Your Plant Can Thrive with Babcock & Wilcox

Boiler Performance Enhancements  |  Upgrade/Rebuild Projects
Replacement Parts    |   Construction Services

B&W

ENERGY | ENVIRONMENTAL
Your plant can thrive
with B&W parts, upgrades, controls and services for components and equipment.

Controls and Diagnostic Systems
- Advanced performance technologies
- Sootblowing controls and intelligent software
- Precipitator controls and software
- Boiler monitoring systems

Boiler
- Pressure parts
- Non-pressure parts
- Diamond Power® cleaning systems
- Air heaters
- Fans

Post-Combustion NOx Control
- Selective catalytic reduction
- Selective non-catalytic reduction

Combustion Systems
- Pulverizers
- Low NOx burners
- Igniters and scanners
- Overfire air systems
- Cyclone furnaces

Cooling Systems
- Air-cooled condensers
- Air-finned coolers
- Wet cooling towers
- Hybrid cooling towers

Ash Handling
- Allen-Sherman-Hoff® bottom ash systems
- Allen-Sherman-Hoff® fly ash systems

Illustrations shown in this brochure are representative product offerings and do not depict all products or designs that are available.
In addition to B&W equipment we provide parts, systems and services for all major OEM suppliers, including:

- GE/Alstom/Combustion Engineering
- Babcock Power/Riley
- (Amec) Foster Wheeler
- Doosan
- Mitsubishi Hitachi Power Systems

**Aftermarket Lifecycle Support Products and Services**

How do you maintain your competitive edge in today’s market? Are you operating at peak efficiency and maximizing the returns on your assets? Are you partnering with a proven service provider you can rely on to provide ongoing maintenance support, quality replacement parts and new technologies when needed to meet the latest environmental regulations? These are some of the reasons to choose Babcock & Wilcox (B&W) as your one-stop aftermarket supplier for your entire plant.

**Mercury, Acid Gas and HAP Control**

- Wet scrubbers
- Dry scrubbers
- Dry sorbent injection
- Activated carbon injection

**Particulate Control**

- Electrostatic precipitators (ESP)
- Fabric filter baghouses
- Dust collectors

**Emissions Monitoring**

- Continuous emissions monitoring systems (CEMS)
- Data acquisition and handling systems (DAHS)
Combustion Systems

B&W Roll Wheel™ and E/EL Pulverizers

Capabilities/Competencies

- Modifications and improvements
  - High wear-resistant, severe duty castings
  - Rotating throat
  - DS\(^v\)S\(^\text{®}\) rotating classifier
  - Wide profile roll wheels
  - Erosion-resistant ceramic components

Replacement parts

- Roll wheel rebuilds and exchanges
- Gear box rebuilds and exchanges
- Inventory management programs
- Technical support – inspections, testing, tuning, training

Potential Benefits

- Reduced operating and maintenance costs
- Capacity maintained throughout wear cycle
- Lower pressure drop
- Flexible load-following capability
- Excellent turndown
- Improved component wear life with high wear castings and ceramic protection
- Improved combustion efficiency (reduced unburned carbon) when used with a DS\(^v\)S\(^\text{®}\) classifier
- Ability to achieve optimum fineness when grinding a wide range of coals via online adjustment of roll wheel pressure and classifier speed
CE-Type Pulverizers

Capabilities/Competencies

- Replacement parts for Combustion Engineering (CE) shallow bowl pulverizers and mill size 633 deep bowl pulverizers
- No fee inventory management programs
- Journal rebuilds for all pulverizer sizes
- Extended life journal assemblies
- Xwin® high wear materials technology
- Grinding zone and millside area upgrades
- Technical support – inspections, testing, tuning, training
- New product development

Potential Benefits

- Enhanced performance and reliability
- Increased mill operating cycles
- Improved availability
- Reduced on-site inventory
- Industry leading technical support

Magotteaux Strategic Alliance

A strategic supplier relationship combines the benefits of Magotteaux’s metallurgical expertise and experience in high wear, abrasion-resistant material with B&W’s expertise in pulverizer and boiler design, operation and optimization.
Combustion System Firing Equipment

