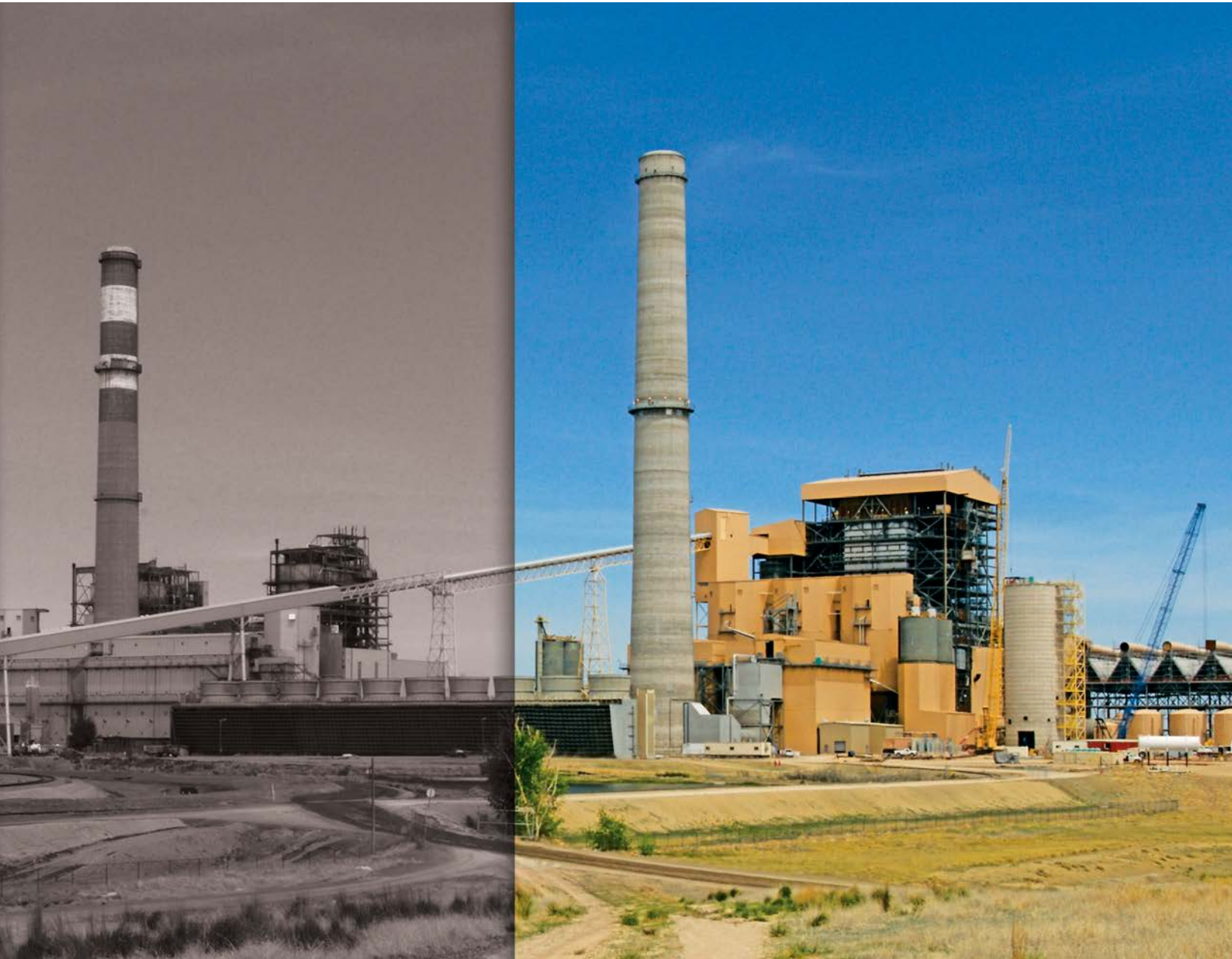


# Your Plant Can Thrive with Babcock & Wilcox Aftermarket Products and Services



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



BABCOCK  
& WILCOX

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 control and monitoring systems

pg. 9

## Boiler

- Pressure parts
- Non-pressure parts
- Diamond Power® sootblowers
  - Air heaters
  - Fans

pg. 10

## Post-Combustion NO<sub>x</sub> Control

- Selective catalytic reduction
- Selective non-catalytic reduction

pg. 20

## Combustion Systems

- Pulverizers
- Low NO<sub>x</sub> burners
- Igniters and scanners
- Overfire air systems
- Cyclone furnaces

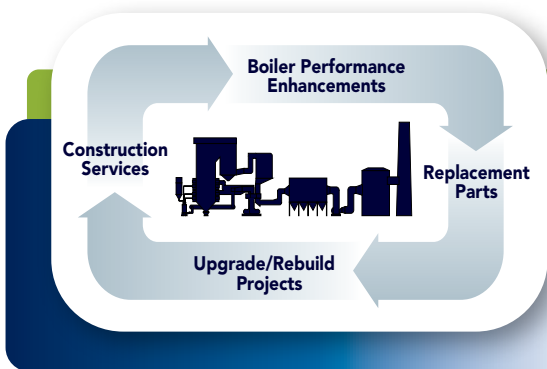
pg. 4

## Ash and Material Handling

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

pg. 12

throughout the entire power plant.



### 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 preferred one-stop aftermarket supplier for your entire plant.

### Mercury, Acid Gas and HAP Control

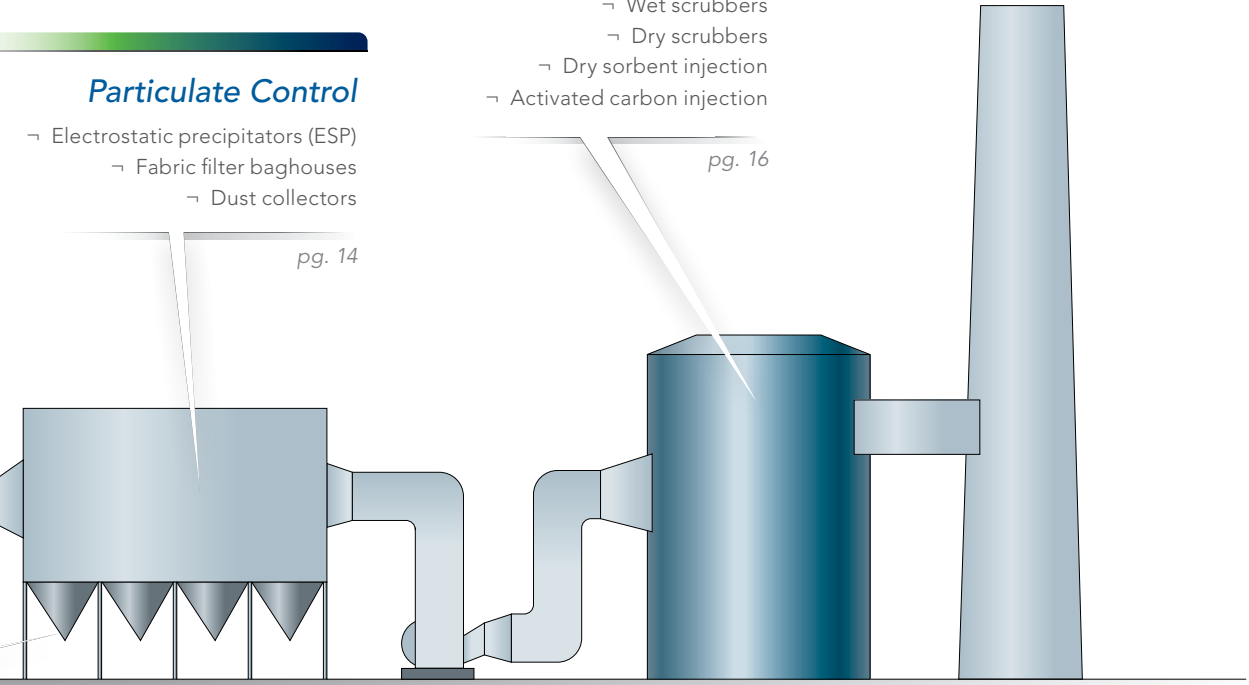
- Wet scrubbers
- Dry scrubbers
- Dry sorbent injection
- Activated carbon injection

pg. 16

### Particulate Control

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

pg. 14



In addition to B&W equipment we provide parts, systems and services for all major OEM suppliers, including:

