Industrial steam generators
connected excellence in all we do

Amec Foster Wheeler
50 MWe biomass grate boiler at P.T. Freeport in Indonesia
A long history in industrial boilers

Having supplied thousands of industrial boilers, ranging in size from 10-330 tonne/hr steam capacity (1-75 MWe), and firing a wide array of solid, gaseous, liquid industrial and waste fuels, we have the expertise to solve your industrial energy needs.

We provide high-value innovative solutions as diverse as our clients’ needs, such as the circulating fluidized-bed (CFB) boiler we provided to a Swedish community to convert recycled wood and refuse-derived fuel (RDF) into steam for heating its homes and businesses, or the bubbling fluidized-bed (BFB) boiler we provided to a Finnish paper mill to convert its waste bark and sludge into useful steam needed by the mill, or the grate boiler we provided to power a Minnesota community using local agricultural waste as fuel.

In addition, we have delivered over 100 waste heat boilers for the nonferrous metallurgical industry all over the world. By recovering heat that would otherwise be lost, our heat recovery technology makes it possible to achieve substantial increases in plant efficiency, while significantly cutting energy costs.

For gas and liquid industrial applications, our technologies span a diverse range of both field-erected and shop-assembled designs. We offer standard durable models or customized designs, featuring high turndown, fast ramp rates, one button start-up, and high reliability.
We offer a full range of economical industrial grate steam generators to meet diverse industrial energy needs. We can transform waste and by-product materials into valuable steam or power to meet energy needs cost effectively.

Our grate units offer wide fuel flexibility, ease of operation, low maintenance cost, and low auxiliary power losses.

We offer both air and water-cooled vibrating grates, flat pinhole grates and continuous ash discharge traveling grates with steam capacities up to 600,000 pounds, or 270 metric tons, per hour.

**RECENT PROJECTS**

**Sumitomo Miyazaki**  
Location: Miyazaki, Japan  
Customer: Sumitomo Heavy Industries  
Start-Up Year: 2006  
Capacity: 60 tph (14 MWe)  
Fuel: Chicken litter, agricultural waste

**Fibrominn**  
Location: Benson, Minnesota  
Customer: Fibrominn LLC/SNC-Lavalin Power Inc.  
Start-Up Year: 2007  
Capacity: 245 tph (62 MWe)  
Fuel: Poultry litter
General design features:
- Capacity: 30-270 tph (75-600 Kpph, 9-76 kg/s)
- Pressure: standard units up to 110 bar (1600 psi), custom units higher
- Temperature: up to 520°C (968°F)
- High turndown
- Warm/hot standby
- Fast ramping for cogen back-up
- Large load swings
- Low heat-flux long-life furnace design
- Convective and drainable superheaters
- Utility quality drum internals
- Convective bank design—optimized to fuel type

Fuels:
- Chicken and turkey litter
- Agricultural waste
- Wood and wood waste
- Wood residue
- Bark
- Peat
- Bagasse
- Sunflower seed hulls
- Coffee grounds
- Municipal solid waste
- Hogged fuel
- Veneer
- Sawdust
- Tires
- Hogged plywood

Fuels:
- Chicken and turkey litter
- Agricultural waste
- Wood and wood waste
- Wood residue
- Bark
- Peat
- Bagasse
- Sunflower seed hulls
- Coffee grounds
- Municipal solid waste
- Hogged fuel
- Veneer
- Sawdust
- Tires
- Hogged plywood

Camden County Energy Recovery Plant, 22 MWe
Our package steam generators have been an integral part of our steam generator product range for over 60 years. With over 300 installations, we have earned our reputation as a supplier of high quality, reliable and cost-effective package steam generators.

We have extensive experience in designing, fabricating and delivering quality package units that meet your specification. Shop fabrication of our units provides a controlled manufacturing environment affording maximum quality and reliability, while greatly reducing product cost by avoiding costly field erection.

