

## pH Measurement in Flue Gas Desulfurization Systems That Use Magnesium Hydroxide Slurry

**Industry:** Chemical, Power  
**Product:** pH/ORP Analyzer

### Introduction

In flue gas desulfurization systems that use magnesium hydroxide ( $Mg(OH)_2$ ) slurry, the consumption of the desulfurization agent ( $Mg(OH)_2$ ) is controlled using online pH analyzers. A great concern in the pH measurement is heavy staining of the pH electrodes by the  $Mg(OH)_2$  slurry. To ensure accurate measurement, frequent cleaning of the electrodes with an acid is required, adding to both maintenance workload and cost.

The EXA AUTO CLEAN chemical cleaning system automates the acid cleaning process, which not only saves both time and expense but also ensures precise pH measurement over long periods.

### Process Overview

In the flue gas desulfurization system,  $Mg(OH)_2$  is used as the absorbent to remove sulfur dioxide ( $SO_2$ ) from the flue gas.

Absorption reaction 1:  $Mg(OH)_2 + SO_2 \rightarrow MgSO_3 + H_2O$

Absorption reaction 2:  $MgSO_3 + SO_2 + H_2O \rightarrow Mg(HSO_3)_2$

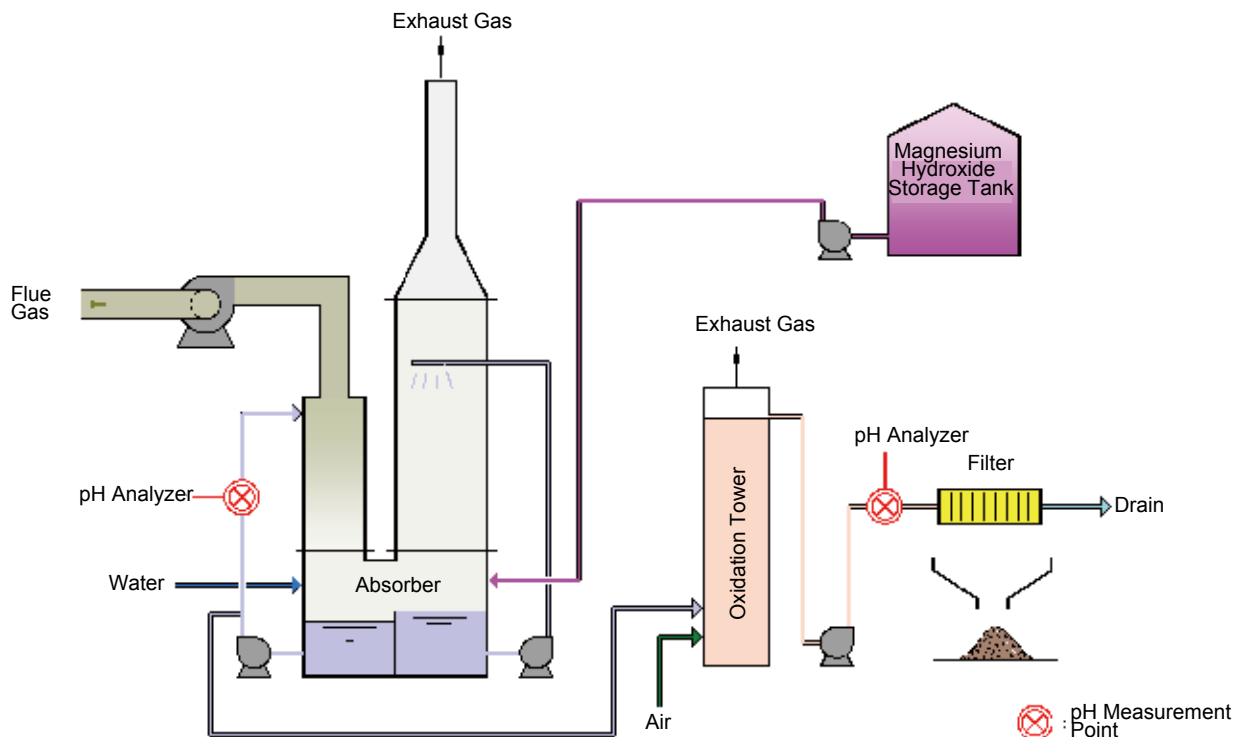
After absorbing  $SO_2$ , the solution undergoes pH adjustment, oxidation, and filtration for detoxification before discharge.