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

# Combustion Systems — Pulverizers

## B&W Roll Wheel™ and E/EL Pulverizers

### Capabilities/Competencies

Modifications and improvements

- High wear-resistant, severe duty castings
- Rotating throat
- DSVS® 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

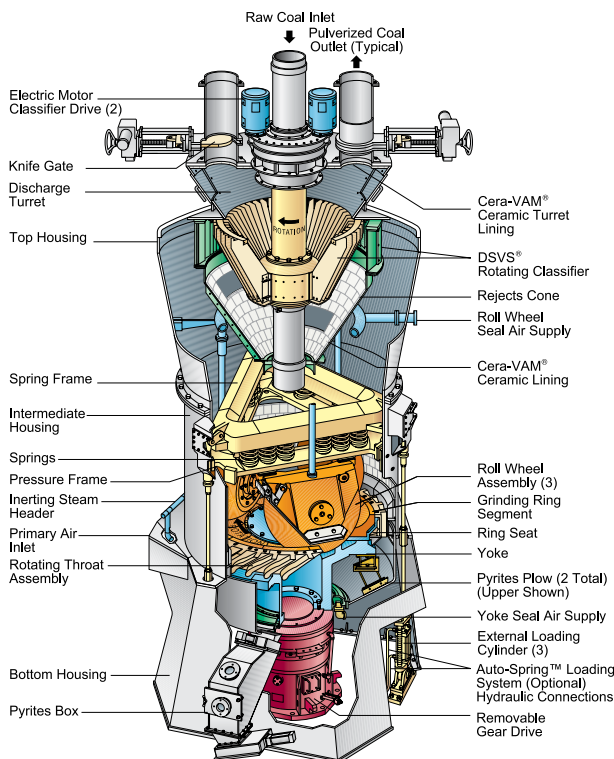
Excellent turndown

Improved component wear life with high wear castings and ceramic protection

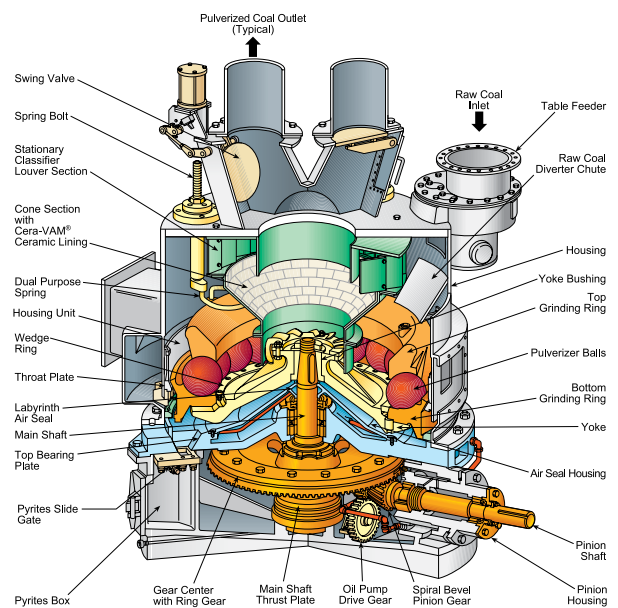
Improved combustion efficiency (reduced unburned carbon) when used with a DSVS classifier

Ability to achieve optimum fineness when grinding a wide range of coals via online adjustment of roll wheel pressure and classifier speed

### Roll Wheel™ Pulverizer



### E/EL Pulverizer



# CE-Type Pulverizers (GE/Combustion Engineering/Alstom)

## 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

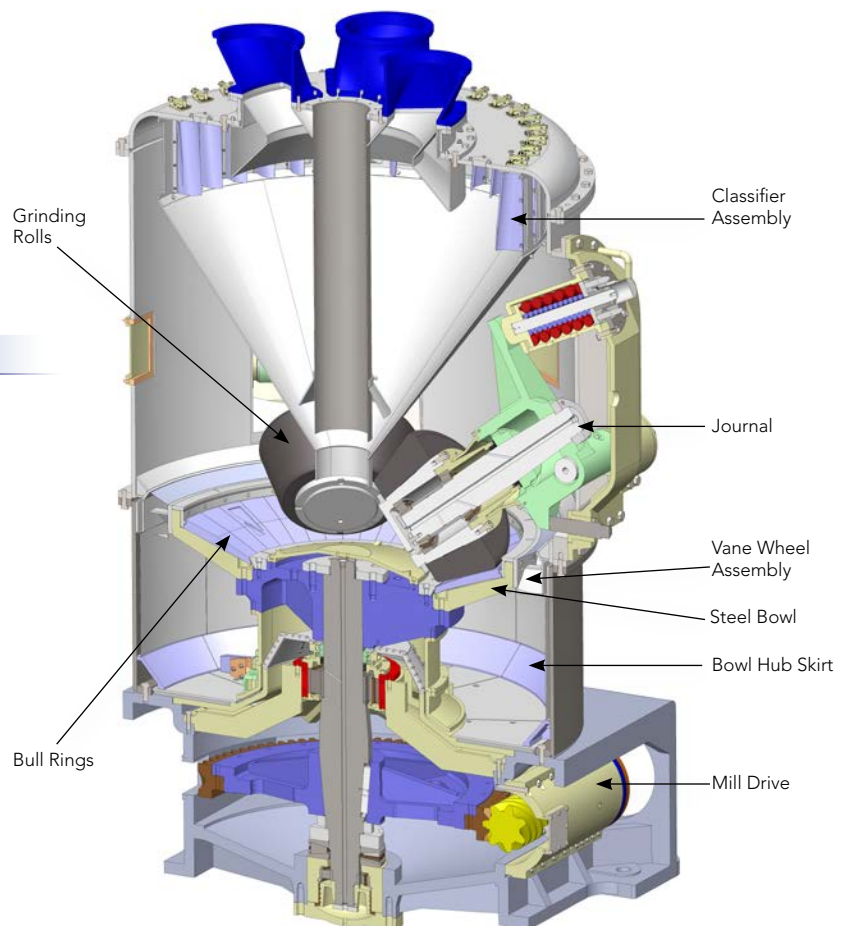
Improved availability

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 Systems — Burners

## Combustion System Firing Equipment

### Capabilities/Competencies

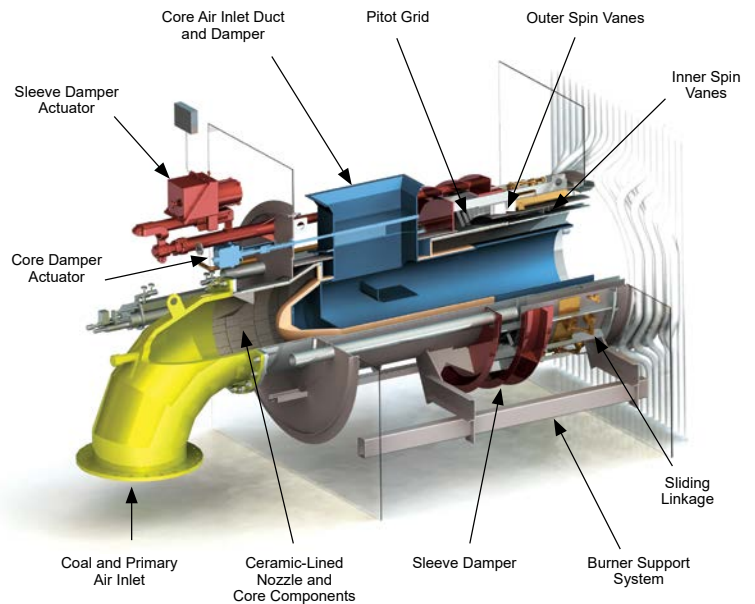
Low NO<sub>x</sub> coal, oil, natural gas, and industrial process gas firing equipment

