Fired heaters
Quick insights
Amec Foster Wheeler **Fired Heaters**

More than a century of fired heaters
supporting the development and growth of the global refining market

Over 2,500 fired heaters in over 70 countries

Locations

[Map showing locations around the world with markers indicating fired heater installations.]
In 1915, the first vegetable oil heater was supplied using Power Specialty’s technology, a founding Amec Foster Wheeler company, and was quickly adapted for the emerging refinery industry. Since then Fired Heaters have been critical components of all refineries, as well in petrochemical, Liquefied Natural Gas (LNG) and other facilities, which the company still designs, builds, installs and supports a century later.

Amec Foster Wheeler’s team of approximately 150 Fired Heater specialists, located across the world, continue to provide full life-cycle support, technically superior designs, and efficient equipment, all based on their significant pedigree and century of experience. Since 1915, we have supplied an average of over 25 fired heaters per year in more than 70 countries, in all six inhabited continents.

“Our Fired Heaters team has a 100 years of cutting edge expertise at its fingertips and has helped to shape today’s global refining and petrochemicals industry. Millions of people, without even knowing it, have been transported by a product which one of our Fired Heaters has helped to refine.”

100 years of history...

1903
Roots of fired heater equipment technology emerged when Ernest Foster invented and patented cast iron ‘gill rings’ increasing the heat transfer surface area of steam super-heaters. These cast iron ‘gill rings’ lead to the same principal being used in the convection section of fired heaters

1915
A vegetable oil heater was the first fired heater to use Power Specialty’s technology

1919
Design and supply of the first all-convective heater to the refining industry

1920
Patent of the first tubular heater with a direct fired radiant section

1927
First vacuum distillation unit heater

1939
Firmly established as the world leader in refinery technology

1939
First double-fired visbreaker/coker heater

1953
Built the world’s biggest crude distillation heater

1954
Patent for the famous Terrace Wall design of Steam-Hydrocarbon Reforming Furnace

1960s and 1970s
Working across the globe supplying fired heaters for new build refineries of which over 200 Terrace Wall Reformers were supplied and our compact CO Boiler developed and supplied

1990s
Growth of investment in petrochemicals, LNG, selective refinery processes such as visbreaking delayed coking, hydrodesulphurisation, catalytic reforming, CO boilers/heaters, steam hydrocarbon reforming and EDC (ethylene dichloride) cracking, has seen the diversification of the fired heaters technology to support the new technology

2012
The 150th delayed coker heater awarded

2015
100 year anniversary of Amec Foster Wheeler Fired Heaters
Our many repeat customers know that Amec Foster Wheeler Fired Heaters deliver value by bringing experience, expertise, innovation, technology and cost-effectiveness to every one of our Fired Heater projects.

Our low life-cycle cost approach to design and our high quality standards have stood the test of time with numerous fired heaters that today are operating well beyond their original design life and performance specifications.
We have a proven track record of delivering projects on time and within budget while maintaining an exemplary safety record.

Commitment to safety
► Zero harm culture
► Active HSSE (Health, Safety, Security and Environment) program
► Safe office behaviours
► Life critical activities

Engineering
► Innovative and custom designed for specific project requirements
  ► Proper mass velocities and heat flux rates for the process service
  ► Burner/heat flux profiles to fit the service and firebox profile
► Total installed cost (TIC) approach to design and supply
► Robust design using the latest design tools including 3D, CFD and CFM
► No outsourcing of engineering so lessons learned are retained

Project services
► Single point of contact (POC)
► Accurate and timely reporting
► Planned constructability reviews
► Full documentation packages: drawings, installation, operation & maintenance (IOM) manuals and data books
► Pro-active approach to client communications

Quality & material services
► High quality and experienced sub-suppliers
► Custom quality plans that include client requirements are actively monitored for conformance
► In-house traffic and expediting specialists to ensure delivery of materials
► ISO 9001, ISO 14001 and ISO 18001 certified

After installation commitment
► Field services available for erection, commissioning and start-up
► Field services available for tuning, audits, repairs or training
► Studies and materials for revamps and upgrades
► Original equipment manufacturer (OEM) replacement parts
Amec Foster Wheeler’s proprietary Terrace Wall™ design features a vertical radiant section consisting of a single row of tubes with burners on either side of the tubes arranged in two terrace levels. Hot flue gases flow naturally upward into the convection section similar to a conventional fired heater providing true counter-current heat transfer for improved radiant efficiency. The convection section has several coil sections, which recover heat from the flue gas leaving the radiant section for various process and utility duties.

