

BREF Compliance Solutions for Waste Incineration Plants

An experienced and full-scope provider of AQCS technologies



PM

HCl

SO₂

NO_x

Hg

Dioxin

Energy

NH₃



Source Timo Julka, Öresundskraft



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Babcock & Wilcox: Experience with National Regulations

EU Waste Incineration (WI) BREF and Industrial Emissions Directive (IED)

- primarily dust, HCl, HF, SO_x, mercury, dioxin and NO_x
- supplied technologies to several plants that operate within the BAT emissions levels proposed in the new WI BREF
- technologies: dry/semi-dry baghouse filter systems, wet scrubbers/condensers, ADIOX[®] technology for dioxin removal, and MERCOX[™] process for mercury removal

U.S. EPA Clean Air Interstate Rule (CAIR)

- primarily SO₂ and NO_x
- technologies: wet and semi-dry scrubbers and SCR
- 4 years to comply
- B&W supplied 20 to 25% of market

U.S. EPA Mercury and Air Toxics Standards (MATS)

- primarily mercury and PM
- technologies: ESP upgrades and fabric filters
- 3 years to comply
- B&W supplied 20 to 25% of market



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The new revision of the European waste incineration (WI) BREF regulation requires municipal and hazardous waste incineration plants to comply with stricter air emissions limits. This includes limits on dust, dioxin, mercury (Hg), hydrochloric acid (HCl), sulfur dioxide (SO₂), nitrogen oxides (NO_x), ammonia (NH₃) and particulate matter (PM). There is also more focus on the plant performance in terms of energy recovery.

The time to act is now. Turn to Babcock & Wilcox (B&W), an industry leader in providing a full suite of options and technologies to meet these challenges. We have the proven technical experience, know-how and responsiveness to help you lower air emissions to acceptable levels.

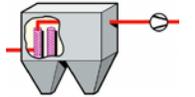
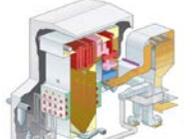
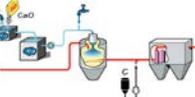
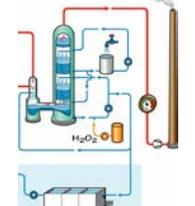
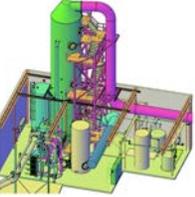
Our vast experience with helping customers meet a wide range of national air regulations at power plants across Europe and the United States includes large-scale implementation planning, system design and project execution.

In addition, our experience with boiler design and combustion fundamentals makes us uniquely qualified to consider how each environmental solution will affect performance and operation of existing power plant equipment.

Proven Full-scope Technology Provider

With our GMAB™ technologies, B&W can apply our experience, innovation and responsiveness to provide a proven portfolio of advanced and integrated emissions control and energy recovery solutions that are customized to meet your needs. Our environmental technologies are working every day in waste-to-energy (WTE) applications around the world.

Babcock & Wilcox Emissions Control and Energy Solutions Experience within WTE

Emission	Technology Solutions
Particulate Control PM	 <ul style="list-style-type: none"> Fabric filter baghouses, single or multi-compartments, rectangular or cylindrical
NO_x Control NO_x	 <ul style="list-style-type: none"> Selective catalytic reduction (SCR) systems Selective non-catalytic reduction (SNCR) systems
Acid Gas Control SO₂, HCl, HF	 <ul style="list-style-type: none"> Wet scrubbers, with or without NaOH, CaCO₃ or Ca(OH)₂ Dry sorbent injection Multi-stage wet scrubbers *
Mercury Control Hg	 <ul style="list-style-type: none"> Pulverized activated carbon (PAC) injection in baghouse filters MERCOX™ wet scrubber process Multi-stage wet scrubbers *
Dioxin Control Dioxin	 <ul style="list-style-type: none"> Pulverized activated carbon (PAC) injection in baghouse filters ADIOX® tower packing and droplet separator material for scrubbers or static absorbers Multi-stage wet scrubbers *
Enhanced Energy Recovery	 <ul style="list-style-type: none"> Wet scrubber condensers in fibre reinforced plastic (FRP) Plate condensers in metallic material Heat pumps and chillers Multi-stage wet scrubbers *
Multi-stage Wet Scrubbers	 <p>* Multi-functional wet scrubbers can reduce a variety of emissions, including acids, mercury and dioxins, as well as provide energy recovery by condensation</p>

