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Application note

Oxygen in rotary kiln (defluorination of phosphate ore for animal feed production)

Application specifications:

- Application: 0 - 21% O_2 in N2 with HF, H_2S, H_2SO_4 and particulate
- Pressure: Atmospheric within the kiln
- Temperature: 650 °C at sample point
- Fresh water inlet: 1 to 2 gpm @ 40 - 50 psig

Benefits:

- No periodic sensor replacement is required
- Stable measurement with simple field calibration of the XMO2 every 6-12 months
- No moving parts and robust design, resistant to liquid carryover

Summary

Large rotary kilns are used in the production of phosphorus products used for fertilizer manufacture and animal feeds. The raw material used is phosphate rock which is a natural rock mined all over the world. The fluorine is removed from the rock through direct heating in the kiln. The defluorinated phosphate rock end product is the source of phosphate used in animal feed concentrates.

Application

Oxygen is measured in the exhaust gas of the rotary kiln which typically use natural gas as a fuel. Oxygen levels are kept below 5% to optimize combustion efficiency and the kiln itself is heated to 650 °C at atmospheric pressure to drive off the fluorine.

Challenge

The exhaust gas of the kilns is extremely dirty and corrosive after treating the phosphate rock. The gas typically contains approximately 2% hydrogen fluoride (HF), water vapor (H20), hydrogen sulfide (H2S), sulfur dioxide (SO2), sulphuric acid (H2SO4) and particulate. The extremely corrosive gases can also render zirconium oxide sensors unusable with poor reliability.

Solution

The XMO2 thermoparamagnetic oxygen analyzer installed in an appropriate sample handling system is utilized to clean and condition the sample while providing accurate measurement, without the need for sensor replacement. An eductor or pump is used to pull a sample from the process and pass it through the sample conditioning system which contains an integral water wash column to wash the sample gas of corrosive components.

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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