An air preheat system (APH) can be provided to recover heat from the flue gas, while avoiding dew point problems. High fuel efficiency can also be achieved in a natural draft design through steam generation and boiler feed water (BFW) pre-heating. On hydrogen steam reformer applications an associated steam system may also be supplied.

The double firing on sloped firing walls and the multiple level burners firing upward and adjacent to the wall refractory provide a firebox with high radiation and predictable flue gas circulation. This assures safe, stable combustion, even with very lean fuels such as pressure swing absorption (PSA) offgas. The burners are selected to spread the flames both horizontally and vertically along the brick firing wall for a planar heat flux pattern.

Low BTU, low pressure PSA offgas is stabilised against the brick firing wall preventing any instability or flame impingement.

The sloping walls also provide a uniform vertical heat flux profile since the distance from the tube to the radiating wall decreases as the rising flue gas cools while releasing heat to the tubes. Each terrace is capable of being independently fired to provide the particular heat flux desired in its zone. This allows the operator to match the vertical heat flux to the process heat demand within the tube, such as adjusting for effects of catalyst ageing, thereby avoiding tube hot spots and prolonging tube and catalyst life.

Terrace Wall units can be supplied as natural draft, APH or gas turbine exhaust configurations. Selective catalytic reduction (SCR) equipment can also be incorporated.

**Applications**

**Steam reforming**
- Ammonia
- Hydrogen
- Methanol

**Ethylene cracking furnaces**

Mechanical design and supply of ethylene pyrolysis furnaces with proprietary process design by others.

**Hydrocracker**

Designs provide a more uniform tube metal temperature for these critical high pressure coils.

**Direct reduction iron (DRI) plants**

Unique geometry is well-suited for these special high temperature gas services.

**Features/advantages**

**Process design and control**

This distinctive double-fired design offers various advantages for critical services in refining and petrochemical applications where uniform, controlled, symmetrical heat is required by the process.

Multiple terrace levels permit controlled heat input and flexibility in optimising cracking coil configurations or biasing heat input to account for reforming catalyst ageing.

Elimination of flame impingement on the tubes provides another advantage of the upward-firing terrace configuration, increasing unit reliability and on-line performance.

Feedstock flexibility and high turndown capability are other features of the Terrace Wall design.

Special flat flame burners designed to Amec Foster Wheeler requirements are available in Lo-NOx designs with ambient air and preheated air capability.

**Draft options**

The Terrace Wall reformer can be designed to operate under natural draft without the need for forced-draft (FD) or induced-draft (ID) fans.

When air preheat is selected, the Terrace Wall design does not
require costly backup ID fans and the associated instrumentation and maintenance. Furthermore, the reformer is designed to switch over to natural draft performance when the APH system is not used or the ID fan fails maintaining production of syngas and steam.

**Life cycle costs**

Improved life cycle costs are achieved on steam reformer services as the Terrace Wall design extends both tube and catalyst life.

The counter-current design significantly improves radiant firing efficiency resulting in lower fuel use for same product capacity.

**Modularisation**

The entire radiant section can be shop-modularised and transported to site, minimising costly high alloy field welding and inspection requirements.

All tube and pigtail welding is performed at fabrication shop, only inlet and outlet manifold welding between modules is required at site.

**Compact plot area**

Compact plot space due to the convection section mounted on top and to the side of the vertically oriented radiant section(s).

