

# Quality Electrostatic Precipitator Technology, Parts and Service

Optimizing the Performance of Existing Systems



ENERGY | ENVIRONMENTAL



# Get the most from your current ESP system



Aging technology and lack of support from some original equipment manufacturers has resulted in lost productivity and reduced efficiency for many electrostatic precipitator (ESP) systems. ESP products and services provided by Babcock & Wilcox (B&W) are designed with one goal in mind—to help keep your ESP functioning at peak performance. Our vast industry experience enables us to provide integrated solutions to enhance equipment performance, regardless of original manufacturer. We provide engineered upgrades, quality components and services to help keep your ESP running efficiently and effectively. Our combination of innovative products and services include:

- Collector plates
- Rapper components and parts
- Discharge electrodes
- Insulators
- Single- and 3-phase power supplies and controls
- Access doors and door seals
- Electrical performance enhancement hardware and software
- Upgrades, rebuilds and conversions
- 24/7 remote diagnostics
- Field services and operating and maintenance training seminars

When considering new equipment, an upgrade or retrofit, conversion, a complete ESP rebuild, or quality replacement parts, we offer a wide range of comprehensive and cost-effective solutions.



# Technology and Innovation

Passionate about innovation and technology leadership, B&W's experienced team of experts develop electrical, mechanical and controls/software innovations, which lead to new products and solutions. Research is done using modeling software, an in-house test ESP and full-scale field tests/experiments. Historical developments have included automatic voltage controls (AVCs), programmable rapper controls, continuous particulate monitors, and purge air controls, just to name a few.

Through continued improvement and expansion of existing technologies, we are constantly developing new solutions to meet your particulate control needs.



# Total Package Solutions

B&W provides a total package of aftermarket products and services designed to reduce operating and maintenance costs, improve reliability and safety, and enhance overall performance and efficiency, regardless of manufacturer.

Capabilities include:

- Engineered equipment upgrades
- Start-up and commissioning
- Construction
- Performance testing and monitoring
- Equipment tuning and optimization
- Remote diagnostic services
- Field service engineering
- Replacement parts
- Continuous emissions monitoring systems



# Engineered Upgrades and

## Internally rapped ESPs

B&W's ESP upgrades can help reduce emissions and correct problems found with internally rapped ESPs. These upgrades improve the original unit design by adding electrical sections, increasing residence time by up to 30% for better performance, and allowing top access for easier maintenance. Upgrades include:

- Enhanced ESP efficiency due to increased gas residence time
- Improved access to internal components
- Inspections and maintenance performed at both the top and bottom of the unit
- External rappers that can be maintained while the unit is online and operating
- Adjustment of individual rappers to strike as needed with variable intensity
- Reduced maintenance, because there are no rotating parts
- Minimized effects of sparking
- Precision alignment that can be maintained

## Original equipment manufacturer (OEM) upgrades

To address design deficiencies and increased maintenance requirements of original equipment, B&W can upgrade virtually any existing ESP, regardless of manufacturer. Two examples follow.

### Buell-Type ESPs

B&W can provide upgrades which are specific to Buell-type ESPs. These include collecting and high voltage rapper shaft design upgrades and boot seal upgrades to prevent rapper/vibrator shaft corrosion, as well as correcting binding issues. Upgrades include:

- Elkhorn adapters for easier wire replacement and to help prevent spit arcing and wire shroud damage
- Lower panel guide (B-Line) modifications to relieve plate bowing; allows plates to expand vertically, and improves rapping effectiveness
- Heavier, stronger replacement weight hooks to reduce mechanical fatigue and arcing

- Replacement discharge electrodes with solid shrouds in a variety of materials and configurations
- Patented ESP-3 collecting plates for long life, durability and bow resistance; later adapted to other ESP designs
- Replacement plate support bolts to stop in-leakage

### Joy Western ESPs

B&W offers a wide range of upgrades and replacement parts for all Joy Western ESPs. Upgrades include:

- Collecting plates and discharge electrodes
- Stabilized discharge electrode frames to stop wire oscillation problems
- Top hat seals to stop in-leakage at support points and reduce the quantity of purge air required
- Weight upgrades and improved anti-sway bars that eliminate destabilization
- Plate straightening devices for M-Channel and RUCC plates resulting in increased electrical clearance and improved performance

## ESP Rebuilds

B&W provides innovative ESP rebuild solutions around the world. Backed by years of experience, we develop a customized rebuild plan using information gathered by analyzing and assessing ESP operation and physical equipment, and comparing it to production requirements and emissions reduction goals. Rebuilds can include replacement of mechanical components (collecting surfaces and rapping systems) and/or electrical components and controls, all backed by a dedicated support team of engineers and technicians.