PM

Particulate Matter Control

Baghouse Fabric Filters

B&W provides cost-effective control of particulate emissions and opacity with our proven pulse jet fabric filter technologies. Integrating fabric filters with our sorbent (PAC and/or alkali) injection provides high removal efficiencies of air pollutants, including acids and dioxin removal, in a variety of applications.

Both rectangular and cylindrical designs as well as single or multi-compartment systems are available. Each system can be custom designed for integrated multi-pollutant emissions reduction.



Dioxin Control

Dioxin

PAC injection

PAC injection prior to the gas entering a baghouse fabric filter is the most common method of removing dioxin from flue gases.

ADIOX[®] technology

An alternative or complementary method of dioxin removal is the ADIOX technology. The patented ADIOX process is based on the high affinity of dioxins to carbon. By dispersing small particles of carbon in polypropylene plastics, a material excellent for dioxin abatement is produced. A dioxin molecule that is present in the flue gas is initially absorbed into the polypropylene and then migrates to a carbon particle where it is strongly adsorbed (bound to its surface).

When the service life of the ADIOX material has ended, the material is incinerated. The dioxins are destroyed during the incineration process and the dioxins are taken out of the ecocycle.

Tower packings and droplet separators, produced of ADIOX material, can be installed in wet scrubbers, or in dedicated dioxin removal absorbers where the gas is dry or saturated.



Mercury Control

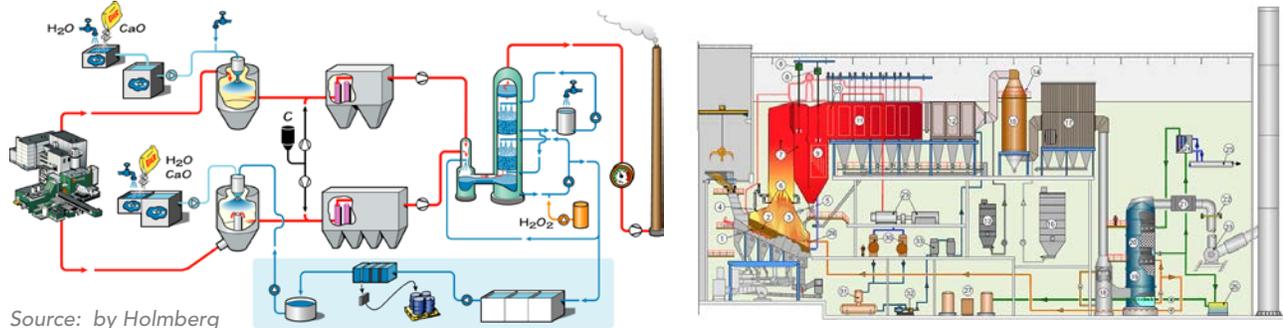
PAC injection

PAC injection prior to the gas entering a baghouse fabric filter is the most common method of removing mercury from flue gases.

MERCOX™ scrubbing-based technology

Mercury is often emitted from thermal treatment installations during brief periods creating extremely high mercury concentration spikes in untreated flue gases. Many traditional flue gas cleaning systems have limited buffer capacity, which means such concentrations cannot be reduced as much as desired. In such cases, or in applications in which the mercury content in untreated flue gas is usually high, the MERCOX™ process is an effective cleaning system.

The MERCOX process is especially competitive in applications with a high proportion of metallic mercury. MERCOX technology uses an eco-friendly oxidizing agent to oxidize the metallic mercury into a water-soluble form. The various compounds of mercury can then be absorbed in the scrubbing liquid together with the other acid gases.