Further, when required, a close-coupled process gas boiler eliminates long transfer lines and their maintenance issues.
Amec Foster Wheeler’s proprietary Terrace Wall double-fired design is applied to horizontal tube units to provide the same uniformity in heat flux and predictability in flue gas recirculation as utilised in the vertical tube units.

This firebox layout, along with the low peak to average heat flux ratio, provides the optimum heat input for sensitive or severely fouling process fluids. This layout, with individual passes located in separate, isolated cells is especially beneficial in the delayed coking process and visbreaking. It allows precise flow and firing control for long operational time between decoking procedures.

The burners on both sides of the tubes fire upward, adjacent to a brick wall, spreading the flame along the tube length and providing the optimal heat flux profile in the firebox. Single and multiple burner levels (terraces) are provided, depending on specific process requirements, to control heat input to the radiant coil.

Grade mounting of radiant sections provides easy side access to view and monitor burners as well as full viewing of the tubes for optical pyrometry monitoring. The burners are side mounted for easy access and maintenance.
The convection section is located above and/or between Terrace Wall radiant sections. The number of convection sections can be varied from one per heater to one convection section per pass, depending on operational needs. In addition, they can be off-set from the radiant coil for ease of the entire radiant coil removal and replacement.

High thermal/fuel efficiency combustion air preheat can also be incorporated, as well as SCR equipment.

Applications

**Delayed coker heaters**

Offer optimal results under special and varying conditions including complex feedstocks, wide feed ranges, turndown, and on-line decoking for maximum run lengths.

**EDC cracking furnace**

A design, providing the required configuration for controlling heat input, residence time, and process film temperature.

**Hydrocracker heaters**

Horizontal tube designs provide the most uniform and predictable heat flux to the process coil.

**Vacuum and Visbreaker heaters**

For complex conditions requiring the benefits of low peak-to-average flux rates, controlling bulk fluid, film temperature and lower pressure drop.

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**Features/advantages**

**Process design and control**

Precise individual pass flow control and firing control.

Uniform heat flux to process from top to bottom of coil due to the double firing and the impact of the sloped walls; as the flue gas cools the distance from the walls to the tubes decreases.

Stabilised flame pattern on brick walls with an increased number of burners used has little chance of flame impingement.

When the process requires, multiple burner levels (terraces) for optimum control of heat flux are provided.

Special flat flame burners designed to Amec Foster Wheeler requirements are available in ultra Lo-NOx designs with ambient air and preheated air capability.

**Maintenance**

Full viewing of radiant tube from both sides for pyrometry measurement.

Grade mounting of radiant cell allows easy access to burners for control and maintenance.

Delayed coker heaters have robust radiant stanchions that provide for individual component replacement.

Multiple convection sections on delayed coker heaters can allow individual pass on-line mechanical decoking (pigging).

Radiant sections can be supplied with or without header boxes for quick access to return bends.

**Modularisation**

Each radiant cell can be shop-assembled with refractory, radiant coils, and manifolds.

The extent of modularisation depends on transportation limitations but can include air ducts, burners, floor refractory, and burner piping (if within scope of supply).

Convection section supplied fully modularised.
Arbor heaters

Arbor heaters are used mainly for high capacity vapour heating services since this configuration can be designed for low pressure drops. The arbor term describes the shape of the coil. Numerous parallel passes of U-shaped tubes are collected on inlet and outlet manifolds. Two arrangements of manifolds are used, top mounted manifold (inverted arbor, U) and bottom mounted manifold (arbor, wicket).

Inverted arbor/U-type

Inverted arbor or U-type with top-mounted manifolds, require side wall burner mounting and horizontal firing. Horizontal firing is limited to gas-only burners and leads to special considerations due to opposed burner firing. This style is selected to reduce the length of the large diameter transfer line connections to stacked reactors.

Arbor/wicket type

Arbor or wicket type, with bottom mounted manifolds, allows for floor fired burners and also allows for liquid fuel firing capabilities in addition to gas. This configuration is the original design used for multiple reactor heating applications. Wicket arbor units are capable of larger capacities in a single unit than inverted arbor units, due to the limitations of sidewall-fired burner flame coverage.