**Recent Projects**

- **Sturgeon Refinery**
  - Location: Alberta, Canada
  - Customer: North West Redwater Partnership
  - Start-Up Year: 2015
  - Capacity: 3 x 357 Kpph (162 t/h)
  - Fuel: Natural gas, hydrogen rich refinery gas

- **Aughinish Alumina Refinery**
  - Location: Aughinish Island, Ireland
  - Customer: Aughinish Alumina Refinery
  - Start-Up Year: 2014
  - Capacity: 2 x 330 Kpph (150 t/h)
  - Fuel: Natural gas

- **Johnsonville**
  - Location: New Johnsonville, TN, USA
  - Customer: DuPont
  - Start-Up Year: 2015
  - Capacity: 2 x 317 Kpph (144 t/h)
  - Fuel: Natural gas, hydrogen gas
General design features:
- High turndown with up to 25-100% temperature control range
- Extended low load operation down to 10% continuous minimum load
- Fast ramping for cogeneration backup with hot/warm standby capability
- Large load swings up to 20% MCR per minute variations
- Complex combination firing of multiple type of simultaneous fuels
- One button start-up

Fuels:
- Natural gas
- Refinery process gases
- Landfill gas
- Blast furnace gas
- Coke gas
- Waste gases
- Heavy fuel oil
- Diesel
- Waste liquids

---

### Boiler Series, Sizes and Steam Condition Ranges

<table>
<thead>
<tr>
<th>Series</th>
<th>Capacity kpph / tonnes/hr</th>
<th>Overall Unit Dimensions</th>
<th>Weight tons / tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Height ft / m</td>
<td>Width ft / m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5000</td>
<td>50-100 / 23-45</td>
<td>14.2 / 4.3</td>
<td>12.3 / 3.8</td>
</tr>
<tr>
<td>5100</td>
<td>90-210 / 41-95</td>
<td>17-17.75 / 5.2-5.4</td>
<td>13-13.3 / 4.4.1</td>
</tr>
<tr>
<td>5200</td>
<td>190-270 / 86-123</td>
<td>19-21.5 / 5.8-6.6</td>
<td>17.3-19.3 / 5.3-5.9</td>
</tr>
<tr>
<td>5300</td>
<td>250-360 / 113-163</td>
<td>24.5-26.5 / 7.5-8</td>
<td>21-22.3 / 6.6-6.8</td>
</tr>
<tr>
<td>5400</td>
<td>360-500 / 164-227</td>
<td>28.5-30.4 / 8.7-9.3</td>
<td>23.3 / 7.1</td>
</tr>
<tr>
<td>5500</td>
<td>500-600 / 227-272</td>
<td>32.2-34.5 / 9.8-10.5</td>
<td>28 / 8.5</td>
</tr>
<tr>
<td>Custom</td>
<td>600+ / 272+</td>
<td>As per project request</td>
<td>As per project request</td>
</tr>
</tbody>
</table>

---

### RECENT PROJECTS

**Ichthys Onshore LNG Facilities**
- **Customer:** CH2M Hill Australia Pty. Ltd., UGL Engineering Pty. Ltd.
- **Location:** Blaydin Point, Australia
- **Start-Up Year:** 2014
- **Capacity:** 3 x 228 Kpph (104 t/h)
- **Fuel:** Natural gas

**Manifa**
- **Customer:** Técnicas Reunidas
- **Location:** Manifa, Saudi Arabia
- **Start-Up Year:** 2011
- **Capacity:** 2 x 452 Kpph (205 t/h)
- **Fuel:** Natural gas

**Chevron**
- **Customer:** Chevron Products Co.
- **Location:** Pascagoula, MS, USA
- **Start-Up Year:** 2010
- **Capacity:** 2 x 200 Kpph (91 t/h)
- **Fuel:** Natural gas
Metallurgical waste heat boilers

Amec Foster Wheeler Metallurgical Waste Heat Boilers (WHB) are designed to cool the hot process gases from non-ferrous pyrometallurgical furnaces or similar processes. Heat is recovered for power generation, drying, heating and other purposes to improve process plant efficiency. This recovery of the heat ultimately saves fossil fuel.

