

Precise and durable temperature control in preheaters

Boost efficiency, cut emissions and save energy in cement production

Benefits at a glance

- Acceleration of the calcination process
- Increase kiln throughput
- Reduction in dust emissions
- Savings of up to 30% in energy consumption through preheating

Process conditions

- **Pressure:** -50...-60 mbar (-0.72...-0.870 psi)
- **Temperature:**
 - Inlet stage (flue gas): 800...1200°C (1472...2192°F)
 - Upper cyclone stage: 300...500°C (572...932°F)
 - Lower cyclone stage: 600...800°C (1112...1472°F)
 - Raw materials (before kiln): 800...1000°C (1472...1832°F)
 - Exhaust gas outlet: 300...450°C (572...842°F)
- **Medium:** raw meal



In cement manufacturing, precise temperature measurement and control during the preheating phase is critical for optimizing energy efficiency and process reliability. The iTHERM FlameLine TAF16 high-temperature thermometer, combined with the remote iTEMP TMT142B transmitter, offers a robust solution to the harsh conditions of cyclone. Withstanding extreme temperatures, corrosive and abrasive environments, this advanced measurement system ensures long-term stability and accuracy.

The challenge In cement production, accurate and reliable temperature measurement plays a crucial role. One of the most critical steps in clinker production is the preheating of the raw material before it enters the rotary kiln. The raw material is fed into the cyclone and preheated to a temperature of around 850°C (1562°F). This preheating step is very important as it is estimated to save up to 30% of the cement plant's total energy consumption. Even at this stage, accurate temperature measurement is essential to ensure maximum energy efficiency.

When measuring temperature in cement production, there are several challenges that the measuring points need to adapt to.

Due to the moving particles (raw material), the thermocouples are faced with the challenge of withstanding abrasion. In addition, there is a chemical reaction of the flue gas from the kiln and the continuous temperature of over 850°C, which place difficult and challenging conditions on the measuring equipment.

Cyclones usually have different stages of raw material heating. There is usually an upper stage where the raw material is first introduced; here, the temperature can range between 300 and 450°C (572 and 842°F). This is followed by the lower stage, where the raw material is heated to a higher temperature, which can range between 800 and 1000°C (1472 and 1832°F) depending on the number of stages.

The temperature in the cyclone is crucial to ensure that the raw material is sufficiently preheated before entering the rotary kiln, which significantly improves the overall energy efficiency of the cement manufacturing process.

Our solution To overcome these challenges, the comprehensive Endress+Hauser temperature portfolio provides the right solution with the iTHERM FlameLine. An iTHERM FlameLine TAF16 high temperature thermometer with metal sheath enables the customer to achieve reliable and accurate measurements with long-term stability, despite the extremely challenging process conditions, thanks to its unique design, construction and manufacture. The measuring point is supplemented by iTEMP TMT142B, which can be used as a remote indicator and reliably reports the signal back to the control system.

Result The unique design, construction and manufacture of the thermometer ensure reliable and accurate measurements with long-term stability. When implemented, this advanced temperature measurement technology can help reduce the overall energy consumption of a cement plant by up to 30%. This improvement is made possible by several key benefits, including acceleration of the calcination process and an increase in kiln throughput. In addition, the system contributes to significant cost savings in fuel consumption for kiln operation and leads to a significant reduction in dust emissions, supporting both economic and environmental goals.

Components

- iTHERM FlameLine TAF16 High temperature thermometer (310 SSt, 446, Inconel 600, Sandvik 253 & 353MA, NiCo)
- iTEMP TMT142B temperature transmitter



iTHERM FlameLine
TAF16



iTEMP TMT142B



Example of a kiln for heating raw materials



Example of a cyclone for preheating raw material

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