Package steam generating systems

connected excellence in all we do

amecfw.com
Amec Foster Wheeler package boiler operating at Dow Chemical in Alberta, Canada since 1994
A long, successful history of proven and reliable package boilers

Industrial steam generation is all about high reliability at the lowest steam production cost. Amec Foster Wheeler provides a solution focused on these attributes.

Package Steam Generating Systems have been an integral part of Amec Foster Wheeler’s product base for over 60 years. With over 500 installations, we have earned our reputation as a proven and responsible leader in this industry.

Our diligent pursuit of improved system performance and quality is founded on the concepts of system reliability, value engineering and execution excellence. We make it a priority to understand and address the unique requirements of your project, with the goal of delivering excellence.
Amec Foster Wheeler provides a complete power solution

For all industrial and power applications

**Standard scope**
- Burners with fuel valve trains
- Burner management systems
- Emissions control equipment
- Attemperation systems
- Instrumentation & controls
- Motor & turbine drives
- Economizers
- Stacks
- Valves & trim
- ASME piping
- Sootblowing systems
- Flues & ducts
- Platforms & walkways
- Structural steel

**Extended scope**
- Air pre-heaters
- Deaerators
- Feedwater pumps
- Blowdown systems
- Chemical feed systems
- Steam/water sampling system
- Water treatment systems
- Continuous emission monitoring
- Electrical equipment & lighting
- External piping
- System design
- Construction
- Subcooler condensers
- Remote monitoring & diagnostic system
- Complete boiler island

**Fuels**
- Natural gas
- Refinery gas
- Landfill gas
- Waste gas
- CO gas
- Coke oven gas
- Blast furnace gas
- Alcohols
- Waste liquids
- Heavy oils
- Light oils

**Emission control techniques**
- Low NOx burners
- Flue gas recirculation
- CO oxidation
- SCR systems
Package boilers usage
- Demanding & critical processes
- Cogeneration or combined heat and power
- Emergency steam demand
- Increase in overall system availability
- Fast delivery of reliable steam supply

Broad industrial experience
- Chemical pants, gas plants & petroleum refineries
- Mining & oil sands
- Power, cogeneration plants & combined cycles
- Manufacturing & district heating
- Sugar cane & paper
- Desalination plants
- Landfill applications
Boiler features

AG series

Amec Foster Wheeler Package Boilers are a fusion of proven technology, experience and resourcefulness.

We incorporate state-of-the-art design and construction standards adopted from our large utility products, best practices and company know-how. These standards have been refined and well proven through many years of experience with the oil & gas, chemical and power industries. Based on these standards and your needs we can customize each solution for your benefit.

The result is a boiler of superior construction, custom designed to project-specific requirements and focused on your project needs. Amec Foster Wheeler’s proven AG series package boiler technology consists of six distinct series: 5000, 5100, 5200, 5300, 5400 and 5500. Each series offers a unique set of standard features.

- Custom units can be designed beyond standard product capabilities to meet specific project needs

Boiler features

AG series

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Up to 600,000 lb/hr (272 t/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure</td>
<td>Up to 1800 psig (124 barg)</td>
</tr>
<tr>
<td>Temperature</td>
<td>Up to 1005°F (540°C)</td>
</tr>
<tr>
<td>Emissions</td>
<td>Best Available Technology</td>
</tr>
<tr>
<td>Scope</td>
<td>Full Turnkey</td>
</tr>
</tbody>
</table>

* Custom units can be designed beyond standard product capabilities to meet specific project needs
Typical Amec Foster Wheeler package boiler design

Large drums allow for faster starts, add operating stability during load swings, and reduce the likelihood of unit upsets.

Bent tubes around burner openings eliminate panel hot spots and require minimum refractory for burner fit-up.

Complete Mono-wall® division wall prevents gas bypassing the furnace to convection bank, which could lead to high CO emissions and reduce thermal efficiency.

Fully convective and drainable superheater is behind screen tubes, protected from radiant heat which optimizes performance, increases availability and decreases maintenance.

Mono-wall® construction provides a distortion free, gas-tight enclosure.

Large cross-sectional furnace is ideal for flame separation and low emissions.