pH adjustment:  $Mg(HSO_3)_2 + Mg(OH)_2 \rightarrow 2MgSO_3 + 2H_2O$

Oxidation:  $MgSO_3 + 1/2O_2 \rightarrow MgSO_4$

### Expected Benefits

- Improves the efficiency of a flue gas desulfurization system with  $Mg(OH)_2$  slurry
- Ensures stable, continuous pH measurement
- Reduces operating costs
- Eliminates manual cleaning



## Solution Details

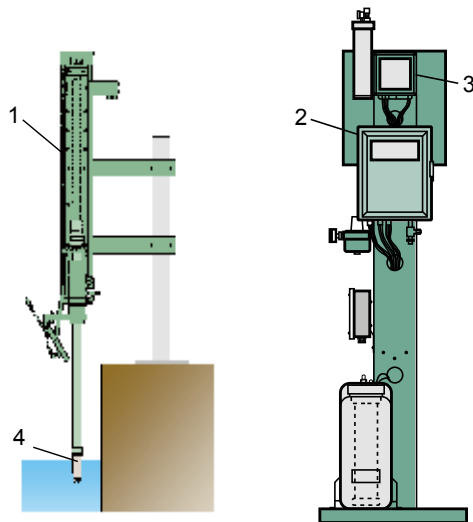
### Field Data

When performing pH measurement in a flue gas desulfurization system with Mg(OH)<sub>2</sub> slurry, the electrodes tend to become heavily stained by the slurry. The cleaning of the electrodes and the reduction of maintenance time and cost are key points to consider when selecting a pH analyzer for the system.

	pH System with Chemical Cleaning	General pH Analyzer
Cleaning	"Automatic acid cleaning: 2 or 3 times/day, user programmable Manual acid cleaning: approx. monthly"	"Manual acid cleaning: once/day"
Calibration	Manual calibration: weekly	"Manual 2-point calibration: weekly"
Other maintenance	Replenishment of chemical tank: approx. every 2 months	—

Acid cleaning is done with a 4% hydrochloric acid solution

### Measurement System



EXA AUTO CLEAN chemical cleaning system

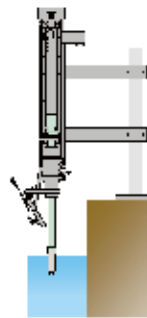
- 1: PH8HS3 holder
- 2: PH8SM3 operating unit

EXA PH 4-wire pH measurement system

- 3: PH400G 4-wire pH converter
- 4: PH8EFP KCI refillable pH detector

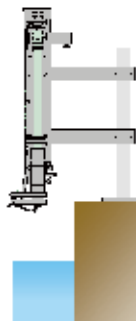
### Operation Outline

#### Measurement Status



Sequence Operation  
[Measurement]  
Measurement takes place when cleaning command is not issued or when measurement command is issued.

#### Cleaning Status



[Cleaning]  
The pH detector is pulled out of the solution and housed in the cleaning chamber where chemical cleaning takes place. After cleaning, the system moves to measurement mode in accordance with the programmed sequence.

### Utilities

Power supply:	100 V AC, 50/60 Hz
Power consumption:	approx. 60 VA
Air source: pressure:	300 to 950 kPa
Maximum consumption:	approx. 20 L/min
Chemical cleaning solution consumption:	approx. 100 mL
Tank effective capacity:	approx. 17 L

### Notes

- An organic solvent cannot be used for cleaning.
- Deterioration of materials in chemical solution piping and air piping  
When the system is installed in a location where it is exposed to direct sunlight, the polyethylene resin piping will last approximately one year. (It is recommended that fluoro resin piping be used.)