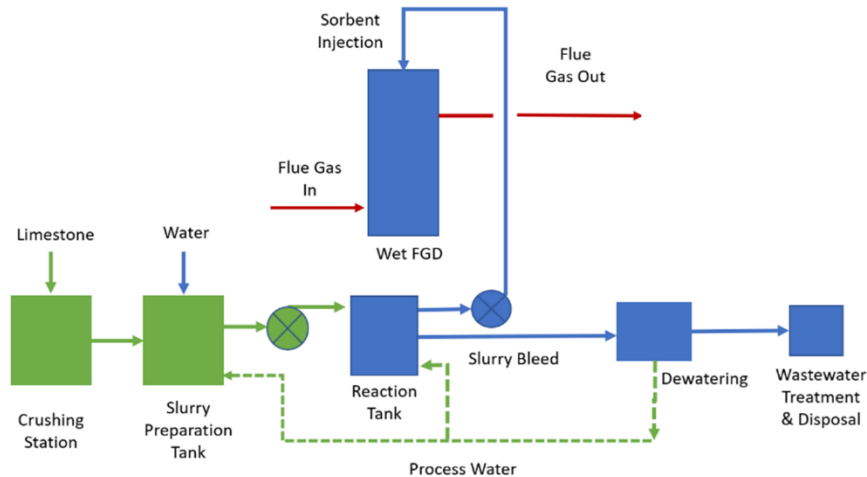


WET FLUE GAS DESULFURIZATION

A standard wet FGD system manages waste gases with SO₂ levels up to 2000 ppm by using cost-effective and easily accessible alkali reagents.¹ This system typically includes equipment for storing and preparing sorbents, an absorber vessel, a mist eliminator, and vessels for waste collection and treatment, as shown in the figure.¹ An alkaline reagent, typically limestone (CaCO₃), is sprayed into the spray column in the form of slurry and reacts with sulfur dioxide to form a solid product, gypsum (CaSO₄·2H₂O).² The flue gas is passed from the bottom of the column to the top and meets the slurry in a counterflow arrangement.



Wet Scrubber - Flue Gas Desulfurization

REMOVED COMPONENTS

- Sulfur dioxide (SO₂) - more than 99% removal.¹
- Removes HCl and HF.¹
- Controls particulates, acid mist, and mercury.¹

FUNCTION in CCU VALUE CHAIN

- Sulfur compounds react with capture agents, resulting in higher make-up rates and higher operating costs.
- Acid gases, SO₂ and SO₃ will react with the amine solvent and form heat-stable salts.
- A reclaimer is often included to remove these contaminants.

LIMITATIONS

SO₂ concentration limits for MEA capture plants.³

Fluor: < 10 ppmv

ENERGY

- Electricity for operating pumps, fans, and other equipment.
- Heating or cooling utilities, depending on the FGD technology and process requirements.

CONSUMMABLES

Chemicals used for sulfur dioxide absorption and neutralization:

- Limestone (calcium carbonate) is used for absorption.
- Water for scrubbing and neutralization.

Energy & consumables⁴

Parameter	Value
Water (t/tSO ₂)	21.2 ¹ – 67.8 ⁴
CaCO ₃ (t/tSO ₂)	1.8 ¹ – 2.54 ⁴
Electricity (MWh/tSO ₂)	0.069 ⁴ – 1.3 ¹
Heat (MWh/tSO ₂)	7.8 ⁴

COSTS

The costs of wet FGD systems can vary widely depending on factors such as plant size and capacity, installation and engineering expenses, operating and maintenance costs, including chemicals and utilities. Typical costs range from **€400 – €700 per tonne SO₂ removal** for various configurations.⁵ Other sources mention the cost to be **€498 per tonne SO₂ removed**.¹

⁵(flue gas from coal plant; lifetime – 20 yrs; 2020 euros; discount ratio – 40%; electricity price – 70 €/MWh; coal price – 55.4 €/t; cooling water – 0.003 €/t)

¹(flue gas from coal plant; SO₂ removal efficiency – 95%; lifetime – 30 yrs; 2016 euros; discount ratio – 40%; limestone – 27 €/t; electricity price – 33 €/MWh; coal price – 55.4 €/t; water – 1.0 €/t)

TECHNOLOGY PROVIDERS

- Wet flue gas cleaning by **ANDRITZ AG**, Austria
- Wet flue gas desulphurization by **Doosan Lentjes GmbH**, Germany
- Wet scrubber -FGD by **Babcock & Wilcox**, United States of America
- FGD plants by **Mitsubishi Heavy Industries**, Japan
- SOx reduction solutions by **General Electric**, United States of America
- Wet scrubbing by **GEA**, Germany

ALTERNATIVE TECHNOLOGIES

- Spray dryer absorbers (SDA)
SDA by **GEA**, Germany
- Circulating dry scrubbers (CDS)
- Dry sorbent injection (DSI)
DSI by **GEA**, Germany

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