**Recent Projects**

Customer: North West Redwater Partnership  
Location: Alberta, Canada  
Start-Up Year: 2015  
Capacity: 3 x 357 Kpph (162 t/h)  
Model: AG-5325

Customer: DuPont  
Location: New Johnsonville, TN, USA  
Start-Up Year: 2015  
Capacity: 2 x 317 Kpph (144 t/h)  
Fuel: Natural Gas, Hydrogen Rich Refinery Gas  
Model: AG-5275

Customer: Aughinish Alumina Refinery  
Location: Aughinish Island, Ireland  
Start-Up Year: 2014  
Capacity: 2 x 330 Kpph (150 t/h)  
Fuel: Natural Gas  
Model: AG-5325
Boiler features

Amec Foster Wheeler’s key design features are based on our experience with many different products and industries. Our company know-how and standards have been developed through our network of majority-owned manufacturing facilities, and in many cases is more stringent than internationally recognized codes, resulting in a very high quality product.

Maintenance-friendly access
Observation ports are supplied in the furnace and convection rear walls, while access to key maintenance areas is provided through large diameter man-ways in the furnace, water drum and steam drum. Generously-sized access platforms, walkways and stairs are standard, all of which will be adapted specifically to your project needs.

Mono-Wall® construction
Amec Foster Wheeler boilers are constructed exclusively using a tubular membrane-wall (Mono-wall®) – for a distortion-free, gas-tight enclosure. Mono-wall® division wall prevents gas bypassing from the furnace to the convective bank which would otherwise lead to high CO emissions and reduced thermal efficiencies. A water-cooled front wall with nested burner opening is standard in our larger boilers to minimize the refractory areas and minimize long term maintenance costs.

Proven and reliable design
Two drum, D-Style design offers proven technology and reliability. Conservatively sized steam drums are standard, improving operational stability during load cycles and increasing drum retention time for maximum system availability. Primary separators are utilized in conjunction with secondary stage chevron driers for maximum steam purity according to power generation standards.

Detailed circulation analysis
A detailed analysis of all operating conditions with our proprietary applications results in the proper circulation design for your boiler, thus eliminating localized recirculating patterns or steam blockages that could result in panel hot-zones and ultimately tube failures.

Detailed vibration analysis
For each boiler model, the gas flows have been analyzed and the boiler tube geometry designed to prevent vibration due to vortex shedding or standing waves. The result is a quiet running boiler operating with a low risk of tube fatigue related failures due to vibration.

Evaporator bank
Serrated tube-to-drum connections ensure integrity of the tube-to-drum seal with additional seal welding when required. All convective bank tubes are in-line to minimize gas-side draft losses.

RECENT PROJECTS

Customer: Técnicas Reunidas
Location: Manifa, Saudi Arabia
Start-Up Year: 2011
Capacity: 2 x 452 Kpph (205 t/h)
Fuel: Natural Gas
Model: AG-5475

Customer: Chevron Products Co.
Location: Pascagoula, MS, USA
Start-Up Year: 2010
Capacity: 2 x 200 Kpph (91 t/h)
Fuel: Natural Gas
Model: AG-5240

Customer: CH2M Hill Australia Pty. Ltd., UGL Engineering Pty. Ltd.
Location: Blaydn Point, Australia
Start-Up Year: 2014
Capacity: 3 x 228 Kpph (104 t/h)
Fuel: Natural Gas
Model: AG-5275
and bare tube gas exposure to promote even heat transfer along the full length of the bank. The bank is also custom engineered for optimum pitch and density to reduce fan power consumption. Large water-to-steam circulation ratios ensure proper cooling of all tubes and therefore higher reliability and operational stability.

**Superheaters**

Fully convective and drainable superheaters are standard and are installed so that they are shielded from the radiant furnace by screen tubes. Metallurgical integrity is ensured through the optimization of steam mass flow rates and the balance of steam distribution within parallel passes. Inter-stage or final stage attemperation is used to ensure the necessary steam temperature during different operating cases while maintaining the steam quality.

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### RECENT PROJECTS

**Customer:** Chevron Products Company  
**Location:** Kapolei, Hawaii  
**Start-Up Year:** 2007  
**Capacity:** 2 x 75 Kpph (34 t/h)  
**Fuel:** Refinery Gas, Fuel Oil  
**Model:** AG-5060

**Customer:** Northland Power  
**Location:** Thorold, Canada  
**Start-Up Year:** 2009  
**Capacity:** 2 x 250 Kpph (113 t/h)  
**Fuel:** Natural Gas, Landfill Gas  
**Model:** AG-5250

**Customer:** RAM/Tema Oil  
**Location:** Ghana  
**Start-Up Year:** 2000/2006/2007  
**Capacity:** 3 x 156 Kpph (71 t/h)  
**Fuel:** Fuel Gas, No. 2 Oil  
**Model:** AG-5150
**Engineering expertise**

Amec Foster Wheeler’s engineering disciplines utilize our proven standards to ensure design consistency across all systems. Amec Foster Wheeler’s standards are continually updated to improve the technology based on advanced engineering studies and validation of field data. This results in optimum performance, reduced auxiliary power consumption, stable and robust emission control and smooth operation across all operating ranges. Engineering assessments of your process needs as well as studies are also available.