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

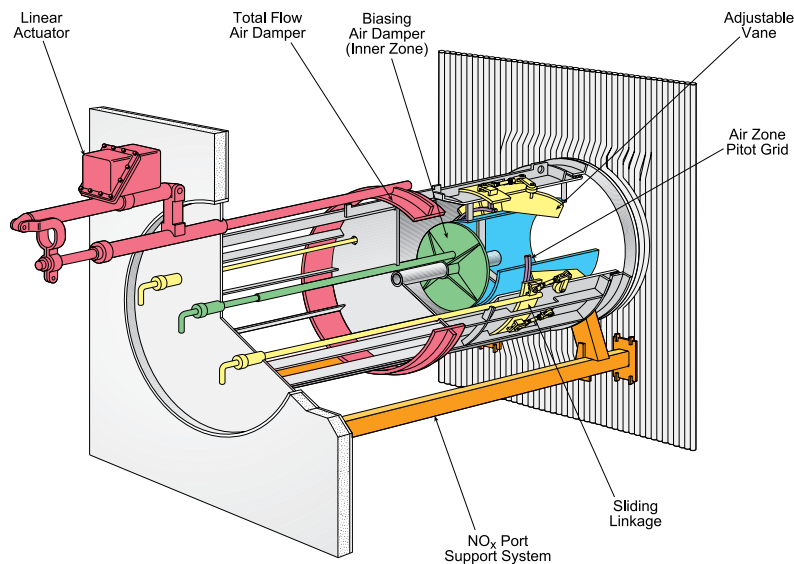
Integrated combustion systems design approach

- 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

### AireJet® Low NO<sub>x</sub> Coal Burner



### Overfire Air Port



## Potential Benefits

Multiple burner equipment options customized to fit your needs

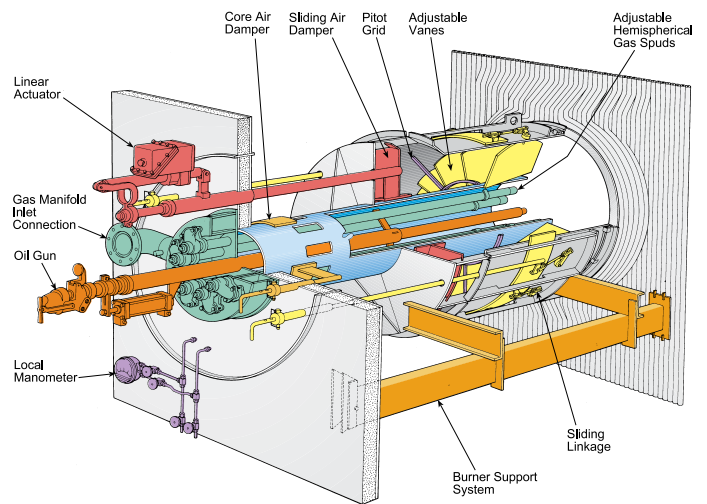
- Unstaged low NO<sub>x</sub> burner systems to minimize furnace corrosion potential firing high sulfur fuels (DRB-4Z burner)
- Minimize SCR reagent costs
- Maximize unit turndown
- Minimize unburned combustibles in fly ash to improve boiler efficiency and support sale/beneficial use

Consistent emissions performance with set-and-forget burner adjustments

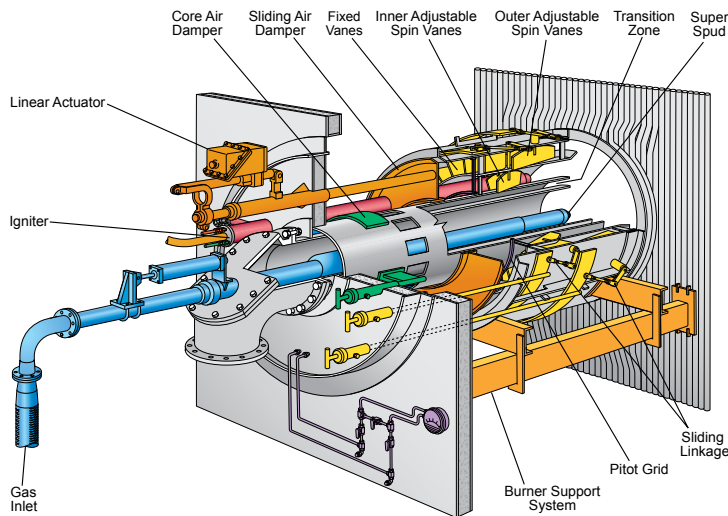
Burner equipment specifically designed for minimal maintenance costs

