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

Electrostatic Precipitators (ESP)
ESP For Tunnel/Underground Use
Bag Filters, eBF™
Ash Handling Systems
With an electrostatic precipitator (ESP), direct high voltage is applied to create a corona discharge to charge particles suspended in the gas and collect them through electrostatic attraction. An ESP is useful in removing particles in the sub-micron range which are difficult to capture with gravitational or centrifugal force.

**Advantages**
- Customized system design
- Collection with G-Opzel™ Plate
- DURATRODE™ discharge electrode
- MIGITM (Magnetic Impulse Gravity impact) rappers
- Semipulse and Multipulse for high collection and energy efficiency

**Projects**
- Boryeong Thermal Power Plant Units 1~8 500MW, Korea (1983~2006)
- Taean Thermal Power Plant Units 7~8 500MW X 4, Korea (2004)
- Taichung Thermal Power Plant Units 9~10 550MW X 2, Taiwan (2001)
- Pohang Sintering Plants 1~4 (POSCO), Korea (1986~2008)
- Gwangyang Ferronickel Plant (POSCO), Korea (2007)

**Wet Type ESP**

Wet type ESPs have many similarities with dry type units in terms of principle and design. However, a basic difference is that the wet type is used in environments where the gas temperature is at or below dew point. Also, the rapping gear associated with dry units is replaced by an intermittent washdown system using water or other liquids to remove deposits from the collecting plate.

Wet type ESPs collect particulates that are sticky or suspended in the flue gas close to saturation temperature. It can also capture high resistance particulates and substances in a gaseous state. Two standard models of wet type ESP are available: Honey Comb Type (vertical flow) and G-Opzel Type (horizontal flow).

**Advantages**
- Low particulate emission
- Excellent collection efficiency for high resistance dust and mist
- Effective water film design
- Multiple designs of discharge electrode
- Comprehensive waste water treatment

**Projects**
- Gwangyang MiniMill 2, POSCO, Korea (1997)
- STS 3rd Steel Plant (TCM), POSCO, Korea (2001)
- Pohang TLC Slag Treatment System, POSCO, Korea (2002)
- Gwangyang Continuous Casting Plants 1~2, POSCO, Korea (2003)

**De-Tar ESP**

This device also removes tar from the coke oven with a byproduct recovery system used in high temperature carbonization.

**Projects**
- Gwangyang Continues Galvanizing Lines 5~6, POSCO, Korea (2004)
This unit removes fine dust particles and purifies air in tunnels and underground space. Tunnel air containing dust passes through the ESP, which features negatively charged electrodes and positively charged collecting plates. Dust is absorbed by the collecting plates so that only clean air is emitted. The system deals with the captured dust particles through periodic cleaning with water.

This system can maintain over 90% collection efficiency even in high speed air streams (over 7m/sec). The ESP is equipped with discharge electrodes of a saw blade shape and has a compact structure. It is ideal for treating large volumes of dust containing gas or air.

Advantages
- Maximized corona discharge due to saw blade shaped discharge electrodes
- Compact single-stage ESP with simultaneous dust collection and discharge in the same space
- Use of commercial charging device (transformer rectifier) removes the need for a separate power grid
- GVC method for precision control and optimization of voltage and electric current
- Can be operated for high speed air streams

Korea Patent No. : 10-0871601 (Registration Date 26th Nov. 2008)
* NET(New Excellent Technology) No. : 0258, Ministry of Knowledge Economy (Registration Date 26th Aug. 2008)

Fabric filters are used for a broad range of industries including steel, non-ferrous metal, cement, power generation, chemicals, lumber and incineration plants. The choice of filter technology and filter media used depends on the type of gas being cleaned and the properties of the dust particles being removed.

1. Reverse Air Fabric Filter
   - Suitable for large facilities (range: 1,500~100,000m³/min)
   - Low air to cloth ratios
   - Simple design with few moving parts
   - Easy maintenance
   - Compartment ventilation during maintenance

2. Pulse Jet Air Filter
   - Wide variety of applications (range: 50~25,000m³/min)
   - Bags are kept on the clean side, eliminating the need for ventilation during maintenance
   - High air to cloth ratios
   - Less space required for installation

Fabric filters boast reliability and high efficiency and can trap dust at temperatures above 250°C, which has been regarded as the critical temperature for conventional fabric filters. Because it functions at high temperatures, there is no need for a flame prevention system. Spark prevention device, cooler, or spray tower. Ceramic filter also leads to energy and water savings.

