



enhanced
by Omya

Flue Gas Cleaning

Sustainable and efficient
flue gas desulfurization (FGD)



THINKING OF TOMORROW



About Omya

Omya is a leading global producer of industrial minerals – mainly fillers and pigments derived from Calcium Carbonate and dolomite – and a worldwide distributor of specialty chemicals.

Founded in 1884 in Switzerland, Omya has a global presence extending to more than 175 locations in over 50 countries with 8,000 employees.

The company provides a wealth of product solutions that contribute to its customers' competitiveness and productivity in multiple industries such as Construction, Printing & Writing, Technical Polymers, Packaging, Food, Personal & Home Care, Pharmaceuticals, Agriculture, Forestry, Water and Energy.

For an efficient Flue Gas Desulfurization (FGD), Omya special Calcium Carbonates such as Desulfocarb, Desulfonit, Reasorb and Epsical help to increase process and cost efficiency in FGD. Omya also offers different types and grades of natural mineral products as well as selected distribution products designed for the removal of airborne pollutants such as Mercury.

Omya offers selected Calcium Carbonate products such as chalk, limestone and marble products which have the required high purity and precise particle size distribution for FGD.

Flue Gas Cleaning

Sustainable and efficient flue gas desulfurization (FGD)

When coal is combusted in power stations the sulfur contained within is released as sulfur dioxide (SO₂). Sulfur dioxide is released into the atmosphere it is converted to sulfuric acid, a component of acid rain, which lowers the pH of soil and freshwater bodies, resulting in substantial damage to the natural environment. Flue-gas desulfurization (FGD) is the removal process of sulfur dioxide (SO₂) from flue gas emissions. Stricter environmental regulations are forcing many utilities to improve their FGD system allowing them to further reduce sulfur dioxide (SO₂).

Omya's efficient Calcium Carbonate products are used in the FGD process where they react with the sulfur dioxide to form calcium sulfate (gypsum). Depending on the process and the properties over 98% of the sulfur can be removed.

The subsequent produced gypsum can be used as an additive in cement, as a source of sulfur in fertilizers or in plasterboard manufacturing which helps to increase cost efficiency of the FGD process

Benefits

- *Efficient elimination of Sulfur*
- *Improved cost efficiency*
- *Better emission regulations compliance*
- *Improved sustainability and carbon footprint*

Improved compliance with BAT emission regulations

Stricter environmental regulations forcing many utilities to improve their flue gas treatment system to further reduce sulfur dioxide (SO₂) as well as mercury emissions.

Omya's Desulfocarb, Desolfonit, Reasorb and Epsical are selected high efficient limestone or chalk products developed to achieve required compliance with emission regulations.

BAT- associated emission levels (BAT-AELs) for SO₂ emissions to air from the combustion of coal/or lignite

Combustion plant total rated thermal input (MW _{th})	BAT-AELs (mg/Nm ³)			
	Yearly average		Daily average	Daily average or average over the sampling period
	New plant	Existing plant (3)	New plant	Existing plant (7)
< 100	150–200	150–360	170–220	170–400
100–300	80–150	95–200	135–200	135–220 (5)
≥ 300, PC boiler	10–75	10–130 (6)	25–110	25–165 (4)
≥ 300, Fluidised bed boiler (1)	20–75	20–180	25–110	50–220

(1) For circulating fluidised bed boilers, the lower end of the range can be achieved by using high-efficiency wet FGD. The higher end of the range can be achieved by using boiler in-bed sorbent injection.

(3) These BAT-AELs do not apply to plants operated < 1500 h/yr.

