

Wet Electrostatic Precipitators

An established history of fine particulate,
condensables and acid mist collection



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Our combined experience includes more than 5000 ESP installations, worldwide.



Babcock & Wilcox (B&W) has a long history of providing innovative industry-leading emissions control solutions. Our experience with electrostatic precipitator (ESP) technologies, both wet and dry, includes our established OEM experience base and expertise, as well as those gained through strategic acquisitions and licenses such as:

- Hamon Research-Cottrell – acquired in 2022
- SLF Romer (F.L. Smidth Airtech) – licensing agreement since 2003
- Joy Environmental and Western Precipitation – acquired in 1995

Fine particulate, condensables, and acid mist collection

Dr. Frederick Cottrell developed the first wet ESP in 1907 to control sulfuric acid mist from a copper smelting process in Pinole, California. Since that time wet ESP technology has become well-established around the world in both industrial and utility applications to remove sub-micron particulate, condensables and sulfuric acid (H_2SO_4) mist. It is especially useful as a final polishing device in air pollution control systems where an upstream dry ESP, fabric filter or wet scrubber cannot capture the sub-micron particulate or acid mist due to its small size.

When wet flue gas desulfurization (FGD) systems or wet scrubbers are used for sulfur control, wet ESPs have also proven to be effective in collecting H_2SO_4 and other condensables, along with fine particulates, reducing opacity concerns at the stack.

In addition to reducing emissions and opacity from a stack, wet ESPs can be used to recover valuable product from a process gas.

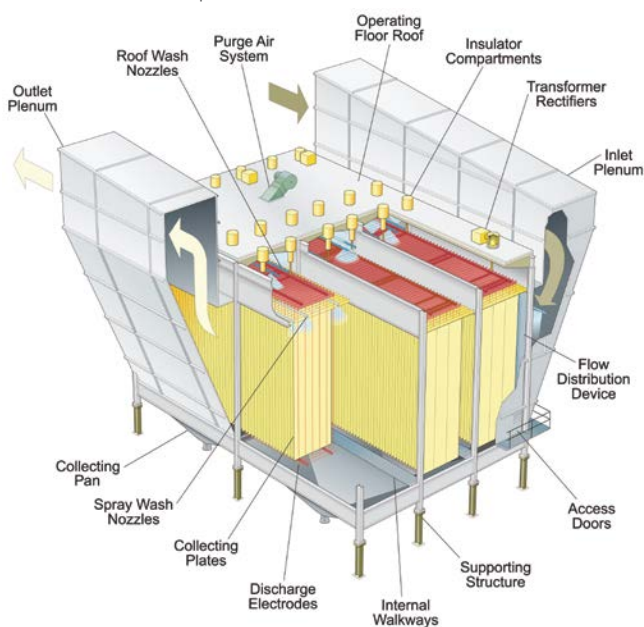


Utility and industrial applications covering a wide range of fuels or process gas

Operation

Wet and dry ESPs operate on the same basic principles:

1. Charging of incoming particulate with negative ions from corona generation using a high voltage system
2. Collection of the negatively charged particulate on a positively charged collection electrode surface
3. Cleaning of the captured particulate on the collecting electrode surface via use of water sprays, irrigation or condensation versus rapping or sonic horns. Cleaning methodology is the primary difference between dry and wet ESP operation.



Features and benefits

- **Performance** – over 90% collection efficiency typical and up to 99% possible*
- **Compact Size** – minimizes space and cost
- **Opacity** – less than 10% visual possible*
- **Reliability** – well-established technology in hundreds of applications
- **Fuel Flexibility** – applicable for various fuels
- **Multi-Pollutant Control** – sub-micron solid particulate, condensables, and sulfuric acid mist
- **Modular Design** – allows for scale up to any size air flow and ease of installation
- **Simple Maintenance** – no moving mechanical parts; continuous self-cleaning
- **Pressure Drop** – typically less than 1 in. wg (0.25 kPa) through the wet ESP
- **System Integration** – total system capability with other pollution control devices

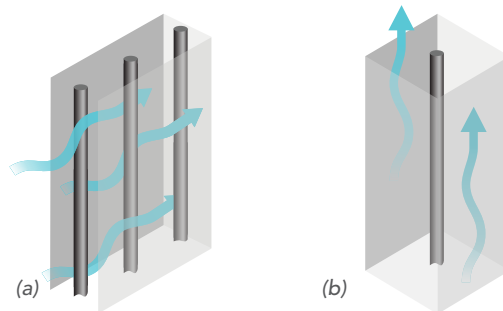
*when integrated as part of an appropriately designed emissions control system

Design/configuration

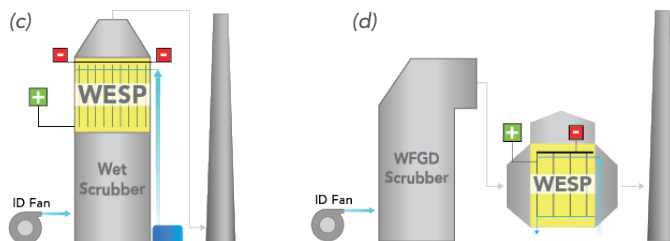
Wet ESPs are generally configured in one of two ways:

- Horizontal gas flow with flat plate collecting electrodes (a)
- Up-flow tubular configuration (b)

Collecting tubes are either round, square or hexagonal. B&W's expertise includes both plate and tubular designs.



A wet ESP can be integrated into the scrubber/absorber tower (c), or it can be located after the scrubber (d) where the flue/process gas has been cooled to moisture saturation. Once cooled, gaseous pollutants condense to form sub-micron aerosols that can be captured within the wet ESP.



A complete wet ESP system typically includes the following components:

- Collecting electrode system
- Discharge electrode system
- Positive insulator vent system
- Internal wash systems
- Transformer rectifiers and controls
- Casing



Effective flue gas pre-treatment for post-combustion carbon capture

Applications

B&W's wet ESP system design is based on our extensive experience with a wide range of industrial, refinery and power applications, including:

- Particulates and sulfuric acid mist from petroleum refinery processes
- Sulfuric acid plants
- Regeneration of spent acids in chemical plants
- Metallurgical sulfuric acid plants in zinc, copper and nickel applications
- Organic fumes such as those generated in fiberglass production applications
- Organic fumes and particulates from sinter plants and steel mills
- Utility power plants

In addition, our wet ESP technology can be utilized as effective **gas pre-treatment in post-combustion carbon dioxide (CO₂) capture applications** to protect the downstream CO₂ capture reagent from contamination.

Pilot unit

B&W maintains a small pilot wet ESP design (under 1000 ACFM [0.47 m³/s]) that is available for rent to test its operation on a plant's process before committing to a full-scale wet ESP.



Materials of construction

Due to the saturated condition of the process gas, wet ESPs are susceptible to corrosion. Proper material selection depends upon analysis of the process gas, and expected pH and chloride levels in the water. Construction materials can range from carbon steel, stainless steel, FRP to high-end alloys. Each industry and plant site are unique. B&W will recommend an appropriate material which provides long life, resistance to corrosion and reliability.

Construction services, upgrades and parts

We provide replacement parts, system upgrades and field engineering services for equipment originally provided by B&W as well as other manufacturers. We also provide specialized construction services through our subsidiary, Babcock & Wilcox Construction Co., LLC (BWCC).

Working closely with BWCC, B&W engineers design for constructability – an advanced construction concept that minimizes on-site labor requirements, increases safety, reduces construction costs and downtime, and assures that product design features are properly applied for optimal performance.



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