ESP rebuilds are recommended when faced with the following conditions:

- Process or fuel changes
- Excessive collecting plate or discharge electrode deterioration
- Damage due to fire or explosion
- Inadequate collection efficiency
- Excessive maintenance costs
- New regulatory requirements



# Services



B&W provides a wide range of engineered ESP systems and services designed to reduce operating and maintenance costs, improve reliability and safety, and enhance overall performance and efficiency, regardless of original manufacturer.



## ESP Optimization Services, Rebuilds and Upgrades

### ■ Service Capabilities

- Inspections
- Mechanical and electrical troubleshooting
- Supervision of plant personnel during repairs
- Operation and maintenance training
- Performance optimization
- Diagnostics (on-site and remote)
- O&M training

### ■ Upgrade Capabilities

- Automatic voltage controls
- 3-phase low ripple power supplies
- Collecting electrode systems
- Discharge electrode systems
- Rappers and rapper control systems
- Purge air systems
- Gas flow distribution
- Internally rapped ESPs
- ESP rebuilds
- OEM upgrades
- ESP to fabric filter conversions







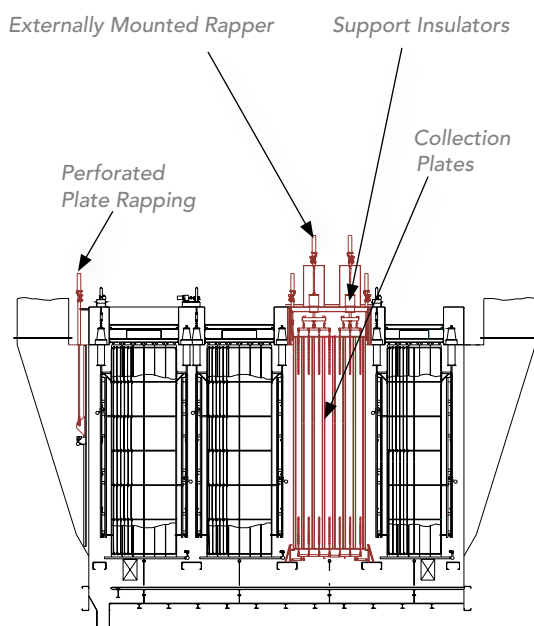
## Upgrades for top-rapped ESPs

To improve ESP performance and availability, B&W can rebuild weighted-wire or rigid frame-type ESPs with a more reliable rigid discharge electrode (RDE). Our quality RDEs are custom manufactured, with options for pin spacing, pin configuration and materials. We consider your process and transformer/rectifier (T/R) ratings, and can provide discharge electrodes of varying configurations to maximize power input in each ESP field. B&W RDE advantages include:

- Low corona onset voltage for better dust particle charging
- Robust RDEs, eliminating broken wires that ground out a field or multiple fields
- No weights to fall into hoppers and damage conveyors
- No need to stock replacement wires or weights
- More easily cleaned than wires, enhancing performance
- One RDE replaces two wires and weights
- Sparking has little damaging effect on RDEs
- Customized RDE pin configuration to give the best performance in each field

## Plate height extension and rapper re-sectionalization

Plate height extensions yield more collecting surface area without increasing the footprint of the ESP. These wall extension frames are built on the ground with large beams pre-fabricated in the shop to minimize field labor and outage time. Re-sectionalizing the rappers can reduce re-entrainment of dust and reduce the rapping intensity necessary to keep the plates clean.



Areas in red illustrate typical upgrade components in our tumbling hammer conversion.

## Adding or modifying electrical sectionalization

B&W can rebuild an ESP to add electrical frames, or add or rearrange existing T/R sets to increase the number of fields in the direction of gas flow. Adding electrical sections improves collection efficiency and provides more operating reliability.

## Upgrades for tumbling hammer ESPs

Our top-rapping conversion provides benefits that improve ESP performance, reliability and collection efficiency—all within the same footprint. Top-rapped ESP conversions include:

- Increased collecting area
- Central support insulators
- Externally mounted rappers
- New collecting plates and rigid discharge electrodes
- Accessible penthouse

# Upgrades & Services

## Real-time remote diagnostics

B&W's trained technicians can provide real-time observation and diagnosis of ESP operations.

Service is available 24/7 to analyze data from SQ-300®i or WinDAC® systems, PRC-100® rapper controllers, CPM® series emissions monitors, and non-B&W voltage controls—allowing instantaneous evaluation of ESP operation. Remote diagnostics can also evaluate other critical parameters, including damper positioning, temperatures, carbon monoxide levels, fan currents, boiler or kiln loads, or virtually any digital or analog input.



## Inspections

B&W offers world-class inspections to ensure that the entire ESP system functions as efficiently as possible. Expert field service engineers and technicians, utilizing experience with nearly every type of ESP in the world, assist in developing a comprehensive approach to maximize performance.

