

# Industrial Air Quality Control Solutions

Quality products and services to minimize environmental impact



# A Total Package of Industrial Boiler Emissions Solutions

The Babcock & Wilcox Company (B&W) can provide solutions for all of your industrial boiler and hazardous air pollutant (HAP) emissions reduction requirements.

Our complete package of proven technologies includes:

- ▶ Acid gas control
- ▶ Particulate control
- ▶ Mercury control
- ▶ Nitrogen oxides control
- ▶ Combustion and fuel preparation upgrades
- ▶ Aftermarket services
- ▶ Replacement parts





Providing solutions backed by experience and extensive research, B&W continues to develop new products and technologies to add to its wide range of emissions control equipment and systems solutions. Our total integrated system approach to pollutant mitigation provides you with the greatest flexibility, accountability, optimized performance and certainty of outcome, while minimizing both capital and operating costs.

In addition to our internally developed technologies, through various acquisitions and license arrangements, we have extended our capabilities to include a large number of well-known names in the environmental industry, including Joy Western Precipitation, GEA Niro, PrecipTech, FIS (Fluid Ionics Systems), and Ecolaire.



## Acid Gas Solutions

B&W offers multiple solutions for acid gas control. Our limestone, lime and sodium-based scrubbing systems can achieve extremely high removal efficiencies, in many cases greater than 98%.

### ***Wet FGD Technology Using Limestone or Lime***

B&W's wet limestone or lime forced oxidation flue gas desulfurization (FGD) systems are proven to achieve high sulfur dioxide (SO<sub>2</sub>), HCl and HF removal while maintaining high availability and reliability. Our wet FGD systems are sized and designed to effectively treat the flue gas from various industrial applications.

As a full-scope supplier, we provide the absorbers, along with the reagent storage and preparation, dewatering, and other auxiliary equipment for a complete and integrated economical solution.

### ***Wet FGD Technology Using Sodium***

B&W's development of sodium reagent-based wet FGD products is supplemented by our ownership of the Joy Western Precipitation technologies. These technologies allow us to provide cost-effective, sodium-based scrubbing systems for acid gas (SO<sub>2</sub>, HCl, HF, etc.) and particulate emission control with minimal investment for a wide variety of industrial applications.

Our sodium-based scrubber minimizes scaling potential and maximizes system reliability. Our flexible, modular design allows customers to minimize operation and maintenance costs.



## **Dry FGD Technology**

B&W's spray dry absorption (SDA) process is a licensed technology from GEA Niro. The technology is proven for high SO<sub>2</sub>, heavy metal and air toxic emissions removal efficiency. The system offers high availability, low capital costs, and low operating and maintenance costs, as well as the inherent capture of oxidized mercury.

The process has proven successful on many industrial applications worldwide including more than 80 waste-to-energy installations, in addition to over 21,000 MW of utility applications.

B&W also holds an exclusive North American license for Enviroserv GmbH's circulating fluidized bed-flue gas desulfurization (CFB-FGD) technology. More commonly referred to as a circulating dry scrubber, a CDS provides a solution for smaller units firing medium to high sulfur coals. Benefits include high SO<sub>2</sub> removal efficiency, low capital cost and integral SO<sub>3</sub>, HCl, HF, heavy metals and PM<sub>2.5</sub> emissions reduction.



## **Dry Sorbent Injection**

Dry sorbent injection (DSI) technology has been used since the 1980s to control SO<sub>2</sub> emissions. B&W has been actively involved in the design and development of injection technology and lance design for optimum reagent and gas mixing. Most recently, this technology has been applied to utility, industrial and waste-to-energy applications to mitigate acid gases such as HCl, HF, SO<sub>2</sub> and SO<sub>3</sub>.

Reagent selection is based on the specific application, unit operating conditions, reagent economics and the pollutants to be controlled. The material storage, handling and transport system can be designed to handle multiple reagents to offer optimum flexibility. In addition, each application will vary depending on the pollutants to be controlled, available residence time and the type of particulate collection device in place.

## Particulate Solutions

### *Fabric Filter Technologies*

B&W provides cost-effective control of particulate emissions and opacity with our proven pulse jet and reverse air fabric filter technologies. The Joy Western Precipitation technology provides a lineage of industrial fabric filters dating from the 1930s. We have designed and installed fabric filters for a variety of industries including steel, cement, incinerator and coal-fired power plants.

Integrating fabric filters with our sorbent injection and FGD technologies also provides low HAP emissions in a variety of applications.

Design features such as long bag technology, integral gas and dust distribution devices, and on-line maintenance access provide benefits not available from other suppliers. Through our innovative technologies, we have provided some of the lowest emission fabric filters in the world.



### *Wet ESP*

Wet electrostatic precipitators (ESP) are a proven technology for the reduction of acid mist and fine particulates for a variety of industrial processes. Through ownership of Joy Western, Fluid Ionics and the FLS wet ESP technology, B&W's wet ESPs have been in successful operation since the 1920s. Installations include oil, coal, petroleum and waste-fired boilers, glass furnace installations, controlling sulfuric acid mist and fine fumes in metallurgical applications, and several other applications as a polishing filter for high efficiency control of condensable emissions and fine particulates.

B&W's wet ESPs are available in either plate-type or tubular-type geometry and may be either vertical or horizontal flow. Both intermittent and continuous washing is utilized for efficient cleaning. Our robust wet ESP design and expertise enable us to select the appropriate materials for the particular design and application. System features include low operating and maintenance costs, and a flexible, stand-alone design that can be integrated with other pollution control devices.



