

Dust Monitoring of Exhaust Gases for Efficient ESP Operation in Cement Manufacturing Process

Industry: Cement
Product: Dust Monitor

Introduction

The exhaust gases at a cement manufacturing plant contain a large amount of dust. To prevent dust from being released into the atmosphere, an exhaust gas treatment device such as an electrostatic precipitator (ESP) is used to remove the dust. For such devices to operate efficiently and keep dust emissions within the specified limits, continuous monitoring of the dust content in the exhaust gases is required. Conventional dust measurement using an optical device is affected by dust buildup on the window or deviation of the light axis, necessitating frequent maintenance.

The DT450G Dust Monitor utilizes triboelectric technology, which allows easy installation and is minimally affected by dust accumulation on the sensor. This makes the instrument ideal for continuous dust monitoring.

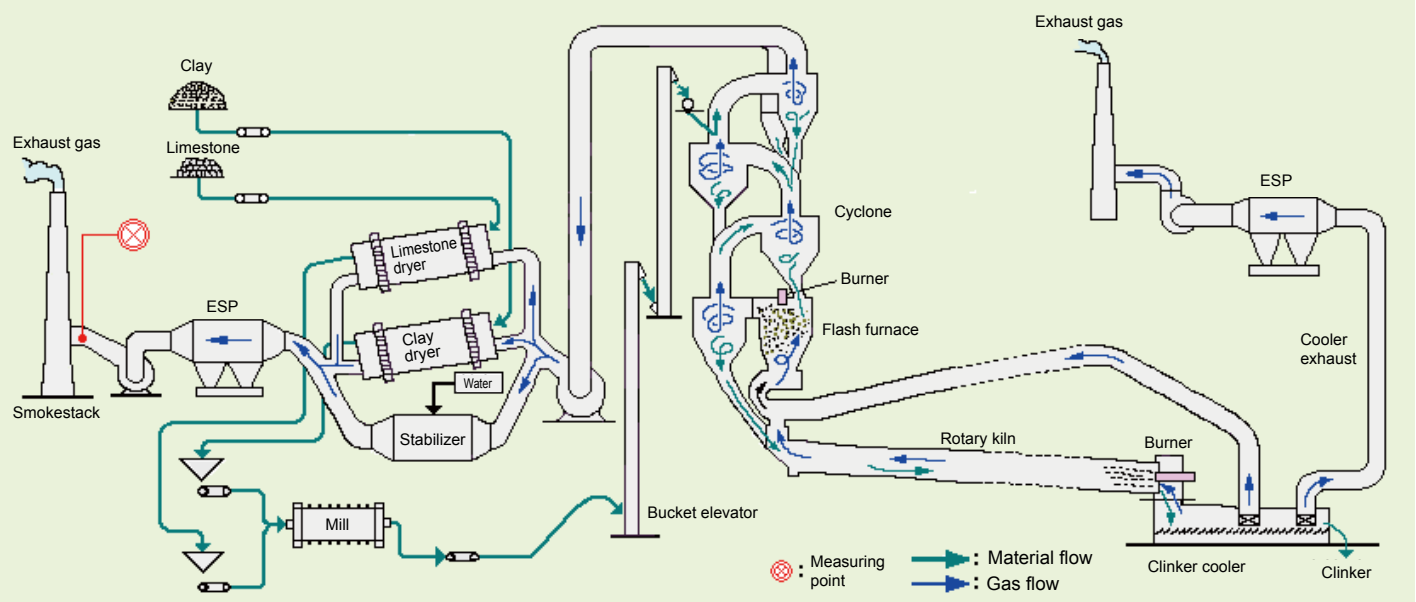
Expected Benefits

- Able to continuously monitor dust content in exhaust gases
- Reduces cost of operating ESP devices
- Minimizes need for equipment replacement

Process Overview

Raw materials such as clay and limestone materials are dried, blended, and pulverized in a mill. The resulting powder is then preheated and decarbonated in a suspension preheater and flash furnace, and calcinated in a kiln to produce clinker. The clinker is cooled, mixed with gypsum and ground in a finish mill to produce cement. Dust content in the exhaust gases is measured downstream from the ESP to keep dust emissions within specified limits.

Cement Manufacturing Process and Dust Measurement Point



Solution Details

Field Data

Process Conditions

Company A

Measuring point: exhaust duct (50 m downstream of ESP)
 Duct size: 2 × 2 m
 Dust concentration: approx. 25 mg/Nm³
 Dust weight ratio: 1.3
 Gas flow rate: approx. 10 m/s
 Humidity: 10 to 20 vol%
 Temperature: 50 to 180 °C

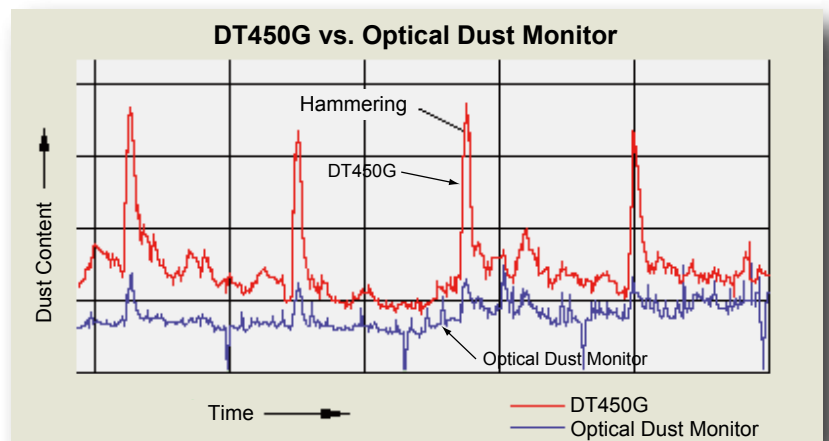
Company B

Measuring point: exhaust duct (20 m downstream of ESP)
 Duct size: 5 × 5 m
 Dust concentration: 10 to 20 mg/Nm³
 Gas flow rate: 8.9 m/s
 Humidity: 15.8 vol%
 Temperature: 100 to 110 °C

Measurement Examples

DT450G Dust Monitor vs. optical (light scattering) monitor

- Results show good correlation between both monitors. The DT450G responds more clearly than the optical monitor to the increased amounts of dust caused by agitation when hammering is regularly performed to remove accumulated dust deposits from the electrodes.



Relationship between applied voltage and efficiency of ESP

- ESP efficiency varies with applied voltage. The higher the applied voltage, the greater the efficiency, resulting in less dust at the outlet. This can be monitored by the DT450G.
- The data on the right was obtained at company B. The DT450G was installed approximately 20 m downstream from the ESP and the sensor was inserted just 30 cm into the duct (5 x 5 m cross section).