While we customize each inspection to your specific needs, a typical mechanical ESP inspection examines such system components as casing, roof and structural members, T/R sets, bus ducts, insulators, ventilation systems, rapping systems, gas distribution devices, collecting plates, discharge electrodes, weights and frames, and hoppers.



## Maintenance

We offer a full range of maintenance services including labor and resource planning, repairs, upgrades, replacement parts and installation services. Individual maintenance programs can be tailored to your specific needs. When used as a preventative measure, a well-planned maintenance program can help to avoid costly repairs and reduce downtime. Our technicians will work with you to prioritize both short- and long-term maintenance requirements.

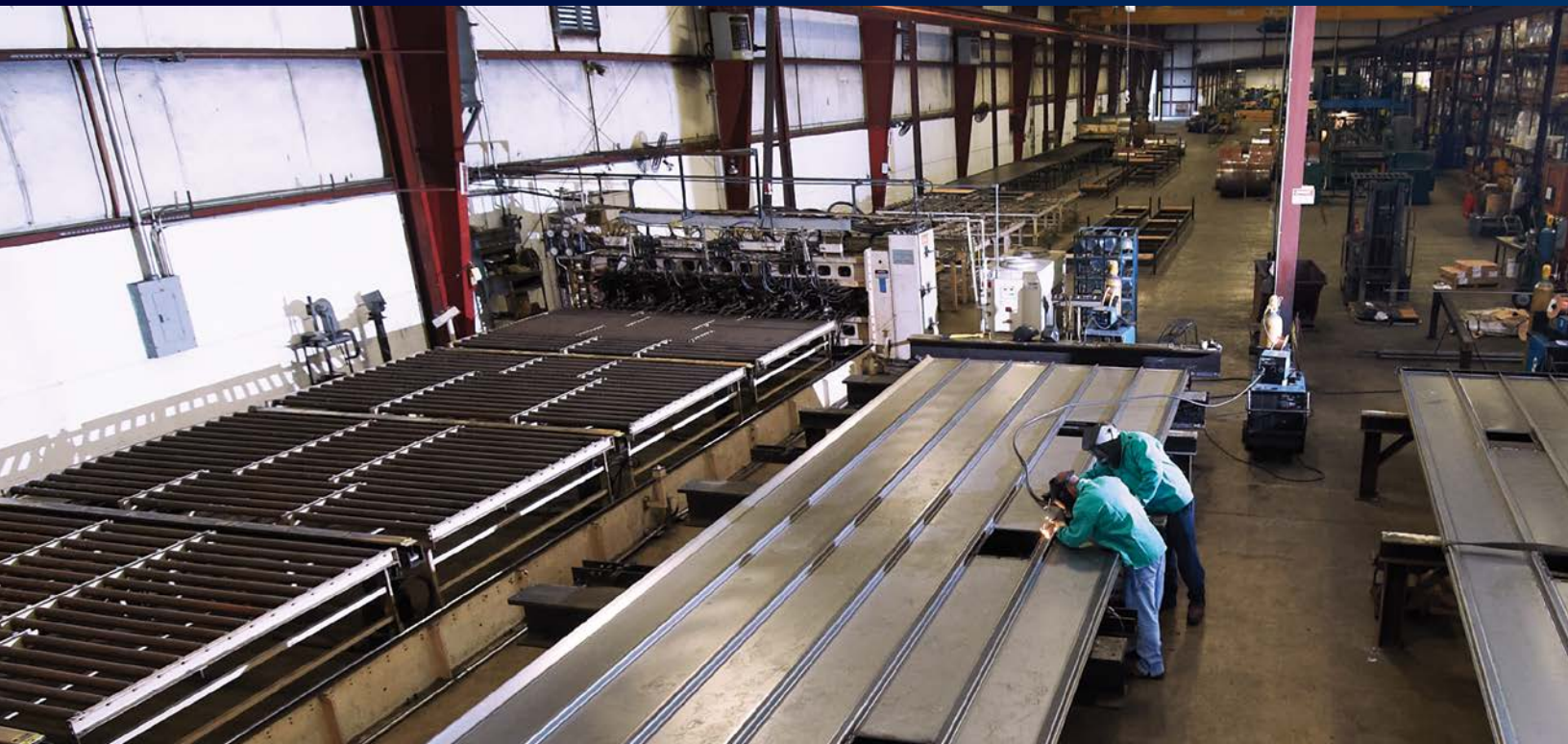
## Operation and maintenance training seminars

B&W understands the importance of proper operation and maintenance. We conduct seminars designed to help you solve equipment problems effectively, improve operational efficiency, and reduce costly downtime. Proper operation of air emissions control equipment can directly impact your bottom line. These sessions focus on comprehensive training and understanding of air emissions control devices and new technologies.