Ceramic filters can be used even at a temperature of 900°C and shows high filtration efficiency against fine particles. In addition, it has resistance to sparks, incandescent particles, and accidental flame. The Ceramic filters are resistant to acid and alkaline corrosion and do not require a lot of space as air dilution is not necessary.

Advantages
- NaHCO₃ and slaked lime injected as sorbents for HCL and SO₂ removal
- Enhanced down ratio
- Integration with optimal dust removal system lengthens catalyst lifespan and removes the need to reheat gas
- Can be used in Heat recovery Plant
- Greater efficiency throughout entire process
Featuring a charging device installed before flue gas passes through the bag filter, the electrostatic bag filter is designed to lower equipment and operating cost compared to using only a bag filter. It combines the benefits of the ESP and bag filter. Electrostatic force is used to address the increase in pressure loss, a problem associated with conventional bag filters. Electrostatically charged dust particles form a dendrite layer on the filter surface which prevents fine particles from penetrating into the filter and reduces filter clogging. Electrostatic bag filter is a high performance dust collection system with enhanced collection efficiency.

**Advantages**
- Formation of dendrite layer of dust by using electrostatic force
- Less clogging by preventing fine particles from penetrating into the filter
- Enhanced collection efficiency
- Less friction loss due to increase in filtration surface
- Increase in filtration speed and amount (assuming identical facilities)
- Longer filter lifespan due to longer dust removal cycle
- Low initial investment and operating (energy) cost

**Projects**
- Yeongwol Plant Units 3, 5, Ssangyong Cement, Korea (2003)

**Difference between other BF**

<table>
<thead>
<tr>
<th>Voltage (kV)</th>
<th>Collection Efficiency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>91.2</td>
</tr>
<tr>
<td>39</td>
<td>98.8</td>
</tr>
<tr>
<td>100</td>
<td>99.46</td>
</tr>
</tbody>
</table>

**Difference between other BF**

<table>
<thead>
<tr>
<th>Aerodynamic Particle Diameter (㎛)</th>
<th>Collecting Efficiency by particular size</th>
<th>Collecting Efficiency by weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.8</td>
<td>99.0</td>
<td>99.5</td>
</tr>
<tr>
<td>1.0</td>
<td>99.1</td>
<td>99.6</td>
</tr>
<tr>
<td>2.0</td>
<td>99.2</td>
<td>99.7</td>
</tr>
<tr>
<td>3.0</td>
<td>99.3</td>
<td>99.8</td>
</tr>
<tr>
<td>4.0</td>
<td>99.4</td>
<td>100.0</td>
</tr>
</tbody>
</table>

**Bottom Ash Handling System**
- Slag and ash falling from the furnace are temporarily stored in the bottom ash silo. They are then sent to the ash pond using a hydro ejector. Alternatively, they are sent back to the bottom ash silo to be recycled after going through a submerged drag chain conveyor or dry ash extraction conveyor.

- Bottom Ash Hopper System utilizing Hydro-ejectors
- SDCC (Submerged Drag Chain Conveyor) System
- Dry Ash Extraction System
- Ash Water & Slurry System

**Fly Ash Handling System**
- Air pressure from the blower or air compressor is used to transport ash to the ash silo via appropriately sized pipes.

- Positive Pressurized Conveying System
  - Lean (Dilute) Phase System
  - Medium Phase System
  - Dense Phase System
  - Negative Pressurized Conveying System (Vacuum System)
  - Combination System
  - Economizer & Air Preheater Ash handling System / Ash Disposal System

**Projects**
- Yeongnam Thermal Power Plant Units 1~2, Korea (2002)
- Ulsan Thermal Power Plant Units 4~6, Korea (1997)
- Sancheong 1 Thermal Power Plant Units 1–2, Korea (2002)
- Dangjin Thermal Power Plant Units 5–6, Korea (2004–2006)
- Retrofit for Ulsan Thermal Power Plant Units 4–6, Korea (2007)
- Boryeong Thermal Power Plant Units 7–8, Korea (2006)

**eBF Structure**
- Maximize the reusability of equipment when replacing BF from ESP effect
- Electrostatic Precipitator + Bag Filters = eBF
- Increase collecting efficiency
- Reduce pressure loss (Lower energy cost)