- 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

### XCL-S® Low NO<sub>x</sub> Oil and Gas Burner



### DRB-4Z® Dual Fuel Burner



### Pioneers in Low NO<sub>x</sub> Combustion Systems

Our low NO<sub>x</sub> 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

## Igniters — Wall-fired Boilers

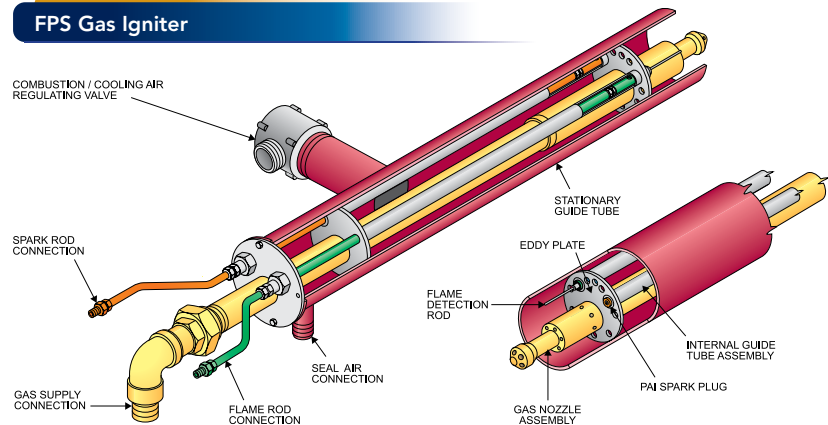
### Capabilities/Competencies

- 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

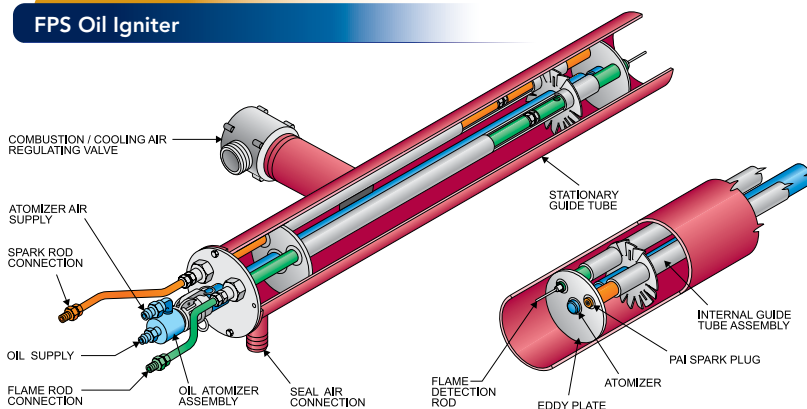
### Potential Benefits

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

### FPS Gas Igniter



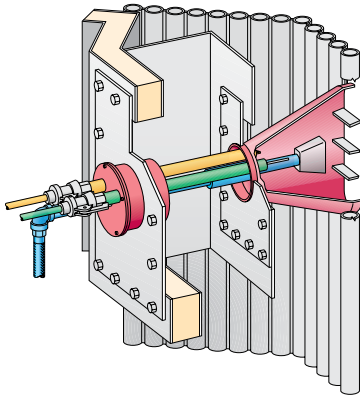
### FPS Oil Igniter



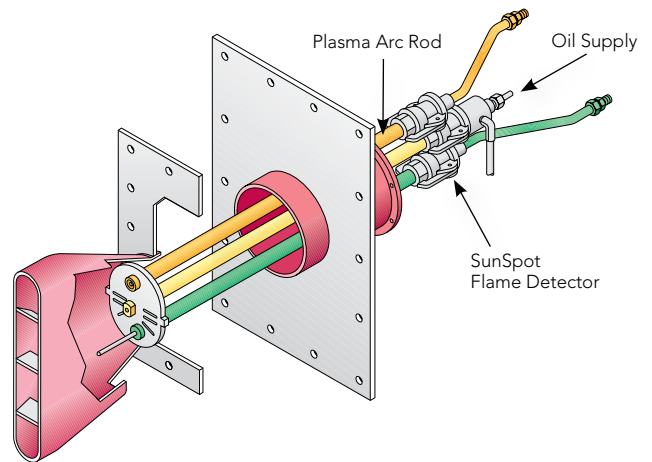
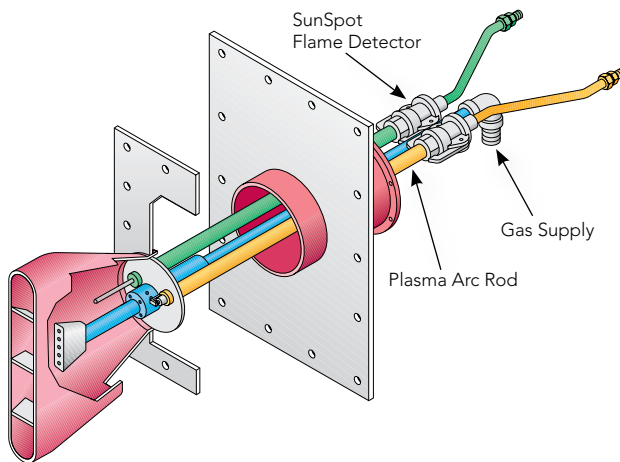
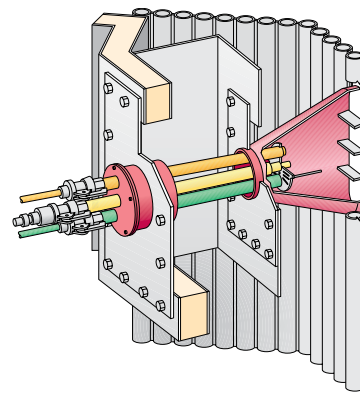


# Igniters — Corner-fired Boilers

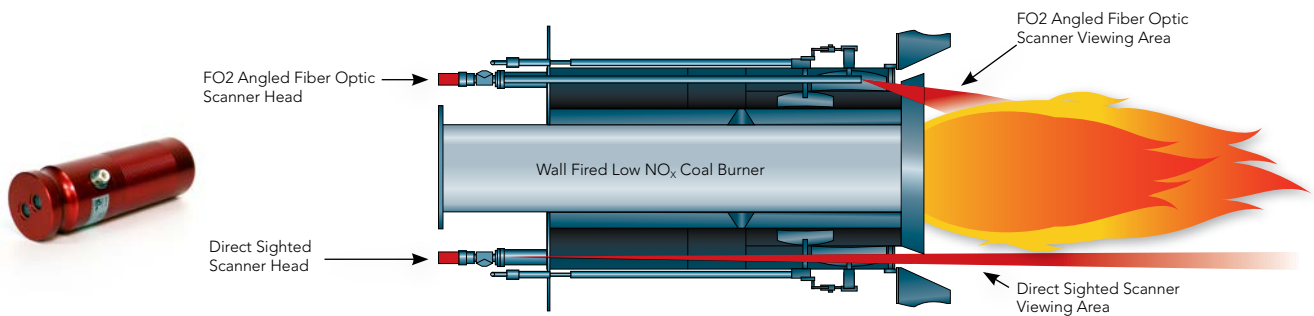
Gas Horn Igniter



Oil Horn Igniter



Scanners



## Boiler Upgrades and Replacement Components

### Capabilities/Competencies

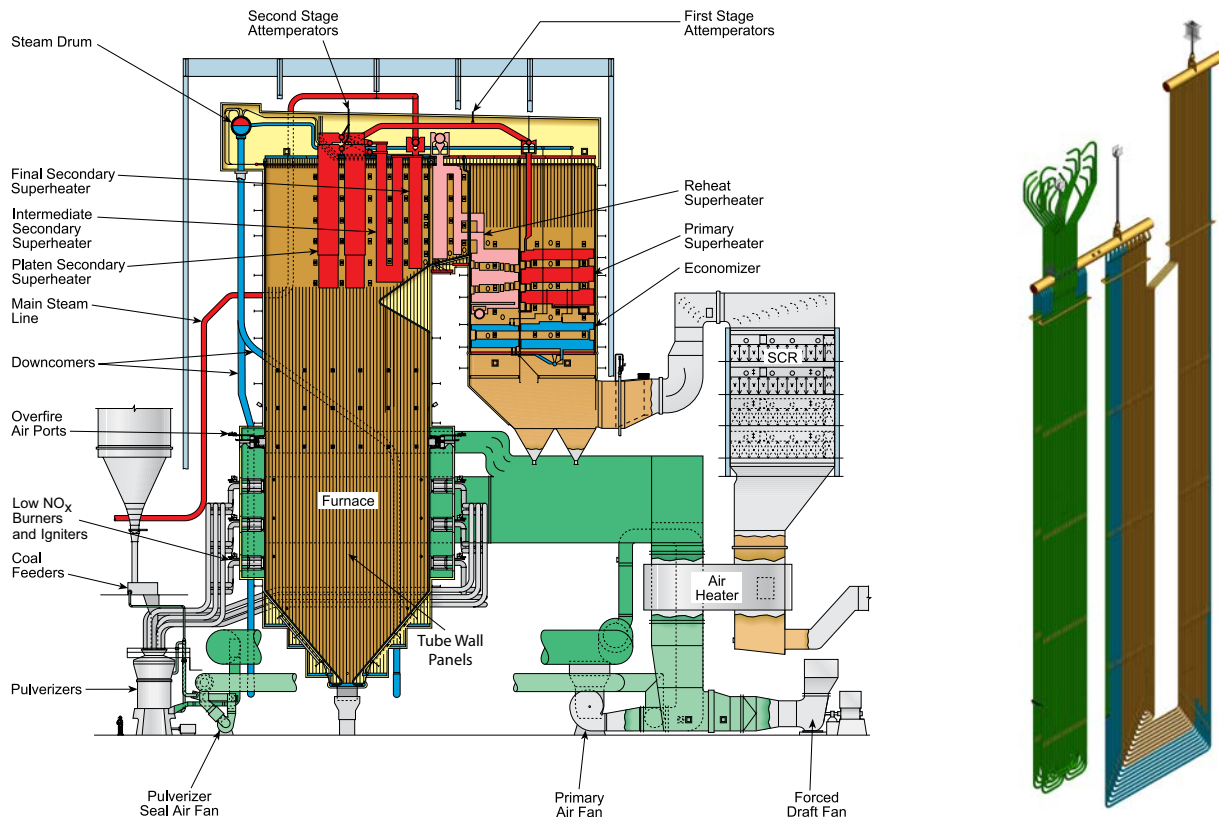
- Modifications, improvements and in-kind replacements
  - Pressure parts
  - Non-pressure parts
- Boiler capacity increases
- Conversions from base load to cycling operation
- Circulation improvements
- Fuel conversions and repowering
- Air heaters and fans, replacement in-kind or upgrades
- Corrosion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

### Engineered Upgrades for most OEMs

Our experience with non-B&W boilers includes Foster Wheeler, GE/Alstom/Combustion Engineering (CE), Babcock Power/Riley to name just a few