# Mechanical Components



## Collecting Plates

B&W's proprietary and OEM direct replacement collecting plates are manufactured in our Folkston, Georgia, USA, facility. Because we control the design, procurement and manufacturing processes, we are better able to meet your quality and project schedule requirements. Each collecting surface undergoes stringent inspections, including flatness, camber, twist and parallelism of the mounting brackets.

Whether you have an emergency need for replacement collector plates or a well-planned rebuild, you can count on us to have the manufacturing flexibility to meet your needs. We offer:

- New and replacement plates, regardless of equipment manufacturer
- Durable materials
- Patented design features
- Versatile designs
- In-house engineering and manufacturing

## ESP-1 collecting plates

B&W's ESP-1 plate provides superior design versatility through its variable stiffener positions for maximum electrical clearances between the discharge electrodes and stiffeners. ESP-1 plate features include:

- Versatile design (variable stiffener positions)
- 18 or 16 gauge (1.2 or 1.5 mm) carbon or stainless steel, or other specialty metals
- Lengths up to 42 ft (12.8 m)
- New and retrofit applications

## ESP-3 collecting plates

B&W's ESP-3 plate is designed for unmatched collecting performance, durability and resistance to bowing, even under extreme conditions. The ESP-3 plate can easily be retrofit into most ESPs, unlike single plate designs, which require re-engineering to fit other OEM designs. ESP-3 plate features include:

- Unmatched performance and resistance to bowing
- Patented closed-section design for improved strength and durability





- 18 or 16 gauge (1.2 or 1.5 mm) carbon or stainless steel
- Lengths up to 48 ft (14.63 m)
- New and retrofit applications

## Discharge electrodes

B&W is a leading designer and manufacturer of discharge electrodes. We also stock electrodes in various materials, sizes and shapes to match your existing equipment. Because you depend on optimal ESP performance, our team can provide discharge electrodes in quick turnaround times.

## RDE-1 rigid discharge electrodes

B&W's RDE-1 rigid discharge electrodes are a reliable alternative to weighted-wire discharge electrodes. Owners and operators benefit from increased ESP reliability and extended plant runs.

RDE-1 electrodes are standard for most new ESP installations and are available as upgrades to existing equipment.

Our RDE-1 electrodes are designed for optimal performance. Features include:

- A wide variety of emitter pin spacings and configurations
- Longer life when compared with weighted wire or frame-mounted wire electrode types
- Superior corona generation over a wider area, when compared with roll-formed discharge electrodes
- Durable and reliable materials of construction, including seamless tubing, drawn arc stud welding, and stainless steel or zinc plated pins
- Simplified cleaning and maintenance





## Weighted-wire discharge electrodes

When properly designed, manufactured and installed, weighted-wire discharge electrodes can provide years of reliable, cost-effective service. Through our manufacturing capabilities and knowledge of ESPs, we can review your specifications and operating parameters to supply the correct wire style, material, shroud design and weight for your application. Our wire electrode shrouds are manufactured to prevent mechanical abrasion and spit arcing. We also perform destructive and nondestructive testing of samples from each order to verify compliance with our quality standards.

## Discharge electrode wires

B&W offers a wide variety of discharge electrode wires to meet your specifications. Technical representatives can assist you with selecting a customized wire for your system.

## Rapper components and parts

B&W can provide replacement rapper components and parts regardless of OEM, with a large assortment of steel replacement shafts, couplings, fittings, receiver shoes, ceramic and fiberglass insulator shafts, roof penetrations, and seals. Our shafts feature tapered couplings produced to exacting standards with

engineered upgrades available which can increase rapping efficiency compared to original equipment.

The simple and rugged design of B&W's rappers and vibrators will effectively and reliably keep your ESP clean for improved performance.

### EGR-1 rapper

Our EGR-1 rapper is a simple, rugged and reliable design that has been used worldwide for decades. The copper coil inside the upper cover creates an electromagnetic field which lifts the steel plunger to a selected height. When the coil is de-energized, gravity returns the plunger to its starting position striking the rapper shaft to dislodge dust deposits. Impact is variable to match your cleaning needs. The key features and benefits of this rapper are:

- Removable top cap enables quick and easy coil replacement
- Epoxy encapsulated coil is resistant to dust and water
- Plungers are available in 8 or 20 lb (3.6 or 9.1 kg) weights for greater flexibility in intensity
- Typical plunger is 20 lb (9.07 kg) for both collecting and high voltage discharge electrodes
- Coils are available in 120 or 240 VDC
- Machined mounting flanges ease leveling
- Individually replaceable





# Mechanical Components

## IMPAK® shaft mounted rapper

B&W's IMPAK® rapper is a reliable replacement for worn or weak shaft mounted rappers. Designed to fit your existing shaft adapter, the IMPAK rapper provides more cleaning power than any similar rapper. The 18 lb (8.2 kg) plunger is spring-assisted for greater impact force, with the capability to strike four times per second. The coil is immersed in a plasticizing compound that bonds it to the tubular housing and protects it from water, grit and dirt. The spring is constructed of vanadium alloy, a material known to withstand millions of cycles. The IMPAK rapper fits a variety of custom mounting bases to match most ESP rapper shafts.

