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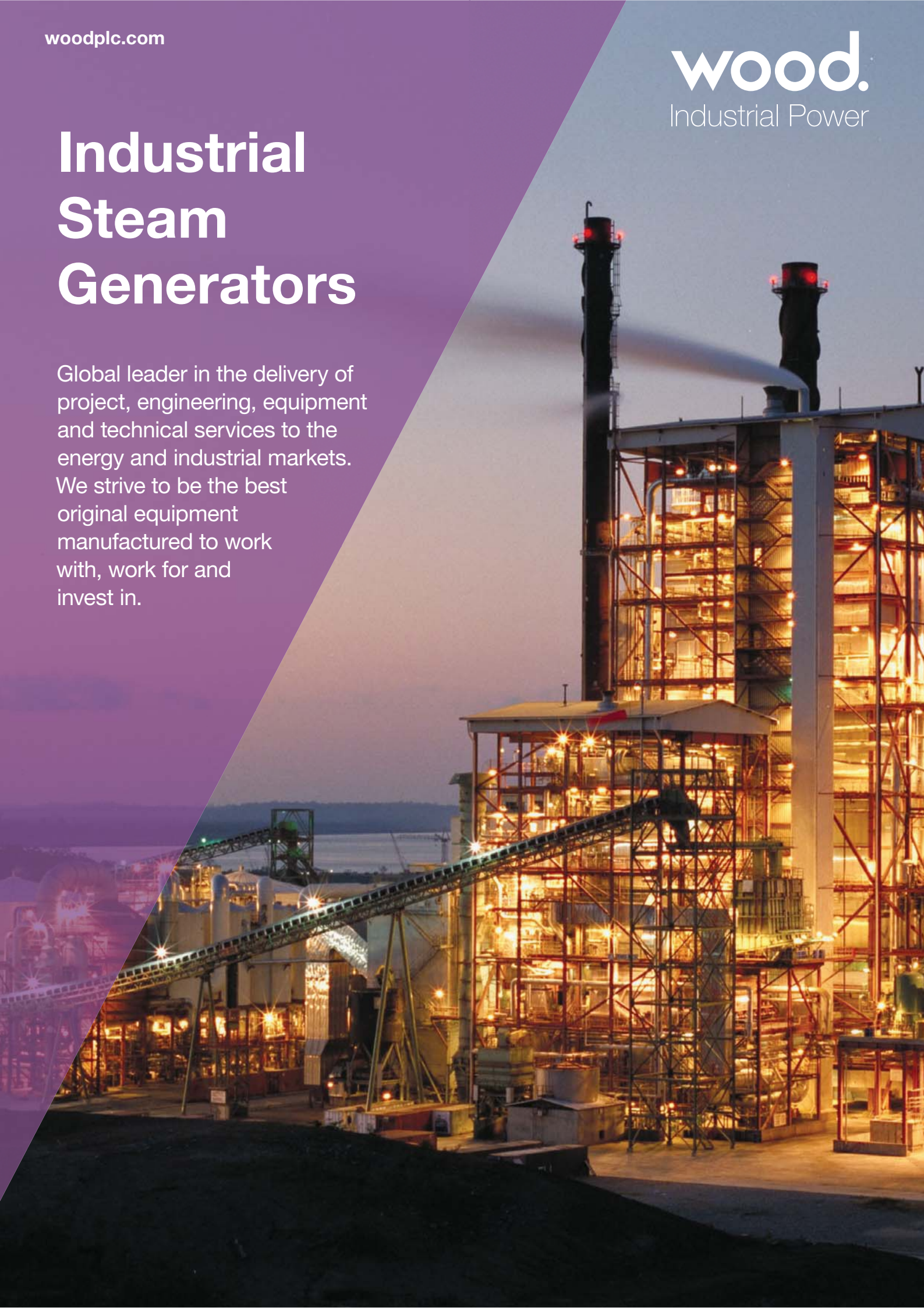
Industrial Power

Industrial Steam Generators

Global leader in the delivery of project, engineering, equipment and technical services to the energy and industrial markets. We strive to be the best original equipment manufactured to work with, work for and invest in.