Many applications have multiple services combined into one radiant box separated either by brick walls or semi-separate radiant cells using air cooled dividing walls. Each service can be controlled by single-fired or double-fired burner firing.

Usually these services have very high inlet/outlet temperatures such that the services are rarely used in the convection section. A convection section can be located above the radiant cells for additional process heating or heat recovery steam generation.

Combustion air preheat and SCR can be provided on either design.

Applications

Catalytic reforming

- Aromatics (AROMAX®) heaters
- Continuous Catalytic Reforming (CCR) Platformer heaters
- Propane Dehydrogenation (Oleflex™, Catofin®) heaters

The following services are best suited in this style heater

- High capacity units
- Low fluid pressure
- Vapour phase heating
**Features/advantages**

**Process design and control**

Arbor-type heaters permit the use of many parallel process passes and are well-suited for high-capacity vapour-phase heating services, especially those requiring a low process-pressure drop.

Fuel gases are readily fired in either the sidewall-fired or floor-fired configurations. State-of-the-art ultra Lo-NOx burners can be designed to handle heavy oil fuels.

The conventional bottom manifold design is also well-suited for firing liquid fuels and can be designed to handle heavy oil fuels.

Control of tube metal temperatures or process outlet temperatures is provided by use of single-fired or double-fired burner firing.

**Maintenance**

Adequate space and platforms are provided along manifolds and penetration seals for proper monitoring and maintenance.

The large size of these heaters and coils requires a significant amount of access platforms often overlooked in budgeting but always provided by Amec Foster Wheeler.

<table>
<thead>
<tr>
<th>Air cooled wall design</th>
<th>Modularisation</th>
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<tbody>
<tr>
<td>Permits the radiant cell structural columns to be located at strategic points for convection section and stack support (simpler and less costly structures) and facilitates larger scale modularisation than the brick-wall design.</td>
<td>The air-cooled wall design approach permits large-scale modularisation of the radiant sections, with shop-installed casing, lining, and structural steel. Radiant coils can be supplied in arbors welded to manifolds for truck shipment. Convection sections are supplied in modules.</td>
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**Critical piping interface**

The movement of large high temperature transfer lines must be accommodated with a properly designed support system, using counterweights or springs. Amec Foster Wheeler’s specialists work with the client’s piping engineers to perform the combined system stress analysis for each coil and transfer line. This approach assures a proper, cost-effective system design, eliminating potentially costly pipe supports that would otherwise be needed.

**Modularisation**

The air-cooled wall design approach permits large-scale modularisation of the radiant sections, with shop-installed casing, lining, and structural steel. Radiant coils can be supplied in arbors welded to manifolds for truck shipment. Convection sections are supplied in modules.

Footnote:

AROMAX® is owned by Chevron Phillips LLC

Oleflex™ is owned by Honeywell’s UOP LLC

Catofin® is owned by Chicago Bridge & Iron Company NV’s Lummus Technology

Continuous Catalytic Reforming (CCR)
Platformer heaters is owned by Axens
connected excellence
in all we do
Vertical cylindrical

The vertical cylindrical (VC) design is the most widely used design in the industry. The radiant section, a vertical cylinder, has floor-mounted burners with vertical tubes arranged in a circle. Sometimes the radiant tubes are in a helix, resembling a large coil spring.

Flue gas flows upward from the radiant section to the horizontal tube convection section. Process preheat services and/or steam generation services are usually located here. A top-mounted stack provides natural draft operation.

Cellular vertical tube box

“Cellular” describes the appearance of this heater’s radiant section as viewed from a top cutaway. The tubes are arranged around the walls, forming a rectangle. This rectangle is further divided by several single rows of tubes arranged across the heater, plus another single row of tubes located along the center axis. The subdivisions are called “cells” or “modules”. The size and number of cells are determined by the heater capacity and burner arrangement.