## Pneumatic rapper/vibrator

Our economical and dependable pneumatic rapper effectively removes stubborn deposits, and is even suitable for pulp and paper recovery boiler and copper smelting applications. Our pneumatic rapper design has been shown to consume 20 to 25% less compressed air, while operating at 20 to 25% higher frequencies compared to other designs. It delivers efficient cleaning and reduces operating expenses at an affordable price. Key features include:

- Air-cushioned piston for reduced stress to head plate of rapper
- Intensity control from direct correlation between air pressure and output
- Polymer coating on piston for lifetime lubrication (or noncoated for use with Air Line oilers)
- Tapered to fit standard 3 degree, 30 ft (9.1 m) designed shafts



## Tumbling hammer replacement boot seals

B&W's boot seals are designed to fit all major ESP brands. Leaking, cracked or damaged boot seals can lead to water and air in-leakage around rapper shafts. This can result in corrosion damage of the shafts, binding due to scale and particulate buildup, and leakage into the treatment zone of the ESP. We offer a full line of boot seals in a variety of compounds for different temperature ranges and applications.





## OEM direct replacement plates

B&W is the manufacturer of products formerly offered by Joy Western Precipitation, an exclusive North American licensee of the Rothemühle ESP designs, and the provider of ESP products and services formerly offered by BHA Group, Inc. and GE Energy. Through our extensive ESP expertise, we can supply direct replacements for many other OEM collecting plate designs.

## Purge air systems

A properly designed purge air system supplies clean, heated air to the insulators at a temperature above the acid dew point, and provides constant flow through the insulator under all operating conditions. B&W can analyze your existing system, including key components such as filter, blower, heater, feedback instrumentation and controls. We can provide performance improvements recommendations or engineer a replacement system

## Insulators

Insulators are used to physically support and electrically isolate the high voltage system from the grounded sections of the ESP. The excellent strength and thermal resistivity of materials used to manufacture

B&W insulators make them highly dependable. Our insulators are strength and dielectrically tested to levels far exceeding typical operating conditions. All types meet or exceed original design specifications. Insulators are critical to the performance of your ESP. Because normal insulator lead times can be 6 months or more, we maintain a working inventory to reduce long lead times and, in most cases, ship from stock.

## Access doors

Quality access doors provide a tight seal to impede corrosion. B&W's standard carbon steel access doors withstand harsh environments and hard wear, providing many years of leak-free service. In addition to carbon steel, we provide doors in composite/stainless steel and stainless steel (which have proven effective at resisting corrosion). Regardless of the original supplier of your ESP, we can supply a door that will stop damaging air in-leakage.





# Mechanical Components

## Door seals, gasketing materials

Over time, door seals can shift, deform, become brittle or fail to seal after doors begin to warp with temperature changes. B&W stocks a variety of quality door seals to meet the specific needs of most applications. Typically, a door seal is packaged in 100 ft (30.5 m) coils. For corners and splicing, an additional 10% of door seal is used. High and low temperature caulking materials are also available.



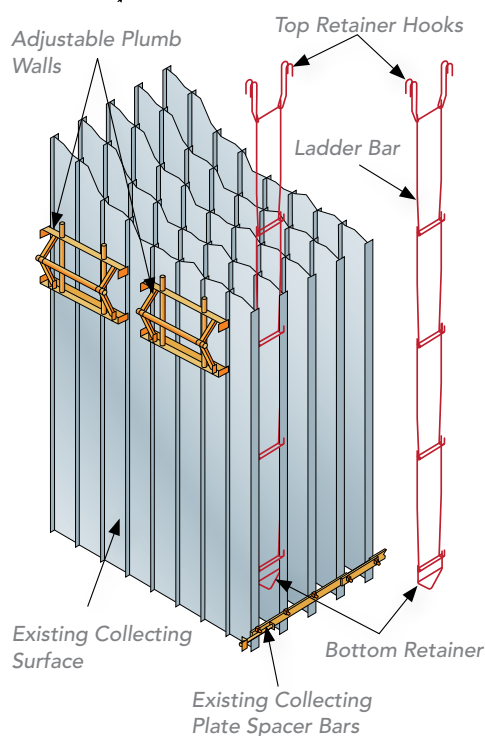
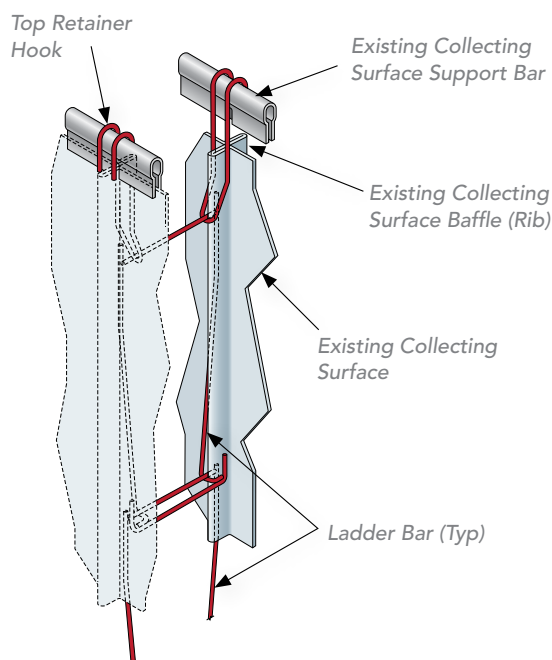
## Straightening systems

