**A Global Leader in Air Pollution Control**
- People & Technology keeping our planet sustainable...

**Gas Treatment Systems**

2 **Rotary Atomizer System**

High speed rotating wheel (10,000~20,000RPM) inside Rotary Atomizer sprays chemicals and coolants in the form of fine droplets to enhance reactivity. Fine particle size increases reaction efficiency, while circular spraying at high RPM facilitates contact with acid gases (HCl, HF, SO2).

Advantages
- Particle size adjustment enhances reactivity, leading to lower chemical usage
- Compact size and easy maintenance

Projects
- Gwangyang Ferronickel Plant, POSCO, Korea (2007)
- Goyang Branch, Korea District Heating Corporation, Korea (2007)

3 **Atomizing Spray Dryer System**

In designing a semi-dry reactor featuring a dual fluid nozzle, the most important point is to maintain consistent gas flow inside the reactor and to evenly inject sorbent into the gas flow.

The dual fluid nozzle, which plays a key role in boosting removal efficiency, has superior spraying performance than the one fluid nozzle. In addition, the droplets sprayed have uniform particle sizes.

Projects
- SungOil Oil & Chemical Company, Korea (2008)
- KCAS incinerator, Korea (2007)
- Gampu incinerator, Korea (1998)
Wet FGD System

1

Wet LimeStone-Gypsum Process

- Hadong Thermal Power Plant Units 7~8
- Samcheonpo Thermal Power Plant Units 1~4
- Cheongju Local Heating Public Cooperation,
- Dangjin Thermal Power Plant Units 1~4

Projects
- High reliability and availability
- Low sorbent and power consumption

Advantages

- 500MW x 4, Korea (2006)

Process

Gypsum dewatered by a vacuum belt filter. Alternatively, a centrifuge may be used in place of the vacuum belt filter.

The pH level in the absorber sump, which changes depending on the quantity of SO2 removed in the absorber or scrubber tower using limestone slurry.

Discharged gypsum is recycled to make gypsum board or cement.

Sulfur oxides (SOx) emitted during the burning of fuel is highly toxic and causes acid rain.

It is generated by facilities that burn fuel containing sulfur, such as coal and oil.

SOx is removed from flue gas in the absorber or scrubber tower using lime stone slurry.

The abated SOx is collected in the absorber sump to form metastable calcium sulfate crystals (gypsum).

The pH level in the absorber sump, which changes depending on the quantity of SOx removed in the absorber, is controlled by adding lime stone slurry. The slurry continues production of high purity gypsum.

Gypsum slurry from the absorber sump is thickened in a dehydrator and then more than 98% is dehydrated by a vacuum belt filter. Alternatively, a centrifuge may be used in place of the vacuum belt filter.

Advantages

- High removal efficiency
- Low sorbent and power consumption
- Stable by-product (commercial grade gypsum)

Projects
- Daegu Cogeneration Plant (2002)
- Jeju Power Plant Units 1~2, Korea (2004, 2009)
- BLCP Thermal Power Plant, Thailand (2005)

2

Wet Mg/Na FGD Process

- Higher SO2 removal efficiency can be achieved by increasing the pH and SO3- levels of the sorbent.

The higher the pH level, the higher the S03- level is. This is because the solubility of MgSO3 increases. To prevent clogging caused by sedimentation and to optimize desulfurization, it is important to control the pH and SO3- levels of the sorbent. The optimal pH level is determined as the end-SOx concentration from the absorber.

In general, the pH level of the sorbent should be 6.0 ~ 6.5 and the SO3- concentration should be below 0.1 mol/L. The SO3- level of the sorbent is controlled by adjusting the amount of caustic acid.

Advantages

- Easy operation and maintenance
- Simple structure and compact size
- Proven track record

Projects
- Jeju Power Plant Units 1-2, Korea (2006)
- SUET Thermal Power Plant, Thailand (2009)

3

FGD Using Alkaline Waste Water

The use of alkaline waste water eliminates the need for additional costly chemicals. This lowers the energy costs due to low pressure loss.

Advantages

- Over 98% removal efficiency
- Reduction in chemicals and energy cost

Projects
- Daegu Cogeneration Plant (2002)

In a GSA system, dust particles from flue gas, reaction products, and alkaline chemicals fed into the system and feeding into the reactor. The gas in contact with flue gas to remove various pollutants with high efficiency.

The dust concentration inside the GSA system reactor is 50 to 125 times higher compared to conventional reactors. The gas in contact with flue gas to remove various pollutants with high efficiency.