A long history in industrial boilers

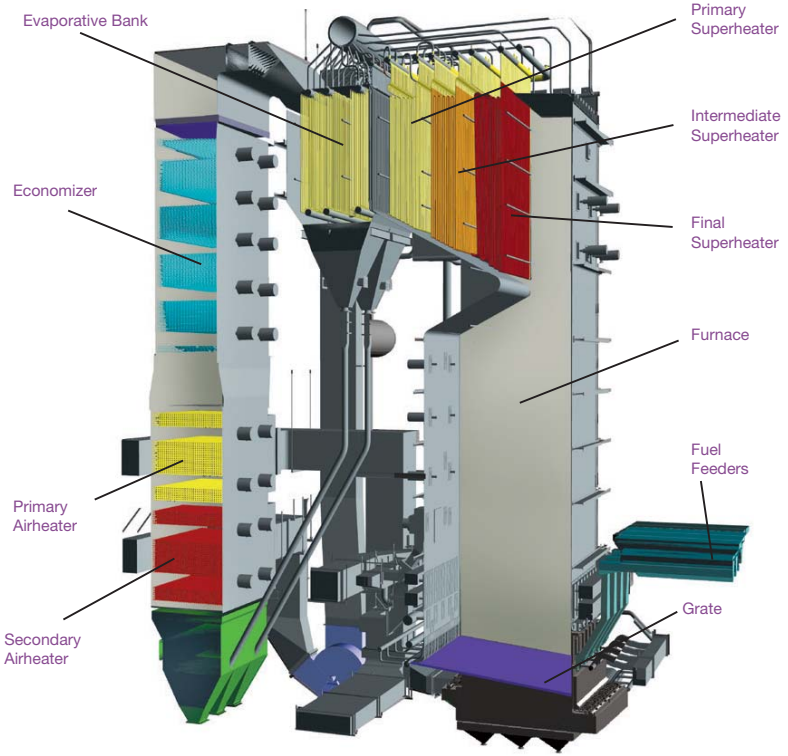
Having supplied thousands of industrial boilers, ranging in size from 10-450 tonne/hr steam capacity and up to 1000 MWe in Utility O&G Boilers, firing a wide range of liquid and gaseous industrial fuels, as well as biomass and solid waste fuels.

We design high-value innovative solutions as diverse as our Clients' needs. A good example of this is our Grate Steam Generator that provides superior fuel flexibility to the market. This includes fuels such as biomass, MSW, agro-waste and poultry litter, along with other solid fuels, to provide a renewable energy solution that meets strict environmental regulations and requirements.

In addition, we have delivered over 100 waste heat boilers for the 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 (including refinery, coke oven gas and blast furnace 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.

Biomass Grate Steam Generators



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.

General design features:

- Capacity: 30-300 tph (66-660 Kpph) *
- Pressure: standard units up to 110 bar (1600 psi)*
- Temperature: up to 540°C (1004°F)*
- Warm/hot standby
- Low heat-flux long-life furnace design
- Radiating / convective and drainable or non-drainable superheaters
- Utility quality drum internals
- Convective bank design–optimized to fuel type
- Own technology for flue gas emission abatement to met the most restrictive environment requirements.

*Higher parameters might be achieved on demand

Fuels:

- Wood and wood waste
- Forest residue
- Bark
- Peat
- Straw
- Bagasse
- Sunflower seed hulls
- Coffee grounds
- Sawdust
- Others

Camden County Energy Recovery Plant, 22 MWe

REFERENCE PROJECTS

Fatima

Location:	Punjab, Pakistan
Customer:	Fatima Energy Limited
Start-Up Year:	2017
Capacity:	220 tph (2 x 60 MWe)
Fuel:	Bagasse

REFERENCE PROJECTS

Laurentian Energy

Location:	Hibbing & Virginia, Minnesota
Customer:	Laurentian Energy Authority
Start-Up Year:	2006
Capacity:	2 x 68 tph (2 x 15 MWe)
Fuel:	Hybrid poplar, wood waste