Our WHB have been developed to operate reliably in severe environments. Amec Foster Wheeler has supplied more than 100 WHBs which are currently operating around the world for the non-ferrous metallurgical industry.

Kazzinc New Metallurgy
Location: Ust - Kamenogorsk, Kazakhstan
Customer: Xstrata Technology Pty Ltd, Australia
Start-Up Year: 2011
Capacity: Saturated steam 29 tph (64 kpph)
Unit Type: 1 x WHB for Cu ISASMELT™ furnace, 1 x WHB for Pb ISASMELT™

Tongling
Location: Tongling, China
Customer: Anhui TongDu Copper Co.
Start-Up Year: 2003
Capacity: Saturated steam 43 tph (95 kpph)
Unit Type: WHB for ausmelt Cu-smelting furnace

Boliden Copper Smelter
Location: Rönnskär, Skelleftehamn, Sweden
Customer: Boliden Mineral Ab, Sweden
Start-Up Year: 2000
Capacity: Saturated steam 17 tph (37 kpph)
Unit Type: WHB for Cu-flash smelting furnace

RECENT PROJECTS

General design features:
- Tough small-diameter standard tube membrane walls
- Omega-tubes for robust heat transfer surface
- Smooth surface composite-tube to prevent corrosion
- Weld overlays applied to extend wall life
- Robust but flexible rapped tube surfaces
- Efficient dust removal arrangement
- Gas flow profile optimized by CFD
- Unique patented Spring Hammer rapping system

Amec Foster Wheeler Metallurgical Waste Heat Boilers (WHB) are designed to cool the hot process gases from non-ferrous pyrometallurgical furnaces or similar processes. Heat is recovered for power generation, drying, heating and other purposes to improve process plant efficiency. This recovery of the heat ultimately saves fossil fuel.

Our WHB have been developed to operate reliably in severe environments. Amec Foster Wheeler has supplied more than 100 WHBs which are currently operating around the world for the non-ferrous metallurgical industry.

Kazzinc New Metallurgy
Location: Ust - Kamenogorsk, Kazakhstan
Customer: Xstrata Technology Pty Ltd, Australia
Start-Up Year: 2011
Capacity: Saturated steam 29 tph (64 kpph)
Unit Type: 1 x WHB for Cu ISASMELT™ furnace, 1 x WHB for Pb ISASMELT™

Tongling
Location: Tongling, China
Customer: Anhui TongDu Copper Co.
Start-Up Year: 2003
Capacity: Saturated steam 43 tph (95 kpph)
Unit Type: WHB for ausmelt Cu-smelting furnace

Boliden Copper Smelter
Location: Rönnskär, Skelleftehamn, Sweden
Customer: Boliden Mineral Ab, Sweden
Start-Up Year: 2000
Capacity: Saturated steam 17 tph (37 kpph)
Unit Type: WHB for Cu-flash smelting furnace

RECENT PROJECTS

General design features:
- Tough small-diameter standard tube membrane walls
- Omega-tubes for robust heat transfer surface
- Smooth surface composite-tube to prevent corrosion
- Weld overlays applied to extend wall life
- Robust but flexible rapped tube surfaces
- Efficient dust removal arrangement
- Gas flow profile optimized by CFD
- Unique patented Spring Hammer rapping system
Field erected oil/gas boilers

General design features:
- **Single and double drum designs**
- Capacity: Up to 450 t/h (990,000 lb/h)
- Temperature: Up to 540°C (1004°F)
- Large furnace with low flue gas velocities
- Convective and drainable superheater
- Conservative designs that can handle a wide range of fuels, including high vanadium oils
- Bottom supported for ease of erection and foundation design
- Complete watercooled furnace walls
- Gas flow perpendicular to the steam drum providing uniform heat across its width resulting in a steady drum level
- Fully welded designs for high steam pressure applications