Capabilities/Competencies

Low NOx, coal, oil, natural gas, and industrial process gas firing equipment

Complete overfire air systems specifically designed for your operating conditions, fuels and furnace envelope

Integrated combustion systems design approach
- Fuel delivery and preparation system
- Flame safety and burner management system
- Combustion controls
- Evaluation of downstream impact to boiler cleaning equipment, ash handling systems and emissions control equipment

Overfire Air Port

AireJet™ Low NOx Coal Burner
Potential Benefits

Multiple burner equipment options customized to fit your needs

- Unstaged low NO_x burner systems to minimize furnace corrosion potential firing high sulfur fuels (DRB-4Z burner)
- Minimize SCR reagent costs
- Maximize unit turndown
- Minimize unburned combustibles in fly ash to improve boiler efficiency and support sale/beneficial use

Consistent emissions performance with set-and-forget burner adjustments

Burner equipment specifically designed for minimal maintenance costs

- Simple fuel element geometry to minimize flow disturbances including integral erosion protection
- Burner designs do not rely on flame holder devices prone to overheating and coking to maintain flame stability and achieve emissions performance

DRB-4Z Dual Fuel Burner

Pioneers in Low NO_x Combustion Systems

Our low NO_x combustion technologies have been successfully applied to a broad range of B&W and non-B&W boilers with varying fuel characteristics and boiler arrangements.
**Combustion Systems**

**Igniters and Scanners**

### Capabilities/Competencies

- Fossil Power Systems (FPS®) oil and gas igniters
- Flexible application of PLC logic to meet burner management system requirements
- Comprehensive analysis for customized control to meet individual design and operational requirements
- Elimination of moving parts allowing a near maintenance-free igniter
- Integral flame rod detector which senses only the igniter in any burner/boiler configuration
- Horn igniters for corner-fired applications
- Complete line of scanners for all fuels in utility and industrial applications

### Potential Benefits

- Proven performance
- Lower opacity
- Reliable ignition
- Superior flame stability
- Integral flame detection
- Fixed position; no moving parts
- Low cost plug-in designs
- Lower maintenance
- Proven mechanical reliability and operation
- Reliable flame recognition

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**Gas Igniter**

**Gas Horn Igniter**

**Scanners**

- FO2 Angled Fiber Optic Scanner Head
- Direct Sighted Scanner Head
Controls and Diagnostic Systems

Capabilities/Competencies

Advanced Performance Technologies
- Flame Doctor® combustion diagnostic system
- FocalPoint™ process optimization system

Sootblowing Controls and Intelligent Software
- Intelligent sootblowing systems
- Advanced sootblower controls
- DCS and PLC systems
- Advanced control systems for boiler cleaning and ash handling

Precipitator Controls and Software
- Precipitator Manager™ software
- SQ-300® Hybrid automatic voltage control
- PRC-100® programmable rapper control
- Remote diagnostics

Boiler Monitoring Systems (Diamond® Electronics)
- GasTemp® optical pyrometer for gas temperature measurement
- Drum level gauges for low and high pressure boilers
- Utilicam® AT and Wall-Eye® camera systems
- Heat flux sensors

Potential Benefits
- MATS compliance solution options
- Lower emissions
- Improved unit heat rate and system performance
- Higher boiler efficiency
- Reduced fouling and slagging caused by poor combustion
- Reduced auxiliary power consumption
- Seamless integration of automated processes
- Overall system optimization

Critical System Performance
Integrated control systems for optimized plant equipment and system performance.
Upgrades and Replacement Components

Capabilities/Competencies

- Modifications, improvements and in-kind replacements
  - Pressure parts
  - Non-pressure parts
- Boiler capacity increases
- Conversions from base load to cycling operation
- Circulation improvements
- Fuel conversions and repowering
- Air heaters and fans, replacement in-kind or upgrades
- Corrosion and erosion protection
- Emissions reductions

Potential Benefits

- Improve ramp-up and turn-down capabilities for rapid grid response
- Solve existing maintenance or operational issues
- Design for fuel flexibility and cost savings
- Optimize plant efficiencies
- Lower maintenance costs
Diamond Power® Boiler and Air Heater Cleaning