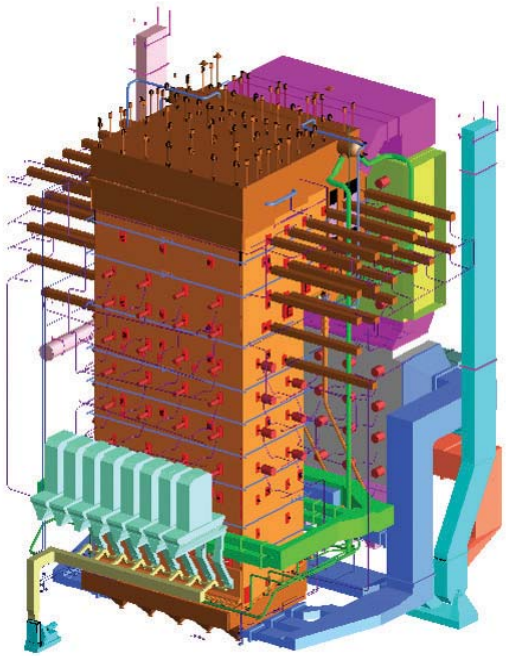
District Energy St. Paul

Location:	St. Paul, Minnesota
Customer:	Cinergy
Start-Up Year:	2005
Capacity:	155 tph (35 MWe)
Fuel:	Wood waste, oat hulls, demo wood

Greif Bros. Riverville Mill

Location:	Riverville, Virginia, USA
Customer:	Greif Bros. Corporation
Start-Up Year:	2003
Capacity:	75 tph (17 MWe)
Fuel:	Forest residues

Solid Waste Boilers



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- Warm/hot standby
- Low heat-flux long-life furnace design
- Radiating / convective and drainable or non-drainable superheaters
- Utility quality drum internals
- Convective bank design–optimized to fuel type
- Own technology for flue gas emission abatement to met the most restrictive environment requirements.

*Higher parameters might be achieved on demand

Municipal Solid Waste Boilers

- Vertical single-pass boiler design to provide long residence times for complete combustion and reduce risk of erosion at turns
- Refractory and overlay protection of lower furnace and superheaters to minimize corrosion of tubes to ensure longer boiler life between outages
- Wood Industrial Power has reliable experience firing MWS

Fuels:

- Poultry litter
- Agro-waste
- Municipal solid waste
- Tires
- Others

REFERENCE PROJECTS

Valorsul WTE

Location:	Lisbon, Portugal
Customer:	Valorsul SA
Start-Up Year:	1999
Capacity:	3x17 MWe
Fuel:	Municipal Waste

Sumitomo Miyazaki

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

Fibrominn

Location:	Benson, Minnesota
Customer:	Fibrominn LLC/SNC-Lavalin Power Inc.
Start-Up Year:	2007
Capacity:	245 tph (62 MWe)
Fuel:	Poultry litter

Waste Heat Boilers

General design features:

- Tube membrans walls
- Weld overlays applied to extend tube life, where applicable
- Efficient dust removal arrangement
- Gas flow profile optimized by CFD
- For non metallurgical application
- Wide tube spacing and sootblower cleaning

Our complete line of Waste Heat Boilers (WHB) are designed to cool the hot process gases. Heat is recovered for power generation, drying, heating and other purposes to improve process plant efficiency.

Our WHBs have been developed to operate reliably in severe environments. We have supplied more than 100 WHBs which are currently operating around the world.

REFERENCE PROJECTS

SunCoke HH2

Location:	Ohio - USA
Customer:	SunCoke Energy
Start-Up Year:	2014
Capacity:	Superheated steam 41 tph (90 kpph)
Unit Type:	WHB for coke production furnace

Cleco - Cabot Canal

Location:	Lousiana, USA
Customer:	Cleco Corporation
Start-Up Year:	2018
Capacity:	Superheated steam 179 tph (394 kpph)
Unit Type:	WHB for carbon black process

SunCoke GCO

Location:	Granite City, IL, USA
Customer:	SunCoke Energy
Start-Up Year:	2018
Capacity:	140 Kpph (64t/h)
Unit Type:	WHB for coke production furnace

Package Boilers

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.