Heat transfer to the tubes is achieved by a combination of single firing and double firing floor mounted burners. The wall tubes are single-fired, the transverse tubes are double-fired. The critical element in this design is balancing the pass arrangement. Careful design and layout is important to ensure each pass has symmetrical flow and heat transfer. With the process outlet in the double-fired tubes, the high inside film temperature is where the peak to average heat flux is the lowest.

Double-fired vertical tube box

The double-fired design consists of single vertical rows of radiant tubes arranged centrally between two rows of floor-mounted burners. This arrangement provides nearly uniform heating around the tube circumference, and optimises average heat input rates within limits of tube skin temperature and process film temperature.

Vertical tube design can be used in most all non-fouling services. Although these units are not drainable, with constant diameter tubes they can be pigged to remove fluids. Amec Foster Wheeler will select not only the most cost effective style, but will also provide reliable service based on the intended process conditions.

Combustion-air preheat and SCR equipment can also be integrated.

Applications

Cylindrical

- Most services

Cellular

- Atmospheric/ Crude
- Vacuum
- Bitumen
- Charge heating
- Hot oil

Double-fired

- Hydrocracker charge
- Hydrotreater charge
- Styrene steam superheaters
- Pyrolysis

- High temperature process heating
- High temperature steam/gas heating

Features/advantages

Process design and control

Amec Foster Wheeler has the skills and experience to select the best vertical tube design to optimise the heat input rates, adding dividing walls for additional control and determining the proper radiant height/length ratio for the process service.

The cellular type reduces residence time toward the process outlet in double-fired tubes, especially beneficial in severe services.

The cellular design is especially cost-effective for high capacity units, such as atmospheric (crude/bitumen) service as multiple passes are easily accommodated.

Cost saving design

Dependable and cost-effective design minimises plot surface and material costs. Double firing reduces radiant surface area without raising tube metal temperatures.

Minimum plot area

Vertical tube designs with top-mounted convection sections typically require less plot space than their horizontal-tube counterparts. Tube pull space is minimised as radiant tubes are pulled vertically.
Minimum number of burners

With forced-draft or combustion-air preheat, these designs can be tailored to require fewer burners.

These arrangements are often well-suited for firing liquid fuels.

Manifold piping interface

Springs or counterweights are used as required to accommodate expansions or applied external loads on large diameter inlet and outlet manifolds and transfer lines.

A coordinated effort with clients piping engineers minimises the piping interface requirements.

Modularisation

Vertical cylindrical heaters are well-suited for full radiant modularisation, either as full cans on smaller units to panels complete with radiant coils shop installed for large heaters.

Vertical tube box designs are typically supplied in full-height lined panels with radiant coils in bundles to minimise field work.

Convection sections are supplied fully modularised.
Horizontal tube box heaters

The radiant section tubes are horizontal and arranged in a rectangular box-shaped enclosure with a convection section above or between the radiant section(s).

The most popular design is single-fired, consisting of tubes located on the radiant sidewalls and roof with a row of upward-firing burners centrally located in the floor. Smaller units, often called “cabin” heaters, have one radiant firebox with a sloped roof resembling a cabin shape. Larger units have two or more radiant fireboxes, with an essentially flat roof.

On the single-fired design, the flexibility to adjust the radiant tube length to maintain proper height to width dimensions for well-stirred box design practice makes the horizontal tube box a practical design for many critical services.

Our widely used “classic” single-fired delayed coker features a central divider wall (bridgewall) in each radiant section. Burners are located in rows on each side of the bridgewall. This arrangement provides independent firing control for each process pass and enhances heat transfer to the firebox tubes.

Multiple passes on a wall can provide even heat flux and similar hydraulics by use of nested pass designs that is alternating passes down the radiant wall.

Double-fired versions are used in many critical services such as EDC cracking furnaces and hydrocracker heaters.

For EDC cracking furnace application, radiant wall burners are placed at multi-levels on both side walls providing uniform heat to the horizontal tubes located in the middle. Amec Foster Wheeler is experienced in offering the visbreaker heater with air preheat system design in accordance with all licensor design requirements.

