

Wet Electrostatic Precipitators for Industrial Applications

Babcock & Wilcox (B&W) is driven to deliver reliable and competitive solutions to the fine particulate control issues faced by our customers. To support this challenge, we are engaged in aggressive research and development of advanced emissions control equipment and systems. In addition, acquisitions and licenses of environmental control products have expanded the breadth of our technology offerings and our experience base.

With our purchase of Joy Environmental in 1995 and our exclusive worldwide licensing agreement in 2003 with SLF Romer XV ApS, an affiliated company of F.L. Smidth Airtech A/S (FLS), for their wet electrostatic precipitator (ESP) technologies, we have added to our already strong ESP experience base and expertise. We continue to provide industry with the most proven air pollution control equipment to solve difficult emission control challenges.

Renewed interest in wet ESPs

The collection of acid mist fine particulate, such as the metallurgical processes for copper and nickel production, has been accomplished with wet ESPs for more than 100 years. However, with the emergence of expanded emission control requirements, reduced emission limits, and the combustion of non-traditional fuels such as petroleum coke, there has been renewed interest in the use of wet ESPs to control selected emissions, especially sulfuric acid mist (H_2SO_4), air toxics and fine particulates.

When wet flue gas desulfurization (FGD) systems are used for sulfur control, significant levels of H_2SO_4 mist tend to pass through the system and result in opacity issues at the stack. While many particulate wet scrubbers are installed at industrial sites, these do not perform well for the collection

of fine particulates or sulfuric acid mist. Wet ESPs have proven effective in collecting H_2SO_4 and other condensables, along with fine particulates, in these types of industrial applications.

System features and benefits of B&W's wet ESP for industrial applications

B&W's wet ESP system design is based on our extensive experience on various applications and established market leadership in particulate control experience, including both wet and dry ESP technology. Specific features and benefits of our wet ESP design and system offering include:

- modular construction reduces field construction and labor costs
- low pressure drop and reliable designs reduce operating and maintenance costs
- ultra low particulate (solids, mist and fine particulate) emissions
- hazardous air pollutant reduction
- total system capability for integration with other pollution control devices such as wet and dry scrubbers of all types

Wet ESPs are utilized for a variety of industrial applications, including:

Combustion applications (fine particulates, toxics and sulfuric acid mist)

- coal
- bark and recovery boilers that use wet particulate scrubbers
- oil
- petcoke
- municipal waste
- hazardous and chemical waste



B&W alloy wet ESP replacement for lead acid mist units.

- other opportunity fuels
- ammonia scrubbing

Process applications

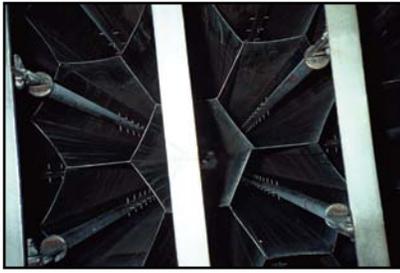
- sulfuric acid plants
- regeneration of spent acids in chemical plants
- metallurgical sulfuric acid plants in zinc, copper and nickel applications
- organic fumes such as those generated in fiberglass production applications
- organic fumes and particulates from sinter plants and steel mills
- particulates and sulfuric acid mist from petroleum refinery processes

Design and operation

B&W's wet ESP products for industrial applications draw from our vast experience with upflow tubular designs, upflow parallel plate designs, and from horizontal flow wet ESP designs. Several recently successful projects have replaced wet ESPs made of lead to all-alloy wet ESP designs.

With the *upflow* design, the flue gas enters the wet ESP and is uniformly distributed by means of gas distribution devices across the individual casing cross-sections. Each gas passage is of hexagonal design to allow for compactness and lower pressure drop.

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The hexagonal gas passage design allows for a more compact unit configuration and lower pressure drop.

Each gas passage contains a rigid discharge electrode. A four-point suspension of these rigid discharge electrodes allows for reliable means of inter-electrode alignment. The self-supporting nature of the electrodes eliminates the need for any bottom mounted support insulators to maintain alignment. Fine particulates and sulfuric acid mist droplets contained in the gas will receive a negative electric charge from the high voltage electrodes and will migrate and collect onto the positively grounded collecting surfaces.

Because of the all-alloy construction, there is no need for the collecting surfaces to be continuously washed to preserve the needed minimum conductivity for the electrostatic precipitation process to function.

With the *horizontal flow* design, a water spray system removes the particulate material deposited on the collection surfaces and discharge system. In fiberglass applications for the collection of organic fumes, the wet ESP internals are continuously washed to remove particulate, to maintain

flush system pH, and to prevent the potential for localized heat generation due to wet ESP sparking. The same concept of continuous washing may be applied in sulfuric acid mist applications to reduce the grade and cost of alloy materials used in the wet ESPs.

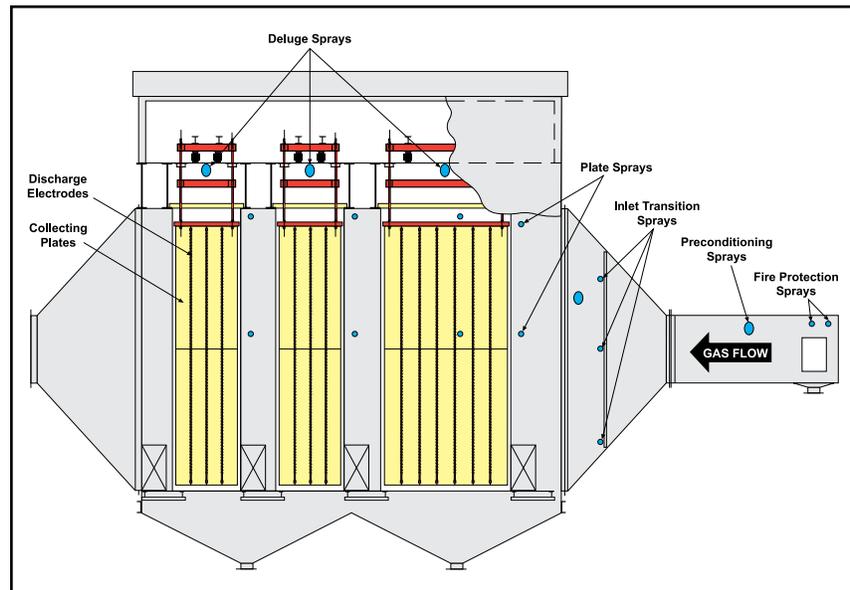
Experience and future development

Wet ESP technology is not new. The combined B&W and FLS wet ESP reference plant list, which includes that of Joy/Western Precipitation and Lodge Sturtevant Limited, dates back to the first commercial ESP in North America installed in 1907. The reference plants include hundreds of industrial wet ESP installations worldwide. The references also demonstrate extensive experience on boiler applica-

tions with a variety of fuels such as coal, pet coke, oil, biomass, municipal wastes, and Orimulsion®.

B&W continues to look for ways to optimize performance and reduce the sizing requirements of the wet ESP product. Results of operating units are continually monitored to provide useful data for advancing the development of this technology. Research and testing continue at B&W's R&D facility and at commercial host testing sites.

For more information about our wet ESP system, a complete list of reference plants, or any of our other pollution control equipment solutions, call us at 330-753-4511 or visit our website at www.babcock.com.



Horizontal flow wet ESP arrangement for fiberglass applications.

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