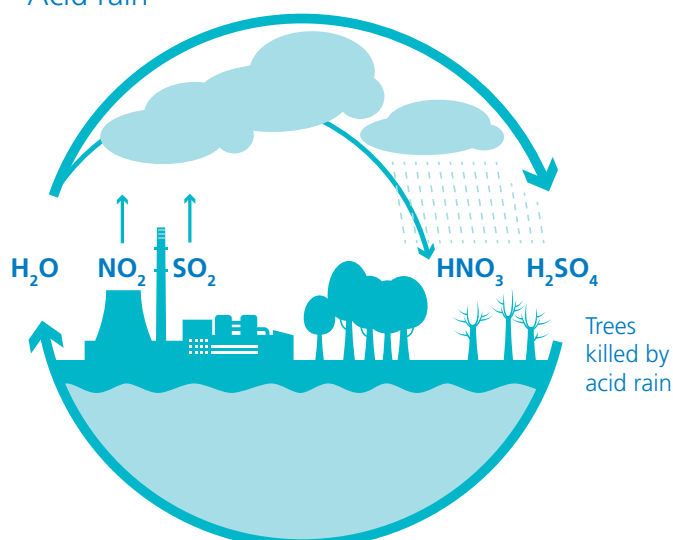
(4) The higher end of the BAT-AEL range is 220 mg/Nm³ in the case of plants put into operation no later than 7 January 2014 and operated < 1500h/yr. For other existing plants put into operation no longer than 7 January 2014, the higher end of the BAT-AEL range is 205 mg/Nm³

(5) In the case of plants put into operation no later than 7 January 2014, the upper end of the BAT-AEL range is 250 mg/Nm³.

(6) The lower end of the range can be achieved when using low-sulphur fuel in combination with a wet abatement system.

(7) These levels are indicative for plants operated < 500 h/yr.

Acid rain



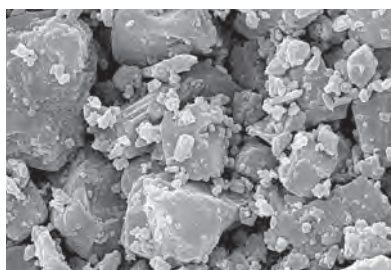
Omya's best-in-class reagents achieve a very high removal rate for a variety of pollutants.

Calcium Carbonate products used in the FGD processes

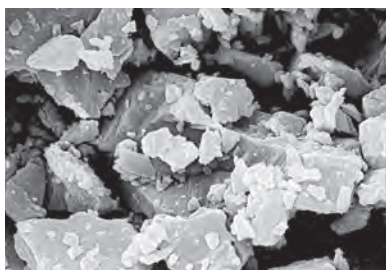
Omya high quality limestone products

Approximately 95 % of the large combustion plants worldwide are using calcite or lime-based products for removal of sulfur dioxide (SO_2) from flue gas by applying dry, wet or combined flue gas desulfurization (FGD) processes.

With Omya's expertise and wide network of plants located at high-purity limestone deposits, Omya Desulfocarb, Desulfonit and Epsical products are uniquely suited to the FGD application due to their superior reactivity and subsequent reduced operating costs.



Epsical (REM limestone picture)



Desulfonit and Desulfocarb (REM limestone picture)

Benefits

High Purity

High Reactivity

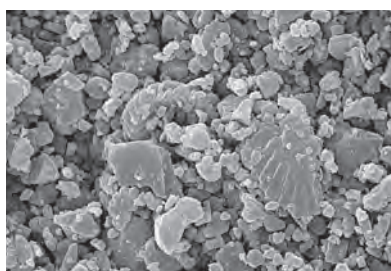
Low stoichiometry

Precise particle size distribution

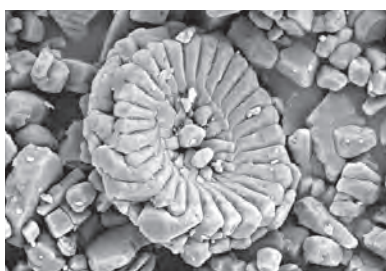
High whiteness

Omya high reactive chalk products

Reasorb is a premium high reactive Omya Calcium Carbonate grade based on Chalk providing for fast neutralization of SO_2 and removal of other contaminants. The use of chalk furthermore improves the brightness and dewatering efficiency of produced gypsum.



Reasorb (REM chalk picture)



REM chalk picture

Benefits

- *High porosity*
- *Fast neutralization and generation of CaO*
- *High specific surface of CaO*
- *Low stoichiometry*
- *Suitability as absorbent*

Omya with its expertise and wide network of plants is uniquely suited for a sustainable high quality and quantity product supply.