Other options, such as combustion-air preheat and SCR equipment can also be integrated.

Applications

Refining

- Atmospheric (crude/bitumen)
- Delayed coker
- Vacuum
- Visbreaker
- Hydrocracker
- Hydrotreater charge
- Single-phase charge
- Reboilers
- Two-phase charge

Petrochemical

- EDC cracking furnaces
- Hot oil heating
- Reboiling
- Single-phase charge
- Two-phase charge

Features/advantages

Process design and control

Achieves better control of heat input to the tube with proper design of the firebox height to width ratio and if needed, use of bridgewalls.

Tube length can be increased over vertical tube designs without compromising flow stability or mechanical design. This benefits large-capacity units.

Tube layout facilitates thermal and hydraulic symmetry for each pass.

Potentially high turndown is especially critical for two-phase flow applications.

Multiple passes on each wall with nested pass design allows uniform heat input to each pass, critical for vacuum heater service (refer to details on facing page).

EDC cracking furnace design with multiple level side fired burners allows fine tuning of heat flux for optimal EDC conversion.

Roof tubes can be provided depending on process, to increase radiant surface area.

Maintenance

Radiant tubes can be individually pulled and replaced along with their tube supports if needed.

Radiant section can be supplied with or without header boxes for quick access to return bends. Mechanical cleanout (plug) headers, if desired, must be in header boxes.

Floor mounted burners are centrally located for proper operation and maintenance.

Modularisation

These heaters offer a high degree of modularisation, in which radiant cells can be shop assembled with refractory, supports and coils installed.

Convection sections are supplied fully modularised.
CO boilers or CO heaters are primarily found in fluid catalytic cracking units (FCCU), residue fluid catalytic cracking units (RFCCU) or fluid cokers in refineries. Amec Foster Wheeler’s equipment can also be used to combust any low-BTU off-gas stream for process heating or steam generation.
Our CO boiler/heater uses our proprietary adiabatic toroidal combustor design, a refractory lined chamber with no heat-absorbing surface followed by a heat recovery section. This combustor design ensures complete, dependable combustion of the CO or low-BTU offgas by thoroughly mixing the offgas, combustion air and supplemental fuel. In many cases the CO fuel content in the offgas is sufficient for combustion and the need for supplemental fuel firing is minimised.

**Forced circulation heat recovery**

The toroidal combustor and forced-circulation convective heat recovery sections are designed for high flue gas velocities to keep any catalyst particles entrained and flowing through the unit. There is no need for hoppers or other catalyst fines collection devices prevalent in other designs.

Heat recovery sections are arranged in horizontal tube rows, with flue gas flowing upward, similar to fired heater convection sections. Steam generation or process heating can be accommodated in these heat recovery coils. Our design experience allows use of tubes with low density thick fins, that is proven by years of successful operation.

**Natural circulation heat recovery**

The toroidal combustor can also be paired with a vertical tube natural circulation heat recovery section. This style is restricted to heat recovery of steam generation applications.

Amec Foster Wheeler engineers and supplies the entire combustor and heat recovery system including circulation piping/valves and the steam drum.

**Applications**

**Combustor sources**

- FCCU regenerator gas heat recovery
- RFCCU regenerator gas heat recovery
- Fluid coker off-gas heat recovery
- Low-BTU off-gas heat recovery

**With heat recovery to**

- BFW/steam services
- Crude heating services
- HC preheat services
- Vacuum heating services
- Hot oil heating services

**Features/advantages**

**Process design and control**

Toroidal combustor assures full combustion while entraining the catalyst fines or other particles so they pass through the unit.

Adiabatic combustor can reduce the amount of supplemental firing for the same heat recovery thus saving operating costs.

Conventional heater convection section design is used in the forced-circulation design for convenient maintenance and operations planning.

Robust pipe materials designed to handle erosive catalyst fines services in forced-circulation heat recovery coils.

