POWER INDUSTRY

COST-EFFECTIVE SOLUTION FOR SO_2 EMISSIONS REDUCTION WITH FORK DENSITY METERS

Installation of a Micro Motion Fork Density Meter in FGD process pipeline

RESULTS

Simple, low-cost installation - reducing instrumentation costs

Improved quality control of lime (calcium hydroxide), optimizing the desulfurization process costs

Longer product lifetime, given the rugged meter design, reducing operation and maintenance costs

Application

Flue gas desulfurization (FGD) is a technology used for removing sulfur dioxide (SO_2) from the exhaust flue gases emitted by coal- or oil-burning power plants. The SO_2 is created when the power plants burn coal or oil to produce steam to power the steam turbines that drive the electricity generators. The tall flue gas stacks of a power plant disperse the gas emissions by diluting the pollutants in ambient air. As a result of stringent environmental protection regulations regarding SO_2 emissions – which have been found to cause acid rain – power plants are now removing SO_2 from the flue gases.

One of the most common methods used to reduce SO_2 emissions is wet scrubbing, which uses a slurry or alkaline sorbent such as limestone or seawater to scrub the gases. In an FGD system, flue gas normally passes through a fly ash removal device, then an SO_2 removal device. When using the wet scrubbing method, the reaction of using limestone slurry produces the resultant slurry called calcium sulfite. The calcium sulfite is then further oxidized to produce a marketable gypsum through a technique known as forced oxidation.

As part of the flue gas desulfurization process, the density of the process liquids is measured at the following locations in the pipeline:

- Limestone slurry production line
- Limestone slurry feed line into Absorber
- Gypsum recirculation line in the Absorber
- Calcium sulfite slurry line going into the Oxidizer
- Gypsum self-drain loop

Challenge

A power plant in China needed to install several density meters in a wet scrubbing FGD system that were workable in the following

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process conditions and met the following commercial requirements:

- Abrasive slurry with a particle size of 10 to 60 µm, and 60 to 70% solids concentration by weight
- Accuracy requirement of 1 to 8 kg/m3
- Nominal flow rate of 150 m3/hr
- 3” 150# process pipe
- Resistant to plugging
- Low pressure drop
- Low maintenance and low cost
- 1.5 to 2 year performance warranty

Solution

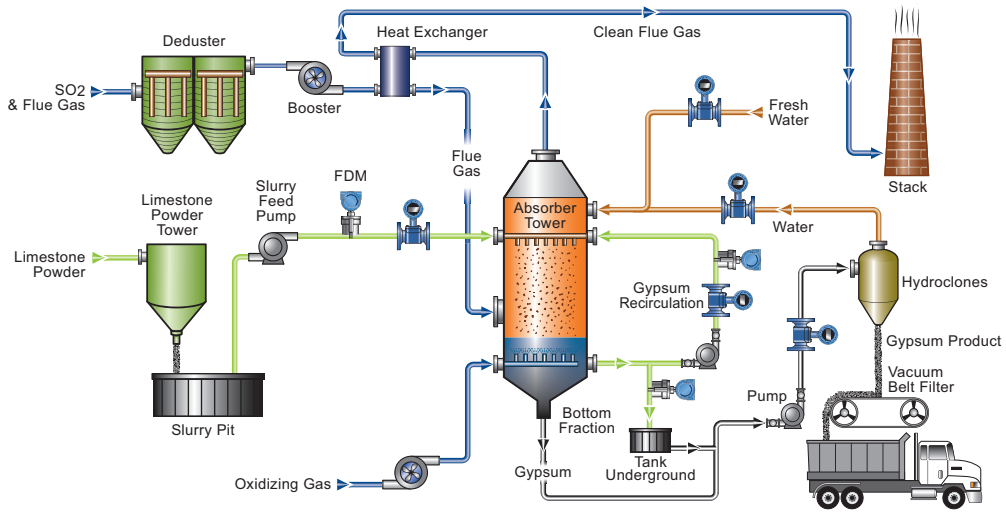
The power plant chose to install multiple Micro Motion® Fork Density Meters. Typically, tube density meters or Coriolis flow meters would have been selected given the particle size and solids concentration. However, by changing the installation, the customer chose to install the Fork Density Meters for the cost competitiveness of these meters. In addition, these meters also provided the following benefits:

- Continuous real-time density measurement
- Easy direct insertion installation
- Good resistance to abrasive fluid
- Wide selection of wetted material applications
- Online diagnostic tools available

The customer installed each meter in a T-piece pocket at a specific angle with 1” recessed from the pipe ID. Each meter was installed at a vertical pipe with slurry flowing upwards. The installation angle is designed to protect the vibrating tines from the abrasive slurry whilst continuously supplying fresh material to enhance measurement accuracy.

Overall, with this installation, the customer received the following benefits:

- Simple, low cost installation – reducing instrumentation costs by approximately $500–$700 per meter
- Improved quality control of limestone (Calcium Carbonate), optimizing the desulfurization process costs by reducing waste of raw material
- Longer meter lifetime, given the meter’s resistance to abrasive fluid, reducing operation and maintenance costs by about $10,000 per year



A diagram of the typical process of an FGD system using the wet scrubbing method to remove SO_2 from the flue gases

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