Capabilities/Competencies
- Designed for low maintenance, reliability, versatility and maximum cleaning performance
- Industry’s largest installed base, providing proven performance
- Available in steam/air, high pressure water, and dual-media air heater cleaning configurations
- Custom designs for each unique online cleaning requirements
- Extended duty upgrades available including PowerTrain® carriages, Diamonized® feed tubes, live-load gland (LLG) and EAPC™ poppet valves
- Complete array of replacement parts, including poppet valves, high performance nozzles, carriage assemblies and drives, and lance tubes

Potential Benefits
- Optimized boiler cleaning systems — a key ingredient in improving boiler heat rate
- Superior cleaning effectiveness
- Optimized boiler cleaning systems
- Improved system performance, generating greater return on assets
- Aids in reduction of boiler tube fouling/slagging
- Regional service centers provide ongoing support and quick turnaround times on carriage and poppet valve upgrades, rebuilds and repairs

B&W provides the complete line of Diamond Power® integrated boiler cleaning solutions, controls and diagnostics.
Allen-Sherman-Hoff® Bottom Ash Systems

Capabilities/Competencies

- Custom designed bottom ash systems
- Submerged chain conveyor for under-the-boiler ash removal from water-impounded hopper
- Remote dewatering systems for bottom ash dewatering and water recycling
- Hydrobin® dewatering systems
- Dry bottom ash conveyor system
- Wet to dry conversions
- Control systems
- Clinker grinders, hopper gates, hydro-ejectors, erosion-resistant piping, valves, and other system components
- Outage and rebuild kits
- Repair center rebuilds
- Inventory management programs

Potential Benefits

- Eliminate ash storage ponds
- Designed for ease of maintenance and system reliability
- Low operating costs
- Coal combustion residual (CCR) and Effluent Limitation Guidelines (ELG) solutions
- Rebuild kits and stocking program reduce downtime and inventory requirements

Allen-Sherman-Hoff® Ash Handling

B&W provides the complete line of Allen-Sherman-Hoff® ash and material handling systems, upgrades and replacement parts, field service and outage planning support, and replacement for competitors’ equipment.

RSC™ Remote Submerged Chain Conveyor

Boiler Bottom Ash Hoppers

Bottom Ash Slurry Transport Pipe

Dewatered Ash Pile

Parts and upgrades

- Gates
- Gaskets
- Bottom cone sections
- Floating and stationary decanters
- Permissive controls
- Hydraulic packages
Allen-Sherman-Hoff® Fly Ash Systems

**Capabilities/Competencies**

- Conventional fly ash and scrubber byproduct material handling systems for recirculation, beneficial use or disposal
- Fly ash conveying systems — vacuum, pressure and combination systems
- DenseASH™ dense phase pressure system
- Wet to dry fly ash system conversions
- Control systems
- Valves and other system components
- Silo storage and unloading expertise
- Optimized ash conditioning for transport and disposal
- Outage and rebuild kits
- Inventory management programs

**Potential Benefits**

- Proven designs for reliable operation
- Low maintenance and increased wear life
- Low lifecycle cost
- Minimizes use of plant process water
- Provides an economical way to utilize FGD wastewater as an ELG solution
- Fugitive emissions compliance solutions
- Rebuild kits and stocking program reduce downtime and inventory requirements

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**Vacuum Pressure Fly Ash Transport System**

![Vacuum Pressure Fly Ash Transport System Diagram]

- Fly Ash Storage Silo with Conditioning Equipment
- Pressure Transport Line to Storage Silo
- Vacuum Fly Ash Transport Lines from Hopper Discharge
- Vacuum/Pressure Transfer Station
Post-Combustion NO$_x$ Control

Capabilities/Competencies

Selective catalytic reduction (SCR) and non-catalytic reduction (SNCR) technologies
New installations
Engineered upgrades and rebuilds
V-Temp™ economizer system, an innovative and cost-effective method of controlling SCR flue gas inlet temperatures
CFD modeling for ammonia injection and mixing design
Combustion additive for enhanced catalyst performance
New or retrofit applications