Forced-circulation steam systems respond better to load changes and start-up fluctuations and have higher flue gas velocities to keep catalyst fines entrained and not deposited in the combustor.

For forced-circulation applications low-density finned tubes are used in FCCU applications for more cost-effective designs.

**Compact plot areas**

Horizontal convection bank mounted directly over the adiabatic combustor with vertical flue gas flow offers the smallest plot footprint and is an excellent choice for limited space (retrofit) applications.

**Soot blower selection**

Many services are dust laden, including catalyst fines. Amec Foster Wheeler has experience with robust sootblower designs and layouts that can entrain particles and prevent their deposition on heat transfer surfaces, including those with low density finning.

**Modularisation**

Heat recovery convection sections can be fully assembled in modules, with lining coils, and supports installed.

Combustor sections of CO boilers can be shop-assembled.

Steam drums, piping, and duct work, are typically shop assembled to maximum extent possible to minimise field erection time and cost.
Modularisation

When building a new heater, the degree of shop assembly is undoubtedly an important element of any offering. The low initial cost of lower shop prefabrication can easily double the TIC. Amec Foster Wheeler designs consider the TIC approach early in the proposal phase of the project where it is most critical for optimal TIC.

Regardless of the type or size of a fired heater or heat recovery unit, the proper assembly of its many components is critical for the successful performance of the unit. The steel casing and structure, refractories, radiant and convection coils, alloy supports, stacks and ducts can each be pre-assembled prior to shipment from fabrication shops, limited only by the shipping and lifting limits of the project.

Modularisation typically refers to large-scale preassembly, which combines the assembly of the various components into complete, integral units or sub-units. Probably the most frequent application of modularisation is the convection section of a fired heater or heat recovery unit. This comprises a large number of tubes with associated manifolds and return fittings, tubesheets, refractories and steel casing with structural members.

Even on panel designs it is important to consider how the panels are supplied and erected. Full-height vertical panels allow structural members to be included in the panels and eliminate column welding. Horizontal panels with structural members included will require structural field welds and increase field assembly time and cost.

Modularisation can be extended to virtually any level, even to complete heaters, with burners, piping and duct work installed.

Generally, the only items which need to be shipped separately are stacks and large equipment items such as fans and air preheaters. These items themselves are supplied as complete assemblies or sub-assemblies for efficient field installation.

Features/advantages

Project tailored

The heater design can be tailored to modularisation, to best match the site’s needs assuring the optimal TIC approach to the heater design and shop supply.

Several levels of modularisation are available depending on heater type, heater size, shipping clearances and site labor conditions. Amec Foster Wheeler can develop a project modularisation plan for:

► Coil bundles
► Fully assembled heaters
► Large modules
► Lined and unlined panels
► Overland transportable modules

Amec Foster Wheeler’s Terrace Wall steam reformer furnaces and delayed coker heaters are well-suited to modularisation and are very cost-effective on TIC evaluation. As another example, the use of separate radiant cells (air-cooled wall design) for a catalytic reformer may permit the cells to be modularised.

Considerations

The extent of shop fabrication or degree of modularisation should be carefully evaluated prior to award to consider the following points to achieve lowest TIC:

► Purchase price
► Shipping costs
► Shipping weights and dimensions (to plant and inside plant)
► Shipping time
► Lifting requirements
► Field erection costs
► Field erection time

Quality

A controlled shop environment provides skilled, specialised work forces and facilitates inspection and monitoring to assure quality products, minimising field work and fit-up problems.
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<th>Shipping and handling</th>
<th>Cost and time effectiveness</th>
<th>Constructability</th>
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<td>Amec Foster Wheeler’s project and logistics team carefully evaluates each design to assure proper clearances, structural integrity and protection in shipment and handling. Modules are structurally integrated and packaged to resist damage in shipping and handling, and to provide ease of installation in the field.</td>
<td>Field erection cost and time can be greatly reduced. This aspect is especially important for projects built in areas of limited work force, plot space or facilities.</td>
<td>Modules provide better ability to construct components to each other as compared to numerous similar-looking panels requiring accurate match marking and sequencing. Close cooperation with the field erector will optimise the use of any heavy-lift rigging needed on the job site.</td>
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</tbody>
</table>
Do you have a fired heater that is 20 to 40 or more years old and still performing well? If so, it’s probably an Amec Foster Wheeler fired heater. Since many Amec Foster Wheeler fired heaters perform well beyond their original design life, OEM parts and services are critical to keep these units operational. We continue to support the operation, maintenance and parts requests of fired heaters that remain in service.

