounts of water vapor, HCl, H_2S and SO_2 impurities. The extremely dusty and flammable material can pose a risk to an accurate measurement and the analyzer itself if an appropriate sampling system solution is not used.

Solution

The Panametrics solution combines the robust XMO2 thermoparamagnetic oxygen analyzer along with a suitably designed sample handling system for the complete package solution. This offers the customer an oxygen measurement at a competitive price point.

Panametrics, a Baker Hughes business, provides solutions in the toughest applications and environments for moisture, oxygen, liquid and gas flow measurement.

Experts in flare management, Panametrics technology also reduces flare emissions and optimizes performance.

With a reach that extends across the globe, Panametrics' critical measurement solutions and flare emissions management are enabling customers to drive efficiency and achieve carbon reduction targets across critical industries including: Oil & Gas; Energy; Healthcare; Water and Wastewater; Chemical Processing; Food & Beverage and many others.

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