Advantages

- Short installation period due to flexible module design
- Low maintenance/repair cost
- Operating cost savings due to use of chemicals
- High removal efficiency

Projects
- Famous Steel Facility Power Plant, USA (2006)

Semi-Dry Reactor System

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Projects
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Dust particles are recycled to the reactor and used as an absorbent. This means lower operating costs due to the reuse of alkaline chemicals. The GSA system can be run at minimal cost according to the target discharge rate if it is lined up so as to avoid gas monitoring system.
**Wet FGD System**

Sulfur oxides (SOx) emitted during the burning of fuel is a highly toxic and causes acid rain. It is generated by facilities that burn fuel containing sulfur, such as coal and oil. Sulfur oxides from flue gas, lime slurry or calcite slurry is used as absorbent. As the sorbent reacts with SOx, gypsum is generated as a by-product. The discharged gypsum is recycled to make gypsum board or cement.

SOx is removed from flue gas in the absorber or scrubber tower using lime or calcite slurry. The absorbed SOx is oxidized in the absorber slurry to form metastable calcium sulfate dihydrate (gypsum). The pH level in the absorber slurry, which changes depending on the quantity of SOx removed, is controlled to maintain the absorbent in the desired state. The solution is continuously produced for waste gypsum production.

Gypsum slurry from the absorber sump is thickened in a hydrocyclone and then more than 90% is absorbed by the absorber, is controlled by adding limestone slurry. This enables continuous production of high-purity gypsum.

SO2 is removed from flue gas in the absorber or scrubber tower using limestone slurry. The absorbed SOx is oxidized in the absorber slurry to form metastable calcium sulfate dihydrate (gypsum). The pH level in the absorber slurry, which changes depending on the quantity of SOx removed, is controlled to maintain the absorbent in the desired state. The solution is continuously produced for waste gypsum production.

In a GSA system, dust particles from flue gas, reaction products, and alkaline chemicals are fed into the system and floated inside the reactor. They get in contact with flue gas to remove various pollutants with high efficiency. The dust concentration inside the GSA system reactor is 50 to 100 times higher compared to conventional absorbers. The reaction zone of each dust particle is coated with alkaline chemicals which are incorporated into the dust particle in the form of a slurry or solid. The coated dust particles come into contact with acidic pollutants such as SOx, HF, and HCl to neutralize and remove them.

The next step is the cyclone, where most of the dust is removed. Dust is completely removed by the ESP or Bag Filter later in the process so that only clean air is released into the atmosphere.

The use of alkaline waste water eliminates the need for additional costly chemicals. This lowers the energy costs due to less pressure loss.

**Advantages**

- Easy operation and maintenance
- Simple structure and compact size
- Proven track record

**Projects**

- Jip-Power Plant Units 1-2, Korea (2006)
- Jeju Power Plant
- Daegu Cogeneration Plant
- Formosa Plastic Factory Power Plant, USA (2009)

**FGD Process**

GSA Technology

- Proven track record
- Simple structure and compact size
- Easy operation and maintenance
- Low maintenance/repair cost
- Operating cost savings due to re-use of chemicals
- High removal efficiency

Projects

- Formosa Plastic Factory Power Plant, USA (2009)
Wet FGD System

- Hadong Thermal Power Plant Units 7~8
- Samcheonpo Thermal Power Plant Units 1~4
- Cheongju Local Heating Public Cooperation

Projects
- 500MW X 4, Korea (2006)
- Korea (2000)
- 500MW X 4, Korea (1995)

Advantages
- Stable byproduct (commercial grade gypsum)
- High reliability and availability
- High removal efficiency

Process

The absorbed SO2 is oxidized in the absorber sump to form marketable calcium sulfate crystals (gypsum).

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Advantages
- High removal efficiency
- Simple structure and compact design
- Proven track record

Projects
- GSA - Bag Filter & ESP Chongging, China
- GSA - Bag Filter & ESP Kara (Denmark)

Advantages
- Short installation period due to flexible module design
- Low maintenance/repair cost
- Operating cost savings due to reuse of chemicals
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Projects
- Famous Heavy Industry Power Plants, USA (2008)

In a GSA system, dust particles from flue gas, reactant products, and alkaline chemicals fed into the system and finally inside the reactor. They get in contact with flue gas to remove various pollutants with high efficiency.

The dust concentration inside the GSA system reactor is 50 to 120 times higher compared to conventional reactors. The dust that each dust particles is coated with alkaline chemicals which are injected into the reactor either in the form of a slurry or solid. The coated dust particles come into contact with acidic pollutants such as SO2, HCl, and NOx to neutralize and remove them.

The next step in the cyclone, where most of the dust is removed. Dust is completely removed by the GSA filter in the process so that only clean air is released into the atmosphere.

The reaction products and dust captured in the cyclone are recycled to the reactor and used as an absorbent. The GSA system can be run at minimal cost according to the target desulfurization rate if it is lined up on an acid-gas monitoring system.

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- KCAS nucleator, Korea (2007)
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