To restore ESP performance, ladder bars can be installed in the gas pass between the stiffeners of bowed collector plates. B&W offers customized ladder bars to fit most major ESP designs. Even severely bowed collector plates can be restored using our patented ladder bar system. Customized options are available to straighten a wide range of collector plates.

Ladder bars install quickly and easily to create a permanent repair that not only removes bowing, but prevents it from occurring. Hooks at the top of the ladder bar assembly hold it in position, with no welding, bolting or riveting required. ESP performance can be restored during a short outage at a fraction of the cost of plate replacement.

The ladder bar system is complemented by other products that improve the effectiveness of the straighteners. Beta bars are adjustable jacks used between the first collector plates and the wall to provide a stable foundation for the ladder bar system. Side spacers

are used at the leading and trailing edges of the plate field to hold the correct spacing, while custom-sized link bars provide isolation of the collector plate bundles for uncompromised rapping. Adjustment anchors are used to give precision alignment of the collector plates. The complete system assures the best alignment and highest power levels.





## Power supply options

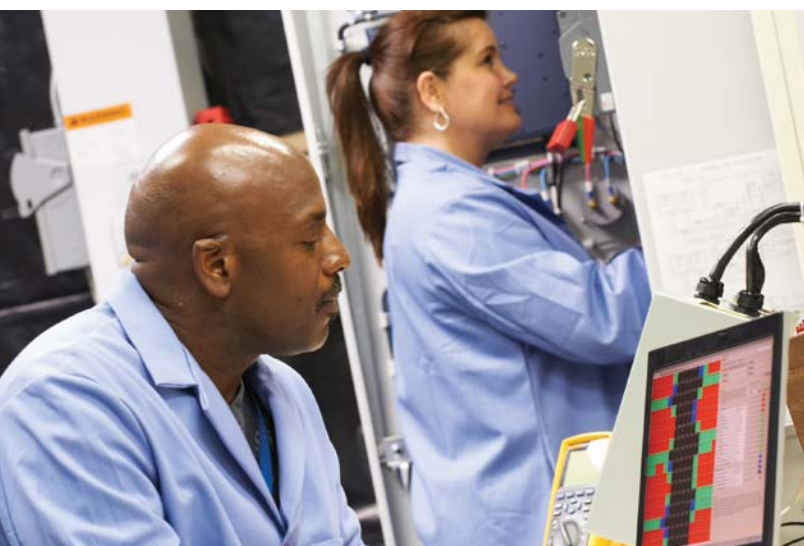
B&W provides a range of technologies to improve ESP migration velocity to increase collection efficiency. These devices operate by reducing the amount of DC ripple that is applied to the ESP field. Decreasing the amount of DC ripple allows power to be elevated to near peak secondary voltages levels. This causes corona power to increase, thereby increasing migration velocity resulting in improved collection efficiency. Options include:

- Conventional single-phase transformer/rectifier (T/R) set (50/60 Hz)
- Conventional single-phase T/R with variable inductance–current limiting reactor (VI–CLR)
- Conventional single-phase T/R with JuiceCan® precipitator power maximizer
- Three-phase T/R (50/60 Hz)
- SQ-300i Hybrid automatic voltage control (for single- or 3-phase)

## Performance enhancement hardware

### JuiceCan® precipitator power optimizer

This proven technology can significantly boost power delivered to the ESP. It is a capacitive device that smooths the output waveform from a conventional T/R set resulting in an increase in migration velocity, thereby lowering emissions. The compact, easy-to-install unit greatly enhances collection efficiency. Multiple units can be placed in parallel to increase this effect.