Fuels:
- Natural gas
- Refinery process gases
- Landfill gas
- CO and blast
- Furnace gas
- Coke gas
- Waste gases
- Heavy fuel oil
- Diesel
- Waste liquids

**Recent Projects**

- **Atherinolakos**
  - Location: Crete, Greece
  - Customer: Public Power Corp.
  - Start-Up Year: 2008
  - Capacity: 225 tph (52 MWe)
  - Fuel: Oil

- **Immingham**
  - Location: Immingham, England
  - Customer: Conoco
  - Start-Up Year: 2006
  - Capacity: 2x330 tph (2x75 MWe)
  - Fuel: Gas

- **Caojing**
  - Location: Caojing, Shanghai
  - Customer: Shanghai SECCO Petrochemical Co. Limited
  - Start-Up Year: 2007
  - Capacity: 3x220 tph (3x55 MWe)
  - Fuel: Oil and gas
Bubbling fluidized bed retrofits

- Reduced carbon profile by use of carbon neutral biomass
- Use of high moisture bark and sludges which are not suitable fuels for existing pulverized coal, oil/natural gas and grate boilers
- Increase in boiler steam production
- Reduction of emissions (NOx, SOx, CO)
- Reduction of unburned carbon in ash
- Economic benefit of extending plant life

Blast furnace gas and CO boilers

- Large furnace to handle low Btu gases and provide conservative heat release rates and flue gas velocities
- Scroll type burners to effectively and efficiently fire the low Btu gases, with minimal support fuel
- Bottom supported for ease of erection and foundation design
- Soot blowers are strategically placed to provide effective cleaning
- Cavities and access doors are provided in all major tube banks for inspections and maintenance

RECENT PROJECTS

Board Mill Metsä Board
- Location: Simpele, Finland
- Customer: Metsä Board
- Start-Up Year: 1997
- Capacity: 27 MWe
- Fuel: Peat, bark, sludge, oil
  - Retrofit to a peat fired boiler

Stora Enso Hylte AB
- Location: Hyltebruk, Sweden
- Customer: Stora Enso Hylte AB
- Start-Up Year: 2006
- Capacity: 23 MWe
- Fuel: De-inking sludge, paper sludge, bark
  - Retrofit to an Axon oven/fuel oil fired boiler

ESE
- Location: Mikkeli, Finland
- Customer: Etelä-Savon Energia Oy
- Start-Up Year: 2013
- Capacity: 100 MWth
- Fuel: Biomass, peat
  - Retrofit to 100% biomass firing
Bubbling fluidized bed boilers

Our Bubbling Fluid Bed steam generators have a history of reliable operation and have brought value to many clients due to their ability to burn high moisture and high ash fuels. We have progressively advanced the state of BFB technology by incorporating design improvements like our rugged step grid, staged air mixing and gas recirculation systems.

- Stepped grid for most difficult fuels
- Conventional grid for cleaner fuels
- Fuel gas recirculation for bed temperature control avoids in-bed tubes
- High gas residence time to ensure lowest dioxin, CO, and fly ash carbon
- Multiple levels of secondary air to minimize NOx formation
- Retractable soot blowing to maintain high boiler efficiency and long tube life

Recent Projects

<table>
<thead>
<tr>
<th>Location</th>
<th>Customer</th>
<th>Start-Up Year</th>
<th>Capacity</th>
<th>Fuel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomass de cantabria at Reocin</td>
<td>Reocin, Torrelavega, Spain Ingeteam Power Plants, S.A.</td>
<td>2012</td>
<td>10 MWe</td>
<td>Biomass</td>
</tr>
<tr>
<td>Wilton</td>
<td>SembCorp Utilities (UK) Limited</td>
<td>2007</td>
<td>31 MWe</td>
<td>Short Rotation Coppice (SRC)</td>
</tr>
<tr>
<td>Portucel Viana</td>
<td>Viana do Castelo, Portugal Stora Enso Hytle AB</td>
<td>2006</td>
<td>11 MWe</td>
<td>Biomass</td>
</tr>
</tbody>
</table>
Amec Foster Wheeler’s Global Power Group offers a full range of steam generator equipment, clean air technologies, aftermarket products and services to the power, industrial, and waste-to-energy sectors. GPG’s global engineering, manufacturing, and procurement network delivers high-quality, cutting-edge products and services safely and cost competitively, no matter where the project is located.

