Panametrics

Application note

Oxygen in rotary kiln

(defluorination of phosphate ore for animal feed production)

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 (H_20), hydrogen sulfide (H_2S), sulfur dioxide (SO_2), sulphuric acid (H_2SO_4) and particulate. The extremely corrosive gases can also render zirconium oxide sensors unusable with poor reliability.

Benefits:

- No periodic sensor replacement is required
- Stable measurement with simple field calibration of the XMO2pro every 6-12 months
- No moving parts and robust design, resistant to liquid carryover

Solution

The XMO2pro 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.

Application specifications

Application	0 - 21% O_2 in N_2 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

Join the conversation and follow us on LinkedIn
linkedin.com/company/panametricscompany

PANA058AN (01/2025)

Panametrics

panametrics.com