FGD processes

For the following described processes, Omya's Desulfocarb, Desolfonit, Reasorb and Epsical fine ground limestone or chalk products are used as sorbents

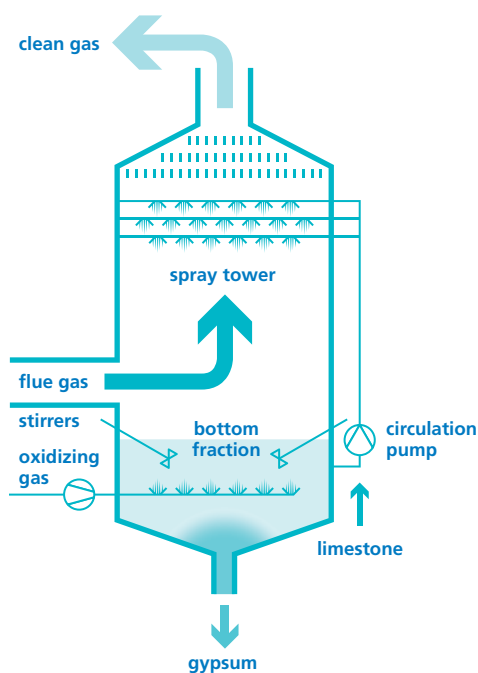
Wet Scrubber Process

Flue gas containing sulfur dioxide (SO_2) enters a large vessel (spray tower or absorber), where it is sprayed with an approx. 25% limestone- or chalk-water slurry reacting with the SO_2 to form first calcium sulfite and consequently calcium sulfate (gypsum).

Within the spray tower absorber the Limestone Forced Oxidation process (LSFO) converts (oxidizes) nearly 100% of the initial formed calcium sulfite to gypsum (calcium sulfate) by bubbling compressed air through the sulfite slurry collected at the bottom of the tower recirculation tank.

These gypsum crystals settle and dewater better than calcium sulfite crystals, reducing the required size of by-product handling equipment. By controlling the gypsum quality in the dewatering step, a wallboard-grade gypsum can be produced.

General Wet Scrubber Process



Benefits

- Full decomposition of the sorbent stoichiometrically close to one.
- Reuse of the generated by-product (gypsum)



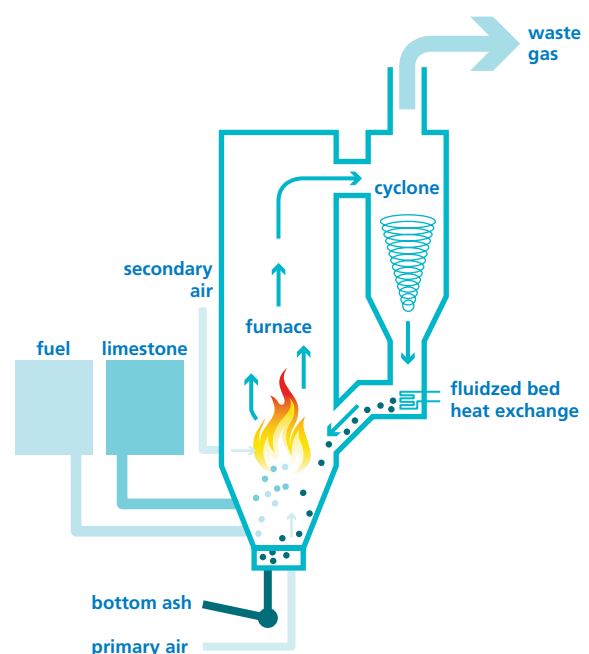
Dry Scrubber Process

Circulating fluidized beds (CFB) technology burns fuels without fire or burners in the furnace but through a process of fluidization where fuel particles are mixed with limestone or chalk capturing the sulfur oxides (SO_2). The limestone, chalk and fuel mixture is recycled multiples times in the CFB process to increase process efficiency and to reduce air pollution due to its ability burning fuel or even biomass in a cleaner way than conventional dry FGD processes.

The low temperature FGD removal process also reduces nitrogen oxide (NO_2) formation. The fluidized bed is generated by air supply from under the bed at high pressure, which lifts the bed material and the coal particles and keeps it in suspension.

Up to 95% of sulfur dioxide SO_2 removal with selected Omya limestone products.