# Electrical Components



## Voltage Dividers

Voltage dividers can be used to evaluate and troubleshoot ESP performance. Designed to maximize the functionality of existing voltage controls, they allow generation of V-I curves, operation of undervoltage alarms, or accurately evaluate ESP performance.

## Variable inductance-current limiting reactor (VI-CLR)

This patented technology increases conduction time when the power supply in a field is operating below the rated limits of the T/R set. Its enhanced conduction boosts average current, average voltage and corona power. B&W's VI-CLR helps achieve improved collection efficiency through reduced wave distortion, producing higher average power levels and increased migration velocity of dust toward the collecting plates.



# Controls and Software

Supporting your existing or new plant operating systems, B&W provides flexible integration and control with our ESP electronics and software technologies. With more than 16,000 controls installed in 52 countries in over 400 plants, our ESP solutions can achieve enhanced performance.

For hardware products communicating serially, B&W offers several core software applications for monitoring and control. We also offer several programs that integrate our software with existing plant control systems (such as a PI system, DCS or OPC).

## Controls and related components

### SQ-300®i Hybrid automatic voltage control

Serving as an integral component of the ESP control system, the SQ-300i Hybrid automatic voltage control (AVC) simultaneously controls the ESP, analyzes alarms, and interfaces with computer-based data acquisition software to optimize ESP performance and collection efficiency. The SQ-300i Hybrid AVC is the newest redesign of our original SQ-300 model and includes added features such as improved speed and process capability, automated spark rate control, flexible connectivity, smaller footprint, and an optional color touch screen user interface. The most significant improvement, however, is its groundbreaking ability to

control a single- or 3-phase T/R set, making it an ideal choice for both simple upgrades and larger rebuilds.

### AVC design with 3-phase T/R set control

The SQ-300i Hybrid 3-Phase AVC has the ability to control power to a 3-phase T/R set so that your equipment is operating to its maximum potential. Because it operates on three phases of incoming power, silicon-controlled rectifier firing occurs at more frequent intervals, maintaining a higher percentage of maximum current and voltage than a single-phase control module.

With its speed and high efficiency process capability, the SQ-300i Hybrid 3-phase controller is designed to work with all 3-phase T/R sets used in ESP applications, regardless of the rating or original equipment manufacturer.





## PRC-100 programmable rapper control and software

The new PRC-100 programmable rapper controller and supervisory software provide a full-featured control system for optimized ESP rapper operation. The PRC-100 controller can control any type of high current rapper and vibrator, detect and control fault conditions, and control low current solenoid outputs for pneumatic vibrators, acoustic horns, and tumbling hammers. A basic configuration consists of a controller module and one or more power distribution modules.

B&W now offers two Microsoft® Windows®-based software options for the PRC-100 (WinRAP® for controls communicating serially, and Precipitator Manager™ software for controls communicating via Ethernet). With either software package, you can profile, monitor and adjust rappers and design, test, modify and implement a rapper control strategy tailored to your site needs. The Precipitator Manager software is designed specifically for high-speed networks and allows improved integration of the PRC-100 and other components.

### PRC-100 controller module

The controller module works with the supervisory software to produce the firing pulses that are sent to the EGR rapper or vibrator and to monitor the voltage and current sent to the rappers. This firing pulse can be AC, DC, pulsating DC, or polarity reversing DC.

The controller module digitizes the input voltage, input current, output voltage and output current during each firing pulse. The average input current per half cycle is used to determine rapper health and to provide open and short detection.

## Programmable logic controllers and logic based control cabinets

Through B&W's cabinet shop, we can engineer and manufacture customized programmable logic control (PLC) systems and cabinets for your ESP or fabric filter. Controls can be designed to function for both current and planned capacities and PLC-based systems are capable of remote diagnostics for technical support assistance. We can also arrange for third-party regulatory testing as needed to meet CE, UL, MET, and cMET requirements.



### Purge air heater controls

The primary function of the purge air heater control is to help maintain required outlet air temperatures in systems using purge air. By maintaining a specified temperature, the control helps to sustain ESP collection efficiency and inhibit cracked insulators that sometimes result from cold air leaks. Although the basic design of the purge air heater control is standard, each system may incorporate different sized blower motors and heaters, a different type of PLC, and custom settings.

## Ring heater controls

A temperature controller is used to manage the ring heaters in the insulator compartments. The heaters turn on and off based on a temperature set point and the measured temperature in the coldest compartment. The number and type of heaters vary with each system.

## Sonic horn timers

Sonic horn timer system designs vary widely. A simple system may be configured to fire one set of sonic horns at regular intervals without a user interface (because the PLC is controlled by the plant DCS system). A more involved system may regulate several groups of horns, and allow manual horn firing and horn bypassing. A complex system may be designed to operate the horns based on the conditions in the compartment, such as differential pressure, and have an intricate cleaning cycle.