## **Dry ESP**

For more than 100 years, B&W has provided dry ESPs for industrial applications including industrial boilers, incinerators, cement plants and steel plants. In addition, our PrecipTech products have enhanced our particulate control portfolio to include replacement parts, upgrades and projects associated with virtually all OEM designs.

Our dry ESPs feature the latest technology advancements including rigid discharge electrodes, state-of-the-art microprocessor controls, modular or unitized collector sheets, and both internal and external rapping designs. These advancements provide our customers with reliable and consistent performance.

For industrial applications, B&W has experience with a wide variety of worldwide fuels including coal, biomass, oil, and various waste fuels. Our extensive process and application knowledge allows us to integrate the dry ESP into the plant with other environmental equipment to maximize the reduction of HAPs while minimizing installation, and operation and maintenance costs.



## **Turbulaire® Scrubbers**

Turbulaire® scrubbers have been used successfully to control emissions from many industrial process operations, including combustion, chemical, mining and metallurgical. Turbulaire scrubbers are often used in conjunction with other collection equipment. Flexibility in space needs and efficiency make Turbulaire scrubbers excellent add-on units, especially for already tight plant layouts. Each Turbulaire scrubber model can be adapted to meet virtually any corrosion problem.

The Turbulaire scrubber mixes the air or gas stream with a liquid medium, entrapping the material to be collected in the liquid. Turbulaire designs are proven, simple, reliable and economical.



# PAC Injection Systems for Mercury and Dioxin/Furan Control

B&W has been actively involved in research and development, demonstration programs, and implementation of mercury and organic HAP control systems since the early 1990s. We provide multiple solutions focused on integrating a variety of technologies with other air quality control systems that may already exist at your facility.

Variables such as fuel, flue or byproduct gas composition, particulate characteristics, emission limits and other operational factors are considered to tailor a customized solution. By understanding the interrelationship between various technologies, as well as the co-benefits achieved with other air quality control systems, our solutions can save significant cost throughout the life of the plant.

## *Mercury Control*

Powdered activated carbon (PAC) injection has been proven very effective for controlling mercury emissions. Other B&W technologies, such as the MercPlus™ coal additive system to promote mercury oxidation, and the Absorption Plus (Hg)™ wet FGD additive system to prevent mercury re-emission, have all been proven to offer cost-effective mercury solutions.

## *Organic HAP Control*

A co-benefit of injecting PAC for mercury control is the adsorption of dioxins and furans. These systems have been in operation for many years on municipal solid waste incinerators. Other technologies for reducing dioxin and furan emissions include combustion system modeling and combustion system modifications.





## Nitrogen Oxides Solutions

B&W provides effective control of nitrogen oxides ( $\text{NO}_x$ ) through a combination of combustion and selective catalytic reduction (SCR) technologies. Low  $\text{NO}_x$  burners and overfire air are used to reduce  $\text{NO}_x$  leaving the furnace and to minimize the size of the catalyst and reagent consumption. We develop the most cost-effective, project-specific SCR solution using either plate or honeycomb catalyst, and supply the complete balance of plant scope as needed for an optimal overall system solution.

Gas flow modeling of the integrated SCR system determines flow distribution and mixing devices to optimize gas conditions entering the catalyst while minimizing system pressure loss.

Our integrated low  $\text{NO}_x$  combustion and SCR systems are designed to be cost effective, dependable and adaptable to the full range of fuels and boiler arrangements found in a variety of industrial applications.



## Combustion and Fuel Preparation Solutions

In addition to the many post-combustion solutions that B&W provides, we have unparalleled experience designing complete steam generating systems. When looking to improve your plant's emissions, this experience enables us to consider the overall system, from fuel chute to stack. B&W's proven combustion and fuel preparation solutions, primarily to control carbon monoxide as well as to improve efficiency, include:

- ▶ Air system upgrades
- ▶ Burner upgrades
- ▶ Stoker upgrades
- ▶ Conversions to bubbling fluidized-bed combustion
- ▶ Coal pulverizer upgrades



## Quality Aftermarket Services

Working with B&W means that you'll have a single-source supplier that provides quality products, performance upgrades with guarantees, and support services for all your environmental equipment, regardless of manufacturer.

B&W provides a total package of aftermarket services, including:

- ▶ Engineered equipment upgrades
- ▶ Start-up and commissioning
- ▶ Performance testing and monitoring
- ▶ Equipment tuning and optimization
- ▶ Field service engineering
- ▶ Replacement parts



## Replacement Parts

B&W provides replacement parts for industrial air quality control and emissions monitoring equipment originally provided by B&W and other manufacturers. Parts are also available for Joy Western ESPs, fabric filter baghouses, Multiclone<sup>®</sup> dust collectors, Turbulaire scrubbers, Microdyne<sup>™</sup> gas scrubbers, and rotary dust valves. As the exclusive North American licensee of GEA Process Engineering A/S for the GEA Niro SDA process, B&W provides original Niro replacement parts.

Our original parts are designed specifically for your equipment. Sizes and tolerances offer the right fit and best wear life for long-term reliability and safe operation.



ENERGY | ENVIRONMENTAL

Established in 1867, Babcock & Wilcox is a global leader in advanced energy and environmental technologies and services for the power, industrial and renewable markets.

For more information or to contact us, visit our website at [www.babcock.com](http://www.babcock.com).



*B&W applies its experience, innovation and responsiveness to provide a complete package of advanced and integrated emissions control solutions for industrial applications.*

### The Babcock & Wilcox Company

1200 E Market Street, Suite 650  
Akron, Ohio, U.S.A. 44305  
Phone: +1 330.753.4511

[www.babcock.com](http://www.babcock.com)    

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