General Dry Scrubber Process



Benefits

- Flexibility accepting different fuel types and qualities
- Significant reduced NO_2 and SO_2 emissions
- No need of expensive and large footprint FGD system

Waste-to-Energy (WtE) Plants Process

Waste-to-Energy (WtE) is a process which involves producing heat and/or electricity from efficient combustion of municipal solid (garbage) waste or other industrial, agricultural, and forestry residues.

Flue Gas Cleaning of WtE Plants

To achieve a good pollutants removal efficiency at least two cleaning stages are required for effective flue gas scrubbing in WtE plants.

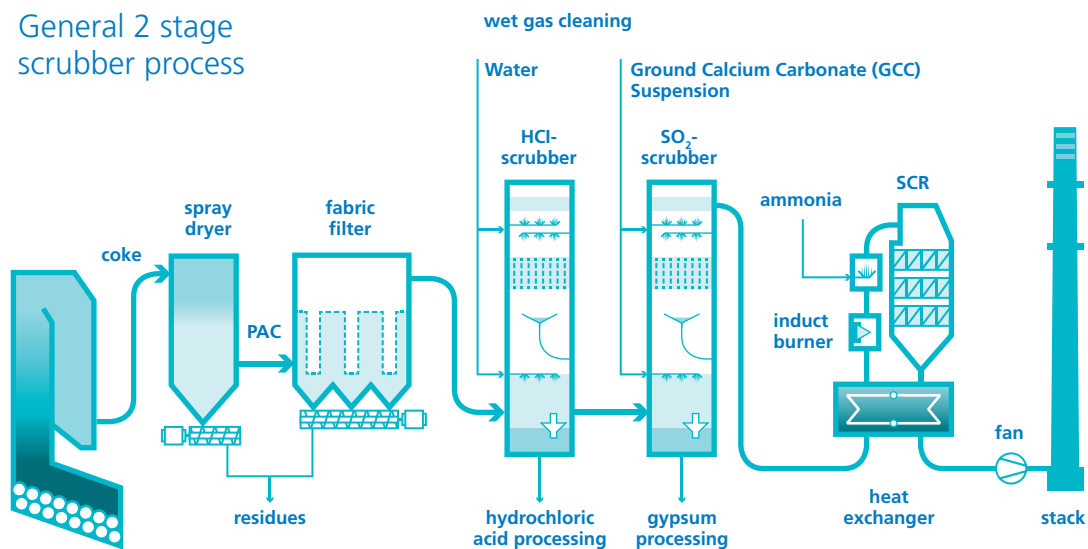
Selected Omya limestone or chalk products are used in both scrubber stages (HCL & Sulfur) for the effective removal of pollutants.

In the first stage (HCL scrubber), particles as well as water soluble pollutants such as hydrochloric acid, hydrogen fluoride, vaporous heavy metals such as mercury and cadmium are removed under acid conditions (pH of around 1), while in the second stage (sulfur scrubber) sulfur dioxide is removed at neutral operating conditions (pH around 7).

Benefits

- *Efficient removal of heavy metals and other contaminants*
- *High flexibility to suit changing operating conditions*
- *Easy to handle and apply*

General 2 stage scrubber process



Easy to handle and apply, Omya Calcium Carbonate products help to achieve a good pollutants removal efficiency.



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Airborne Pollutant Removal

High-performance sorbents for mercury removal in coal fired utilities and industrial boilers

Removing airborne pollutants from industrial exhaust gases is necessary to ensure that powerful toxins and hazardous compounds such as mercury and dioxins do not enter the atmosphere.

Omya offers different types and grades of activated carbon as well as selected specialty products, designed to remove airborne pollutants.



With air quality regulations becoming more and more stringent, it is critical that all measures are taken to improve the quality of air and environment. The unique characteristics of these products helps operators stay within the regulatory limits, even under rapidly changing conditions.

Selected Omya products can be used as a buffer, to insure against an unforeseen variation in the composition of airborne pollutants. Exceptional adsorption properties ensure a high removal efficiency, meaning contaminants can be safely and easily captured, without being released to the environment.

Benefits

- *Efficient removal of heavy metals (e.g. Mercury) and other contaminants*
- *High flexibility to suit changing operating conditions*
- *Easy to handle and apply*



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