# 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

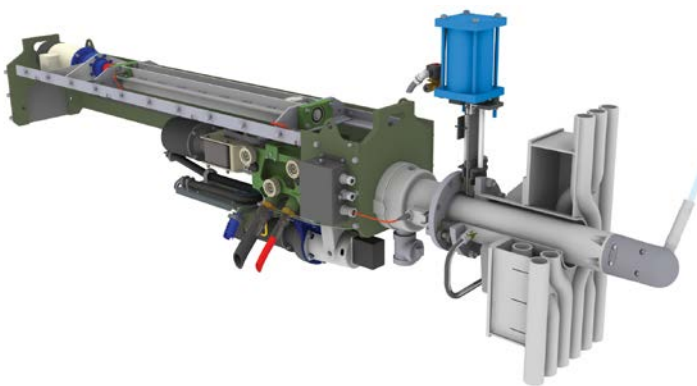
## Potential Benefits

- 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/slugging
- Regional service centers provide ongoing support and quick turnaround times on carriage and poppet valve upgrades, rebuilds and repairs

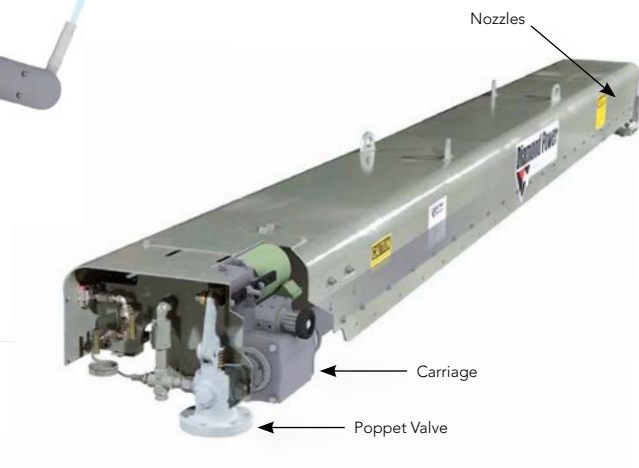
## Sootblower Parts and Upgrades

- PowerTrain® carriage
- Sootblower tubular products
- Diamonized feed tubes
- Heat transfer sensors
- Gemini nozzles
- EAPC externally adjusted poppet valves
- Progressive helix mechanism

HydroJet® Retractable Sootblower



IK-700® Retractable Sootblower



## 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
- Submerged grind conveyor
- 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.

### Bottom Ash Parts and Upgrades

- Gates
- Gaskets
- Bottom cone sections
- Floating and stationary decanters
- Permissive controls
- Hydraulic packages
- Clinker grinders
- Grinder rolls
- Valves

### Submerged Grind Conveyor



# 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

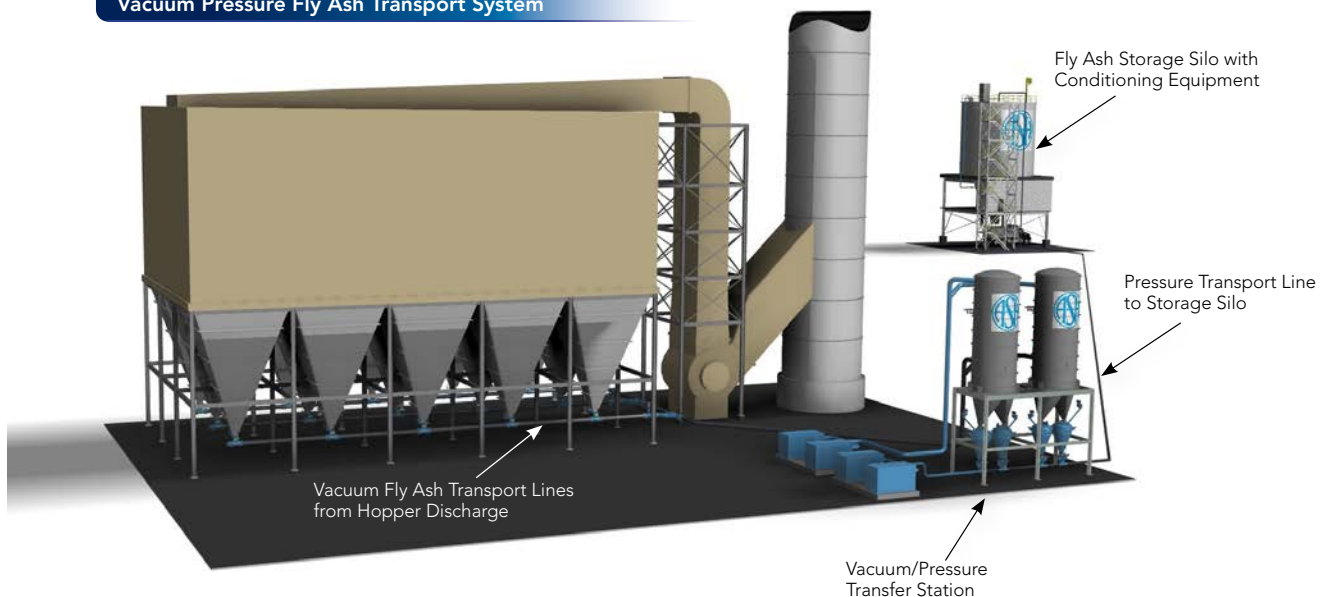
## Fly Ash Parts and Upgrades

- Pugmills
- Airlocks
- Material handling valves
- Airlock refurbishment and upgrade kits

## Piping and Fittings

- Ceramic-lined pipe and fittings
- Replaceable wear-back fittings
- Integral wear-back fittings

## Vacuum Pressure Fly Ash Transport System





## Electrostatic Precipitators

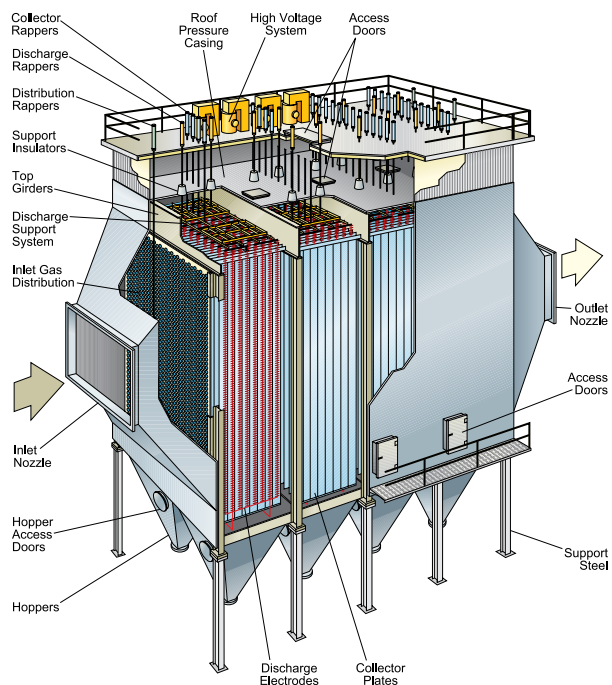
### Capabilities/Competencies

- New installations
- Engineered upgrades, rebuilds and conversions
- Wet and dry technologies
- 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
- 24/7 remote diagnostics