Potential Benefits

Proven NO$_x$ reduction technologies
Vast experience — SCRs installed on more than 32,000 MW of generating capacity
Extensive PRB coal experience
Modularized construction limits impact on plant operations and reduces construction costs

SCR Experience

B&W SCR systems are installed on more than 32,000 MW of generating capacity.
Continuous Emissions Monitoring and Data Acquisition Handling Systems

Capabilities/Competencies

- Complete emissions monitoring systems, including hardware and shelters
- CEMS management, operations support, and replacement parts
- Analyzers for a wide range of gases
- Real-time web-based acquisition and reporting software
- Data controller for calibrating, buffering data, and alarming
- Expertise with U.S. air regulations

Potential Benefits

- Cost-effective and reliable equipment and technologies
- Customized solutions based on your monitoring and data reporting requirements
- More than 25 years of experience
- Technology leaders with the largest worldwide installed base

NetDAHS Edge™ Software

Provides secure, immediate access to emissions data any time, from anywhere, all in one tool.
Particulate Control

Electrostatic Precipitators

Capabilities/Competencies

New installations
Engineered upgrades and rebuilds
Mechanical and electrical components
Controls and software
Replacement parts
Wet and dry technologies

Potential Benefits

Decreased emissions
Reduced operating and maintenance costs
Improved reliability and safety
Enhanced performance and efficiency
Parts availability for quick turnaround and reduced downtime

Dry Electrostatic Precipitator

Fabric Filters

Capabilities/Competencies

New installations
Engineered upgrades and rebuilds
Variety of configurations to accommodate site-specific requirements
Integrated solutions with FGD and sorbent injection provides additional criteria and/or hazardous air pollutant (HAP) removal
Flexible control systems to optimize operating modes and cleaning logic
Upgrades and modifications
ESP conversions to fabric filter technology
Replacement filter bags

Potential Benefits

Low emissions over a wide range of operating conditions
Reduced maintenance and operating costs
Pulse jet technology provides owners with flexible operation and control

Pulse Jet Fabric Filter – Roof Hatch Design
Mercury Control

Capabilities/Competencies

- Powdered activated carbon injection systems
- Calcium chloride fuel injection systems
- Absorption Plus (Hg)® injection of inorganic sulfide to increase mercury removal in a wet scrubber
- An integrated approach for particulate, mercury and acid gas removal

Potential Benefits

- Reduced mercury emissions
- Low overall lifecycle cost
- Optimizes PAC consumption

Absorption Plus (Hg)® Mercury Control

Activated Carbon Injection

- Bin Vent Filter
- Storage Silo
- Air Fluidization
- Weigh Hopper
- Screw Feeder
- Vent Hopper
- Eductor
- To Flue

Mercury Removed from Flue Gas

Sufficient Up-front Gas-phase Mercury Oxidation of Inlet Flue Gas

Inorganic Sulfide Addition

Mercury Purged in Solid or Liquid Streams
Mercury, Acid Gas and HAP Control

Dry Scrubbers — Spray Dryer Absorbers

Capabilities/Competencies

- New installations
- Engineered upgrades and rebuilds
- Control logic and instrumentation upgrades
- Tuning, inspections, training and operation optimization
- Atomizer and atomizer motor servicing
- Atomizer component upgrades
- Replacement GEA Niro atomizer parts
- Gas disperser component updates and replacement
- Back-up atomization systems
- Spray chamber reinforcement, rebuild and replacement
- Gas flow distribution optimization

Potential Benefits

- Reduced lime consumption
- Easily integrated with an existing fabric filter (pulse jet or reverse air)
- Increased acid gas (SO₂, SO₃, HCl, HF) removal efficiencies
- Increased reliability and performance of existing systems
- Elimination of wastewater streams
- More precise process control for varying unit load and reduced low load operation
- Dedicated parts warehouse for fast delivery and reduced downtime

SDA Technology

Removal efficiencies as high as 98%
Dry Scrubbers — Circulating Dry Scrubbers

Capabilities/Competencies

New installations
Engineered upgrades and rebuilds
Controls system upgrades
Gas flow distribution optimization
Tuning, inspections, training and operation evaluation
Solutions for material handling issues