<table>
<thead>
<tr>
<th>PRODUCTS AND SERVICES</th>
<th>Steam Generators</th>
<th>Environmental Products</th>
<th>Aftermarket Services</th>
<th>Auxiliary Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Circulating Fluid Bed</td>
<td>Wet FGD systems</td>
<td>Engineered pressure parts</td>
<td>Condensers</td>
</tr>
<tr>
<td></td>
<td>Pulverized Coal</td>
<td>CFB scrubbers</td>
<td>Replacement parts</td>
<td>Feedwater heaters</td>
</tr>
<tr>
<td></td>
<td>Oil &amp; gas</td>
<td>Dry Sorbent Injection</td>
<td>Weld overlays</td>
<td>Biomass gasifiers</td>
</tr>
<tr>
<td></td>
<td>Solar</td>
<td>Spray Dry Absorbers</td>
<td>Refractory upgrades</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bubbling Fluid Bed</td>
<td>Wet and dry ESPs</td>
<td>Coal mill service and upgrades</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Package</td>
<td>Fabric filters</td>
<td>Construction services</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grate and MSW</td>
<td>Cartridge collectors</td>
<td>Performance upgrades</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Waste Heat</td>
<td>Low NOx combustion</td>
<td>Boiler retrofits</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HRSG</td>
<td>and SCR retrofits</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Contact Us**

**Globally**
amerfw.com

**China**
Unit 12
14th Floor, Tower B
Beijing COFCO Plaza,
No.8 Jianguomennei Street,
Beijing, China 100005
T  +86 (0) 10 6522 2771

8th Floor
UC Tower
500 Fushan Road
Pudong New Area
Shanghai 200122 China
T  +86 (0) 21 5058 2266

**Finland**
Metsänneidonkuja 8
FI-02130 Espoo, Finland
T  +358 (0) 10 393 11

Relanderinkatu 2
FI-78201 Varkaus, Finland
T  +358 (0) 10 393 11

**Poland**
ul. Chmielna 85/87
00-805 Warsaw
T  +48 (0) 22 581 00 36

ul. Staszica 31
41-200 Sosnowiec, Poland
T  +48 (0) 32 368 1300

**South Korea**
7th Floor, 621 Bldg., 76-3,
Samsung-dong, Gangnam-gu,
Seoul, Korea 135-871
T  +82 (0) 2 3446 8325

**Spain**
Calle Gabriel Garcia Márquez, 2
28232 Las Rozas
Madrid, Spain
T  +34 (0) 91 336 2400

**Sweden**
Lindövägen 75
602 28 Norrköping, Sweden
T  +46 (0) 11 285 330

**Thailand**
9th Floor, Maneeya Bldg,
518/5 Ploenchit Road
Lumpini, Pathumwan
Bangkok 10330, Thailand
T  +66 (0) 2 652 0760

**USA**
53 Frontage Rd., PO Box 9000
Hampton, NJ 08827 USA
T  +1 908 730 4000

9780 Mt. Pyramid Ct., Ste. 260
Englewood, CO 80112-7060 USA
T  +1 303 784 4880

501 Grant Street, Suite 400
Pittsburgh, PA 15219-442 USA
T  +1 412 562 7300

1080 Holcomb Bridge Road
Building 100 - Suite 100
Roswell, GA 30076-4346 USA
T  +1 770 325 7500

**Vietnam**
Suite 706-708, 7th Floor,
Central Bldg
31 Hai Ba Trung Street
Hanoi, Vietnam
T  +84 (0) 4 39393809

Copyright © Amec Foster Wheeler 2015