**Worldwide sourcing, manufacturing and execution**

Amec Foster Wheeler’s global production and procurement network provides a strong local presence in many areas of the world. Local content can be optimized to minimize shipping costs or to maximize specific country content to support government-financed projects and customer preferences.

Amec Foster Wheeler’s manufacturing facilities, regardless of where they are located, adhere to the same stringent manufacturing and quality standards. Wherever the boiler and auxiliary components are fabricated, our experienced shipping personnel will coordinate shipment of our products to any location worldwide.

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**RECENT PROJECTS**

<table>
<thead>
<tr>
<th>Customer</th>
<th>Location</th>
<th>Start-Up Year</th>
<th>Capacity</th>
<th>Fuel</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kellog / Statoil ASA</td>
<td>Kartso, Norway</td>
<td>2005</td>
<td>1 x 262 Kpph (119 t/h)</td>
<td>Process Gas, Refinery Gas</td>
<td>AG-5375</td>
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<tr>
<td>CEPSA</td>
<td>La Rábida, Spain</td>
<td>2006</td>
<td>1 x 335 Kpph (152 t/h)</td>
<td>Natural Gas</td>
<td>AG-5375</td>
</tr>
<tr>
<td>Pertamina UP-V</td>
<td>Balikpapan, Indonesia</td>
<td>2004</td>
<td>1 x 275 tph (125 t/h)</td>
<td>Oil</td>
<td>AG-5325</td>
</tr>
</tbody>
</table>
# Package boiler specifications

The Generation 5000 family consists of six distinct groupings of boilers named the 5000, 5100, 5200, 5300, 5400 and 5500 series. Each series offers a unique set of standard geometries and flexible features.

<table>
<thead>
<tr>
<th>Series</th>
<th>Capacity kpph / tonnes/hr</th>
<th>Model</th>
<th>Overall Unit Dimensions</th>
<th>Weight tons / tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Height ft / m</td>
<td>Width ft / m</td>
</tr>
<tr>
<td>5000</td>
<td>50-100 / 23-45</td>
<td>5050</td>
<td>14.2 / 4.3</td>
<td>12.3 / 3.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5060</td>
<td></td>
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<td>5070</td>
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<td>5080</td>
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<td>5090</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5100</td>
<td>90-210 / 41-95</td>
<td>5105</td>
<td>17 / 5.2</td>
<td>13 / 4</td>
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<td></td>
<td></td>
<td>5120</td>
<td></td>
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<td>17.75 / 5.4</td>
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<td>16.7 / 5.1</td>
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<td>5240</td>
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<td>19.3 / 5.9</td>
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<td>21.7 / 6.6</td>
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<td></td>
<td></td>
<td>5375</td>
<td>26.5 / 8</td>
<td>22.3 / 6.8</td>
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<td>5425</td>
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<td>23.3 / 7.1</td>
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<td>28 / 8.5</td>
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<td></td>
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<td>5575</td>
<td>34.5 / 10.5</td>
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</tr>
<tr>
<td>Custom</td>
<td>600+ / 272+</td>
<td>—</td>
<td>As per project request</td>
<td>As per project request</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 cost competitively, no matter where the project is located.

### Products and Services

#### Steam Generators
- Circulating Fluid Bed
- Pulverized Coal
- Oil & gas
- Solar
- Bubbling Fluid Bed
- Package
- Grate and MSW
- Waste Heat
- HRSG

#### Environmental Products
- Wet FGD systems
- CFB scrubbers
- Dry Sorbent Injection
- Spray Dry Absorbers
- Wet and dry ESPs
- Fabric filters
- Cartridge collectors
- Low NOx combustion and SCR retrofits

#### Aftermarket Services
- Engineered pressure parts
- Replacement parts
- Weld overlays
- Refractory upgrades
- Coal mill service and upgrades
- Construction services
- Performance upgrades
- Boiler retrofits

#### Auxiliary Equipment
- Condensers
- Feedwater heaters
- Biomass gasifiers

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