Potential Benefits

Simple process control and maintenance
Increased acid gas ($SO_2$, $SO_3$, HCl, HF) removal efficiencies
Increased reliability and performance of existing systems
Reduced lime consumption
Elimination of wastewater streams

Dry Sorbent Injection Systems

Capabilities/Competencies

Flexible designs to capture $SO_2$, $SO_3$ and HCl
Designed to utilize a variety of reagents (hydrated lime, sodium bicarbonate or trona)
CFD modeling to optimize sorbent-to-gas distribution with static mixer/lance design and configuration

Potential Benefits

Low cost multi-pollutant solution
Optimized reagent utilization
High reliability of storage, conveying and injection system
Improved performance of existing emissions control systems (SDA/PJFF or wet FGD)
Wet Scrubbers

Capabilities/Competencies

- New installations
- Engineered upgrades and rebuilds
- Lime, magnesium-lime, limestone or sodium chemistries
- Inhibited or forced oxidation systems
- Absorber tray retrofits
- Optimized absorber spray coverage (headers and nozzles)
- Control system upgrades
- Tuning, inspections, training and operation evaluation

Potential Benefits

- Increased $SO_2$ removal efficiency
- Increased reliability and performance of existing systems
- Eliminate or reduce flue gas bypass
- More precise process control for varying unit load and reduced low load operation
- Reduced limestone consumption
- Reduced off-spec gypsum
- Minimized or eliminated wastewater effluent stream

B&W wet FGD systems are installed on more than 45,000 MW of generating capacity.
Salt Dryer

Capabilities/Competencies

- Uses minimal boiler flue gas slipstream to evaporate wastewater
- Results in dry salt product ready for disposal
- Looks and operates like a spray dryer
- Simple, well-understood, equipment
- Minimal boiler efficiency loss
- Carbon steel chamber
- Process engineering and construction expertise

Potential Benefits

- Elimination of wet FGD wastewater discharge
- Allows more time for implementation per Effluent Limitation Guidelines (ELG)
- Uncomplicated process requires limited operator attention while maintaining high reliability
- Option for fabric filter to save fly ash for sale
- Designed for improved material handling

ELG Solution

Designed as an effective zero liquid discharge solution for wet FGD wastewater
Cooling Towers / Air-Cooled Condensers

Capabilities/Competencies

- Natural and mechanical draft wet cooling towers
- Air-cooled condensers and air-finned coolers
- Engineered upgrades and rebuilds
- Structural and thermal repair
- New or upgraded fans and tube bundles
- Preventive maintenance
- Inspection and testing
- Online monitoring
- Replacement or spare parts
- Commissioning

Potential Benefits

- Optimized performance
- Improved thermal efficiency
- Reduced power consumption
- Water savings
- Low noise applications
Construction

Capabilities/Competencies

- Focus on safety, integrity and ethical business practices
- New construction, plant modifications and retrofits, maintenance and repair
- Design for constructability and modularization
- Extensive experience with large, complex projects
- Flexible contracting methods
- On-time performance with smoother turnover to plant operations

Potential Benefits

- Safely executed projects
- Fully integrated material design and supply optimizes total project costs and schedule and minimizes risks

Engineering and Field Services

Support after the sale

- Capacity assessment, upgrade and uprate studies
- Circulation and cycling analyses
- Combustion computational flow modeling
- Commissioning and start-up services
- Condition assessment and unit performance studies
- Construction and project management
- Corrosion analysis
- Engineering studies
- Field engineering support
- Plant operation and maintenance
- Technical training

Our People Make the Difference

Rely on B&W's team of field and resident service engineers and service specialists – trusted advisors for your boiler, emissions control system and entire power plant.

Target Zero

Finish each and every day injury- and incident-free
Partnering with B&W for your projects means you’ll receive the added benefit of working with a supplier who has the breadth of technical expertise and proven capabilities to provide solutions for virtually all boiler designs, manufacturers, auxiliary and environmental systems at a power plant.

We also have the flexibility, responsiveness and agility to provide personalized service and attention to your specific application … before, during and long after the sale.