## Precipitator Manager™ software

The Precipitator Manager™ software is B&W's latest and most comprehensive software solution for your ESP. Designed for the security and speed of your Ethernet-connected devices, Precipitator Manager combines the power of multiple programs into one. The software consists of a base module and multiple optional modules, all designed specifically to work within the same framework. You decide which modules are required so that you can

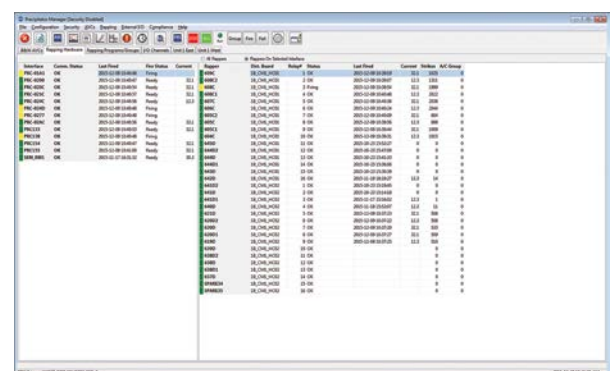
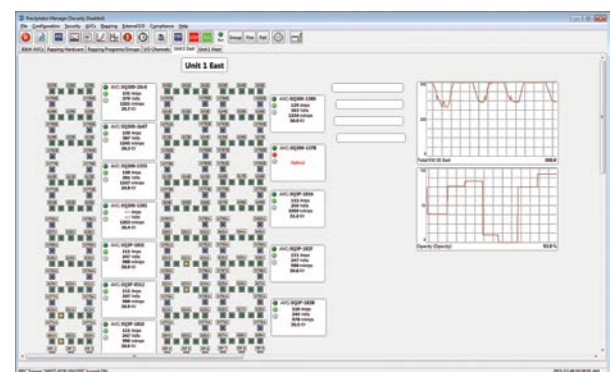
monitor and control your AVCs, rappers, analog and digital I/O, and more, all from a single, convenient interface.

The Precipitator Manager software's base module supports all of the optional modules and performs all of the fundamental software tasks including communications, data collection and backup, security and graphic display configuration. The base module also includes an external I/O manager for built-in OPC client/server functionality.

Optional modules currently include:

- WinDAC® Module (manages SQ-300i and other AVCs)
- WinRAP® Module (for configuring rapper hardware and rapper programs)
- ICP Server Module (to obtain data from B&W hardware I/O)
- Modbus Server Module (to obtain data from external Modbus/TCP device)
- Remote Rapping Module (to provide basic rapping functions via a remote interface)
- Compliance Monitor Module (to monitor status and opacity data)

Additional modules are currently being developed to provide more specialized features and automation.





# Controls and Software

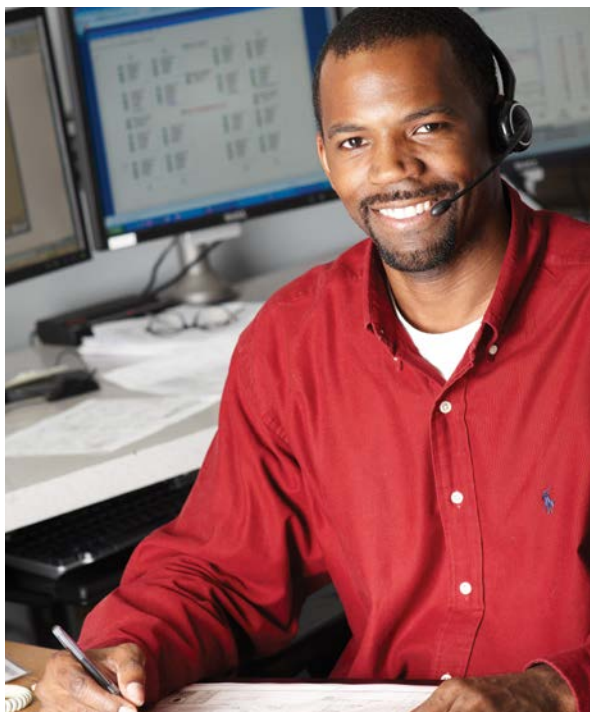


## Continuous particulate monitoring (CPM) systems

Unlike traditional particulate detection methods that simply measure light intensity, B&W's CPM® systems take the guesswork out of particulate monitoring by measuring light modulation, a technique that virtually eliminates false or non-detection of dust and inaccurate particle levels. Our CPM systems bring a real-time approach to emissions monitoring, alerting users as problems occur.

### CPM purge blower

This optional low pressure, high volume blower helps ensure maximum performance. This package provides for clean, heated air to prevent dust and condensation from accumulating on the lens, allowing for a greater interval between preventative maintenance periods.





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