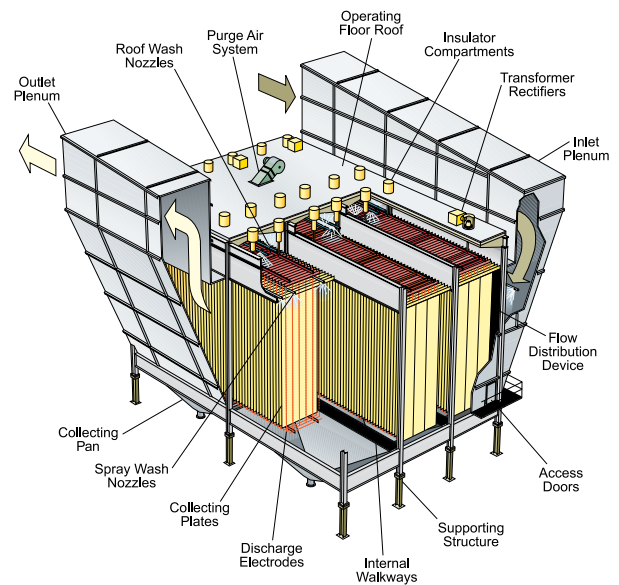
### Potential Benefits

- 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



### Wet Electrostatic Precipitator



### Engineered Upgrades

Designed to reduce operating and maintenance costs, improve reliability and safety, and enhance overall performance and efficiency, regardless of OEM. Our experience includes B&W Precipitech™, Joy Western, Buell, BHA and GE, to name just a few

# Fabric Filters

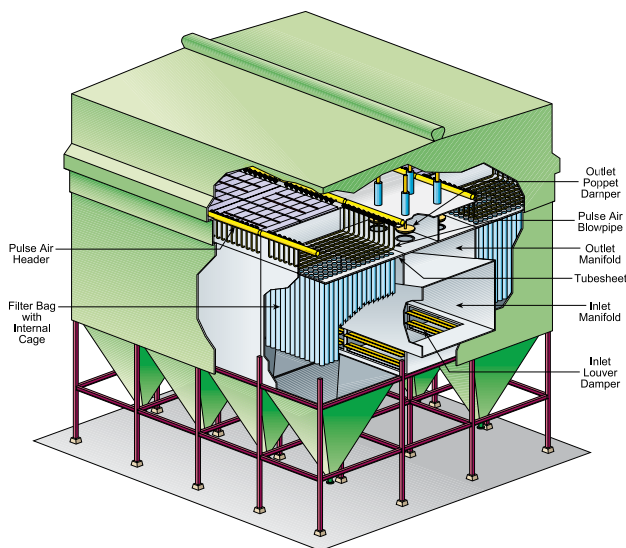
## Capabilities/Competencies

- 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

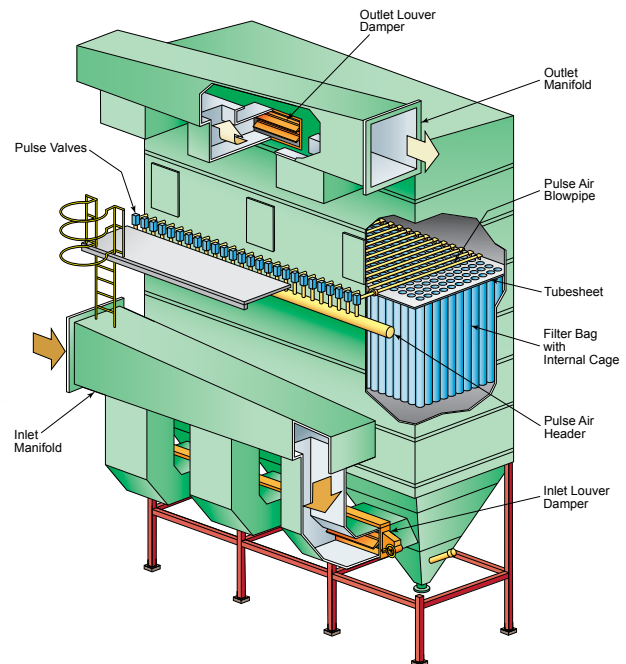
## Potential Benefits

- 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



### Pulse Jet Fabric Filter – Walk-in Plenum Design



### Pulse Jet Technology

Provides improved cleaning efficiency, reduced pressure loss, lower compressed air use and power consumption, and increased bag life.

# Mercury, Acid Gas and HAP Control

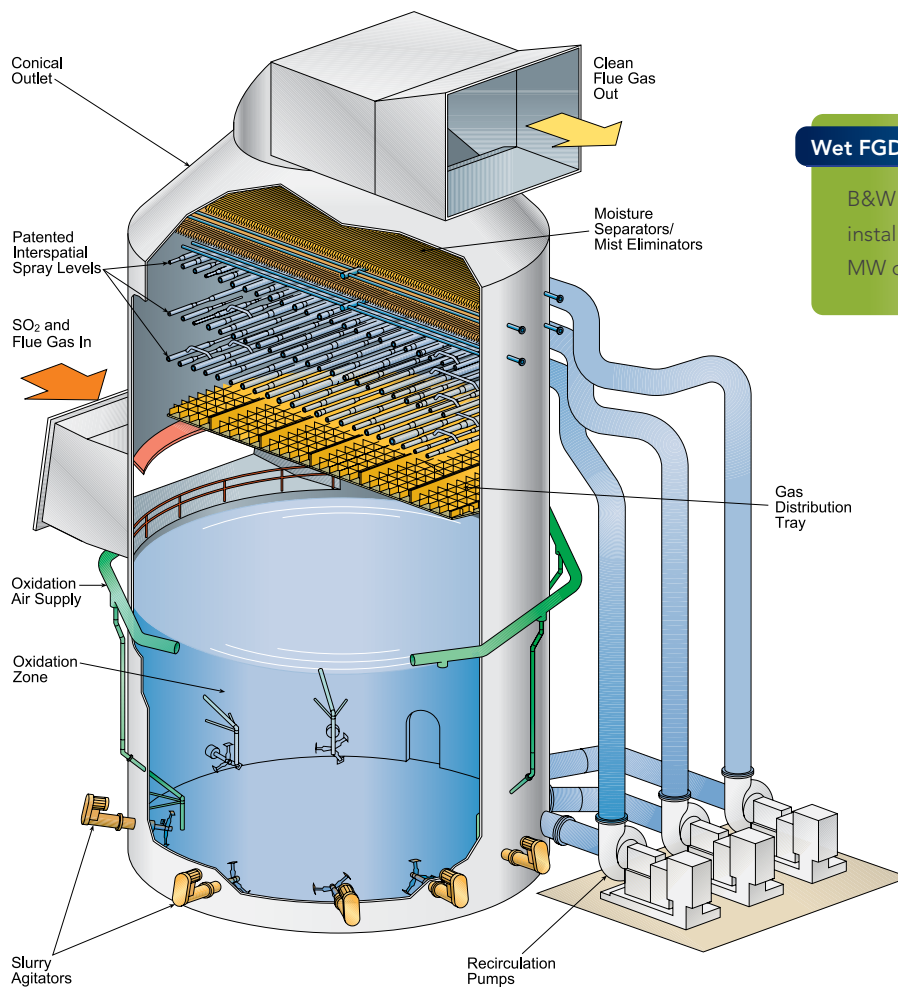
## Wet Scrubbers

### 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<sub>2</sub> 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



### Wet FGD Experience

B&W wet FGD technology is installed on more than 127,000 MW of generating capacity.