Source: by Holmberg

Energy Recovery

Many modern incineration plants are equipped with a boiler system. The steam generates electric power in turbine generators and produces heat in turbine condensers. The heat may be fed into a district heating system.

We have taken the recovery of energy one step further. By cooling the flue gas to below its dew point, it is possible to recover large quantities of latent heat. By means of flue gas condensation, and in some cases with heat pumps, it is possible to increase the energy efficiency by an additional 15 to 25%. Condensation may take place either as a direct heat exchange between gas and district heating water in a metallic plate-type condenser or in a scrubber condenser.

Multi-stage Scrubbers

B&W offers standardized gas treatment scrubbers based on our range of gas treatment technologies including acid gas removal, gas condensation, ADIOX dioxin removal, and/or MERCOX mercury removal. The units are compact and designed for a minimum of on-site erection work.

Benefits

- High performance and availability
- Low maintenance requirement
- Flexible layout and small footprint
- Low total cost
- Functional integration for ease of operation

HCl

SO₂

SO₂ and HCl Control

Baghouse Fabric Filter Systems

We install baghouse fabric filter systems at incinerators for both municipal and environmentally hazardous waste, in biofuel-fired plants and in many other applications.

The primary purpose of baghouse filter systems is the removal of dust and, by introducing an alkali additive, the removal of acidic components such as HCl, HF and SO₂. Dioxin and mercury can also be removed by the addition of activated carbon or coke.

We supply fully dry systems and systems with conditioning (humidifying) of the flue gases. These dry sorbent injection (DSI) systems provide a low-cost solution to capture acid gases.

Spray dryer absorber systems (SDA) are licensed by B&W from GEA Process Engineering A/S for the GEA Niro SDA process.



Wet Flue Gas Desulfurization Systems

Our solution to achieving high SO₂ and HCl removal and system availability when burning fuels containing high and/or fluctuating pollutants levels is wet scrubbing technology.

A scrubber system using NaOH, in combination with upstream dry sorbent injection, is a most suitable and commonly used configuration. In some applications, our hydrated lime or limestone forced oxidation processes may be appropriate alternatives.

Wet scrubber systems offer the possibility to integrate several functions in one single absorber unit. Such functions may include the removal of acids (SO₂, HCl and HF), NH₃, mercury, and dioxin (ADIOX) along with simultaneous energy recovery by condensation.





Project Execution Options

Babcock & Wilcox has a wide range of proven and successful project execution experience, including strategic partnerships, equipment design and supply, or licensing arrangements.

Auxiliary Systems and Services

In addition to our emissions control solutions, we provide a wide range of auxiliary systems and aftermarket products and services, including:

- Boiler cleaning (Diamond Power® sootblowers)
- Ash and material handling systems
- Controls and diagnostics
- Equipment inspections, troubleshooting and optimization
- Engineering studies
- Engineered equipment upgrades
- Startup and commissioning services
- Performance testing and optimization
- Replacement parts





Choose Babcock & Wilcox

Previously under the names of Babcock & Wilcox Vølund AB and Götaverken Miljö AB, B&W now offer our proven environmental and energy efficiency solutions for waste incineration applications through our GMAB product line.

We are well positioned to support your BREF compliance needs and collaborate on solutions for optimizing your fleet.

- **Technology leader** – Full portfolio of environmental compliance solutions
- **Global organization** with dedicated sales and service support at local offices
- **Vast experience** with:
 - National air regulations
 - Large environmental projects – multiple units, compressed schedules
 - New equipment retrofits on existing units
 - Upgrades to OEM competitor designs
 - Variety of contracting methods
- **Global alliances** with key suppliers for critical equipment
- **Range of supply** options including equipment design and supply and EPC turnkey utilizing preferred partners

To find out how B&W can help you meet the WI BREF regulations, contact us today.

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