OEM parts

If your fired heater has a turnaround in the future contact us, as we can assist you with your fired heater turnaround planning needs. We can also support unexpected shutdowns and warehouse stocking.

We provide spare parts for our fired heaters, including many older ones. This is important since these components are custom-designed and of specialty construction. Our replacement parts are specified, tested and inspected prior to shipment to meet OEM standards. We recognise the importance of a quick response, price competitiveness, and expedited delivery.

Aftermarket parts and services

Representative parts listing

► Sight doors – tighter fitting doors for modern burners
► Sight doors ceramic-formed surround – better pyrometry viewing
► Tube hangers
► Tube sheets
► Steam reformer parts
  ► Arch/floor seals
  ► Catalyst support cones
  ► Catalyst tube assemblies
  ► Pigtails
  ► Pusher bars
  ► Stress collars
► Coil hairpin assemblies
► Finned tubes
► Studded tubes

Whether your requirements for parts are an immediate need or you’re stocking your warehouse for normal heater maintenance, and/or unforeseen emergencies, you can depend on Amec Foster Wheeler to meet your needs.
Services
Amec Foster Wheeler offers several services to keep your old fired heater reliable and working longer.

Revamp services
Many of our design improvements, some of which are listed below, can provide benefits of lower maintenance costs, higher availability, better operating limits, lower NOx or improved fuel efficiency.

► Air preheat addition  
► Capacity upgrading  
► Changing process services  
► Convection section replacement  
► Emissions upgrading – burners and SCR equipment  
► Stack extension assessment  
► Steam reformer furnaces  
  ► Capacity increases  
  ► Feedstock upgrades  
  ► Process gas boilers  
  ► Single row conversions  
  ► Steam drums

Field services
Our experienced service staff can provide an audit of the current operation for correct mechanical installation, burner operation, and general operations.

► Emergency field repair  
► Energy audits  
► Steam reformer audits  
► Heater tuning/balancing  
► Burner tuning/replacement  
► Training

Metallurgical consulting services
New and existing fired heaters need careful review and selection of the proper materials for construction, due to heavier and sourer new crudes along with chemical process improvements. Amec Foster Wheeler has expertise to provide solutions for the following technical services:

► Coating specifications  
► Corrosion control and prevention  
► Fabrication specifications and recommendations  
► Failure analysis  
► Material selection and design review  
► Metallurgical assessments  
► Prevention and repair strategies  
► Problem resolution assistance  
► Repair recommendations

When enquiring
For Amec Foster Wheeler units, knowing the contract number or serial number (located on the nameplate) or general arrangement drawing number will help us provide you with a quick response to your enquiry. If your inquiry concerns other manufacturers please provide appropriate drawings or descriptions.
Amec Foster Wheeler designs, delivers and maintains strategic and complex assets for its customers across the global energy and related sectors.

Employing around 36,000 people in more than 55 countries, the company operates across the oil and gas industry – from production through to refining, processing and distribution of derivative products – and in the mining, power and process, pharma, environment and infrastructure markets.

Amec Foster Wheeler offers full life-cycle services to offshore and onshore oil and gas projects (conventional and unconventional, upstream, midstream and downstream) for greenfield, brownfield and asset support projects, plus leading refining technology.

Amec Foster Wheeler shares are publicly traded on the London Stock Exchange and its American Depositary Shares are traded on the New York Stock Exchange. Both trade under the ticker AMFW.

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