## Mercury Control

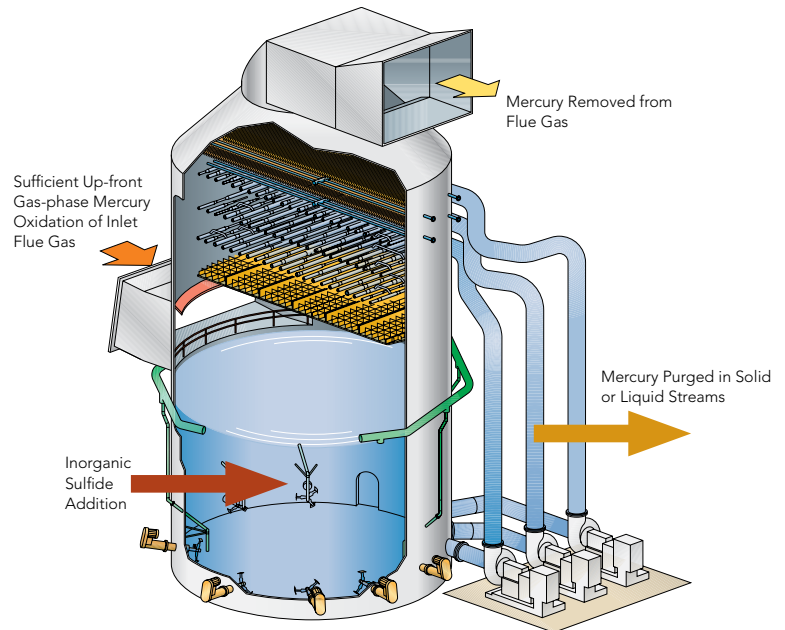
### Capabilities/Competencies

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

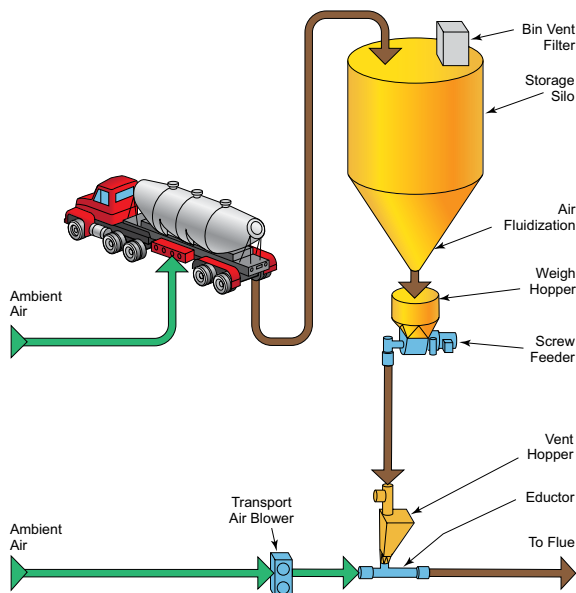
### Potential Benefits

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

### Absorption Plus (Hg)<sup>®</sup> Mercury Control



### Activated Carbon Injection



# Mercury, Acid Gas and HAP Control

## Dry Scrubbers — Spray Dryer Absorbers

### Capabilities/Competencies

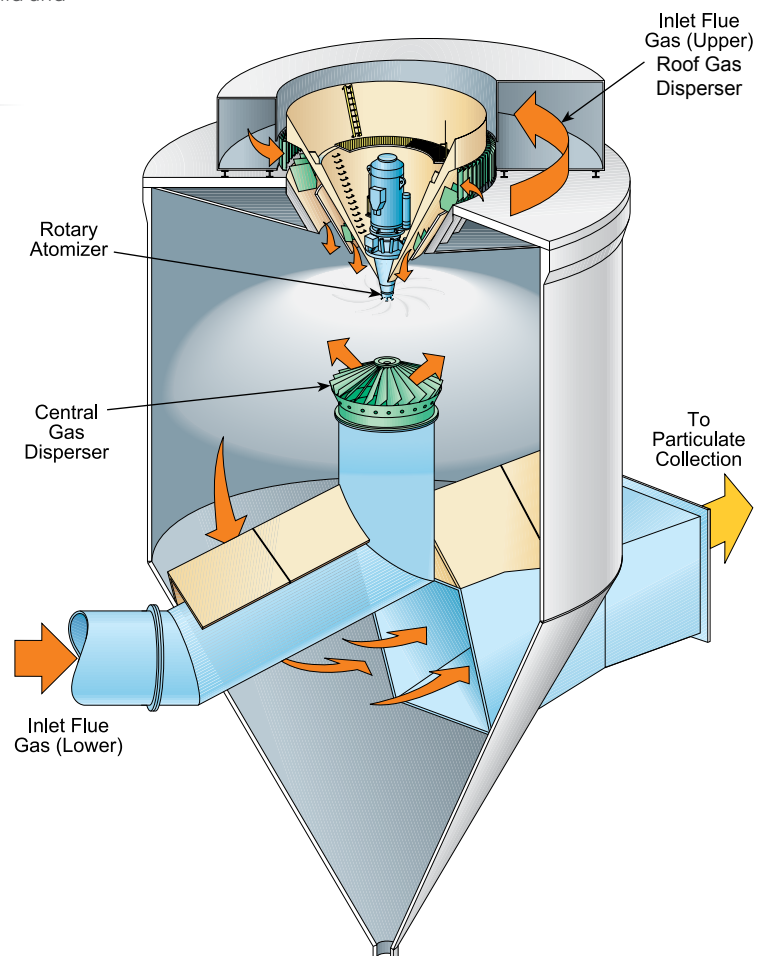
- New installations
- Engineered upgrades and rebuilds
- Control logic and instrumentation upgrades
- Tuning, inspections, training and operation optimization
- Atomizer and atomizer motor servicing
- Atomizer component upgrades
- Replacement GEA Niro atomizer parts
- Gas disperser component updates 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 ( $\text{SO}_2$ ,  $\text{SO}_3$ , 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%





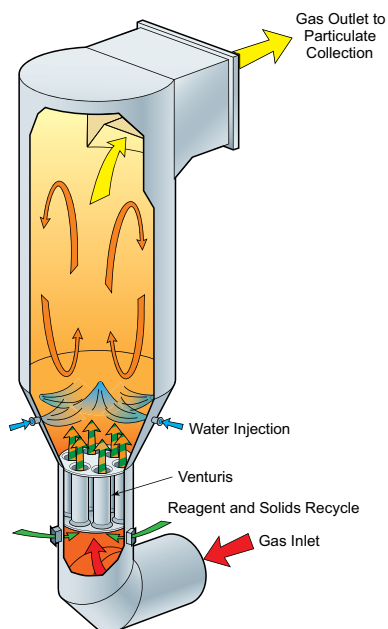
# Dry Scrubbers — Circulating Dry Scrubbers

## 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 ( $\text{SO}_2$ ,  $\text{SO}_3$ , HCl, HF) removal efficiencies
- Increased reliability and performance of existing systems
- Reduced lime consumption
- Elimination of wastewater streams



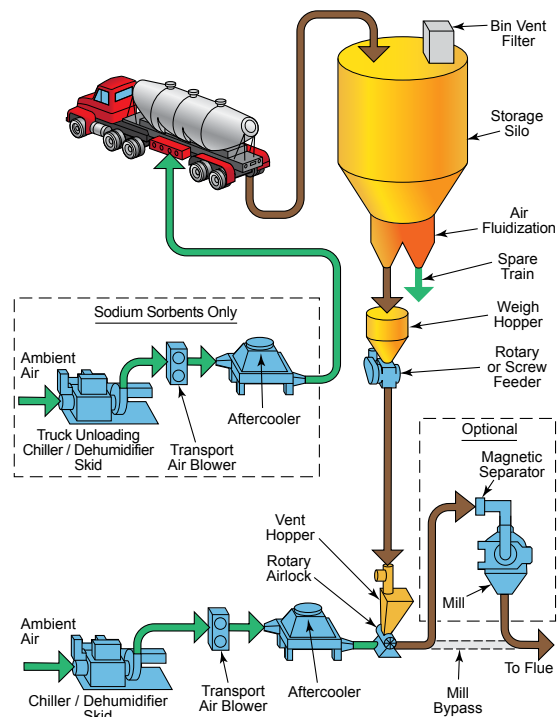
# Dry Sorbent Injection Systems

## Capabilities/Competencies

- Flexible designs to capture  $\text{SO}_2$ ,  $\text{SO}_3$  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)



## Post-Combustion NO<sub>x</sub> Control

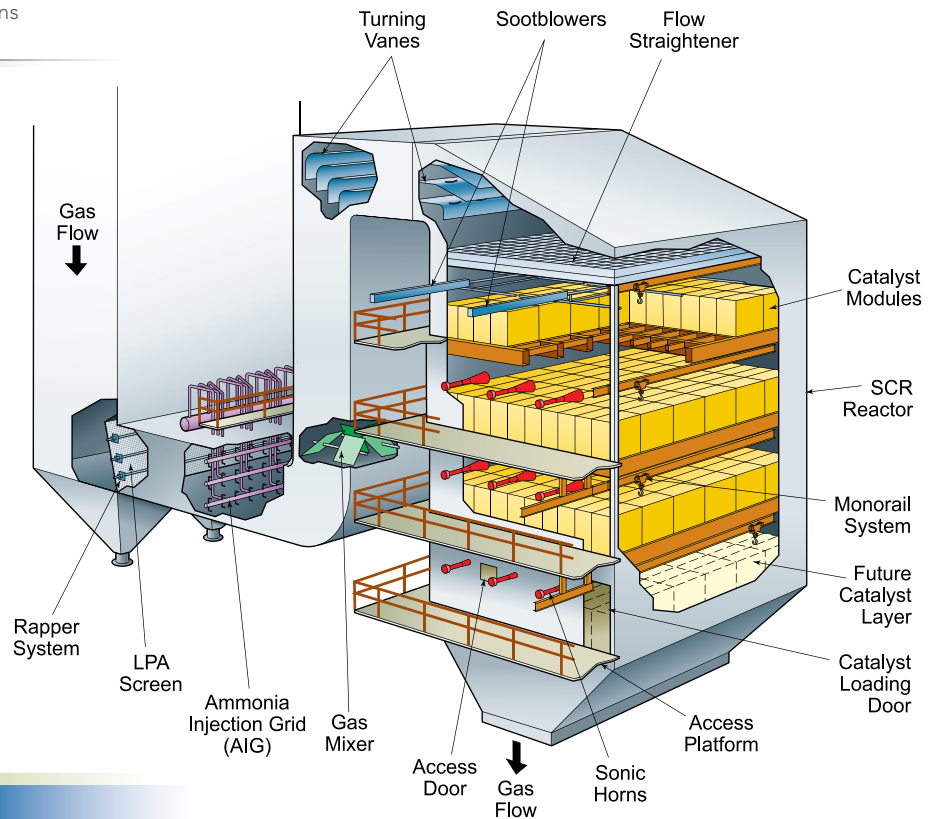
### Capabilities/Competencies

- 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<sub>x</sub> reduction technologies
- Vast experience — SCRs installed on nearly 33,000 MW of generating capacity
- Extensive PRB coal experience
- Modularized construction limits impact on plant operations and reduces construction costs

### Selective Catalytic Reduction



### SCR Experience

B&W SCR systems are installed on nearly 33,000 MW of generating capacity.

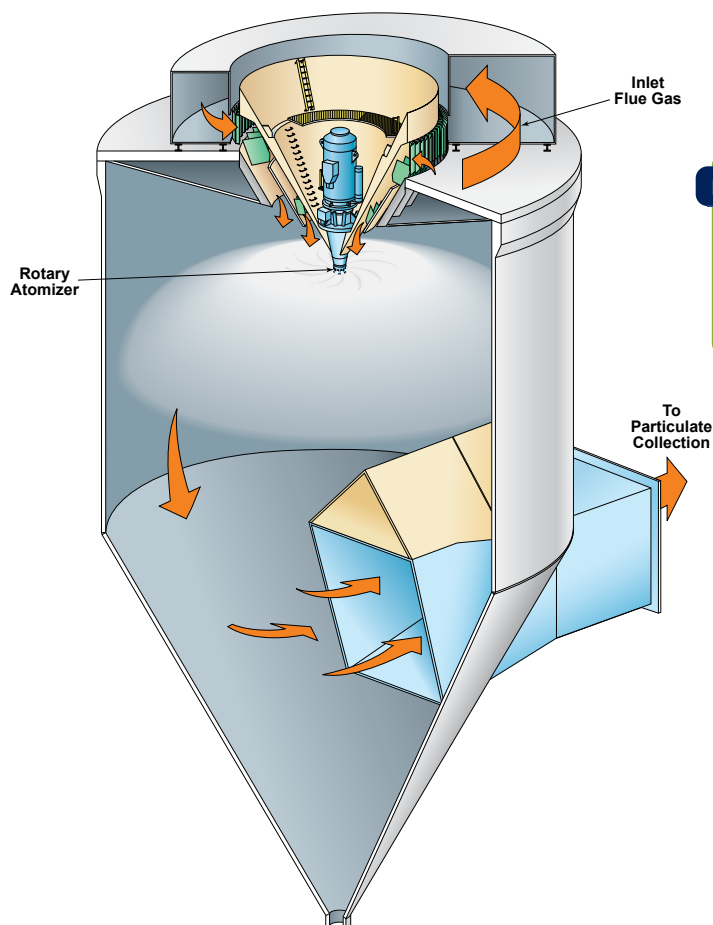
## ZLD Spray Dryer

### 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
- May allow more time for implementation depending on final re-enactment of postponed 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

## Controls and Diagnostic Systems

### Capabilities/Competencies

#### Advanced Performance Technologies

- Boiler control systems
- Burner management and combustion control systems
- Flame Doctor® combustion diagnostic system

#### Sootblowing Controls and Intelligent Software

- Titanium™ intelligent sootblowing systems
- Titanium™ 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®i hybrid automatic voltage control
- PRC-100® programmable rapper control
- Remote diagnostics

#### Boiler Monitoring Systems (Diamond® Electronics)

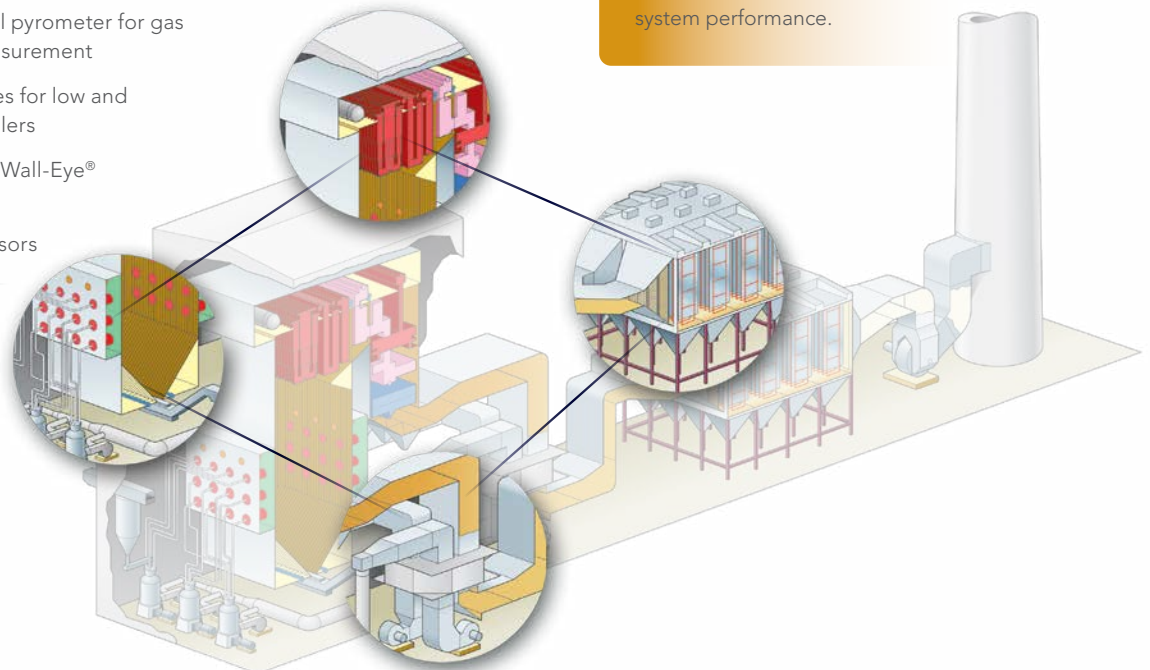
- GasTemp® optical pyrometer for gas temperature measurement
- Drum level gauges for low and high pressure boilers
- Utilicam® AT and Wall-Eye® camera systems
- Heat transfer sensors

### 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.





### Target Zero

Finish each and every day injury- and incident-free



### 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.



## 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





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