General design features:

- High turndown with up to 20-100% 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
- Complex combination firing of multiple type of simultaneous fuels
- One button start-up

Fuels:

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

Boiler Series, Sizes and Steam Condition Ranges

Series	Capacity kpph / *tonnes/hr*	Overall Unit Dimensions			Weight tons / *tonnes*
		Height ft / *m*	Width ft / *m*	Length ft / *m*	
5000	50-100 / *23-45*	14.2 / *4.3*	12.3 / *3.8*	29-38.3 / *8.8-11.7*	36-45 / *33-41*
5100	90-210 / *41-95*	17-17.75 / *5.2-5.4*	13-13.3 / *4-4.1*	36.5-48 / *11.1-14.6*	48-83 / *44-75*
5200	190-270 / *86-123*	19-21.5 / *5.8-6.6*	17.3-19.3 / *5.3-5.9*	49 / *14.9*	84-106 / *76-96*
5300	250-360 / *113-163*	24.5-26.5 / *7.5 -8*	21.7-22.3 / *6.6-6.8*	51.5 / *15.7*	150-167 / *136-151*
5400	360-500 / *164-227*	28.5-30.4 / *8.7-9.3*	23.3 / *7.1*	54.3 / *16.5*	198-211 / *180 -191*
5500	500-600 / *227-272*	32.2-34.5 / *9.8 -10.5*	28 / *8.5*	54.3 / *16.5*	269-288 / *244-261*
Custom	600+ / 272+	*As per project request*	*As per project request*	*As per project request*	*As per project request*

REFERENCE PROJECTS

Dupont New 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

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 and propane 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

REFERENCE PROJECTS

Dow Chemical

Location: Tarragona, Spain
Customer: Dow Chemical Co.
Start-Up Year: 2006
Capacity: 220 Kpph (100t/h)
Fuel: Natural gas

Manifa Saudi Aramco

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

Chevron

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

Industrial Oil & Gas Boilers (SD, MD)

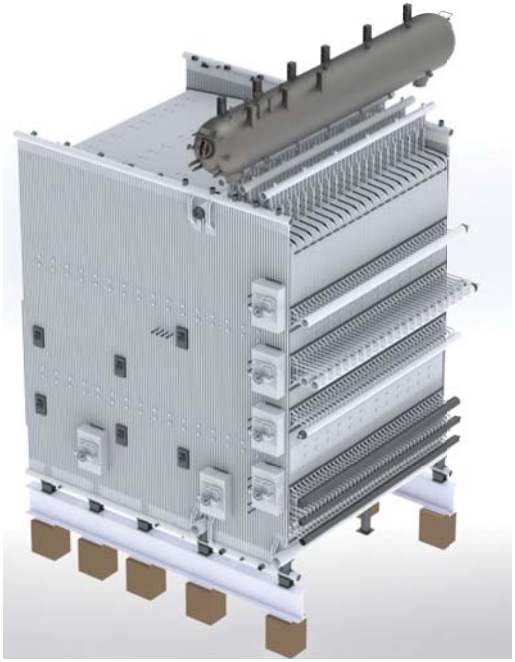
General design features:

- Monodrum (MD) or bidrum (SD) type
- 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
- 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

*Higher parameters might be achieved on demand

Fuels:

- Natural gas
- Refinery process gases
- Landfill gas
- Blast furnace gas
- Diesel
- Coke oven gas
- Waste gases
- Heavy fuel oil
- Waste liquids
- Carbon monoxide (CO)
- Others



Bottom supported single drum boiler

REFERENCE PROJECTS

Atherinolakos

Location: Crete, Greece
Customer: Public Power Corp.
Start-Up Year: 2008
Capacity: 226 tph (52 MWe)
Fuel: Oil

Louisiana

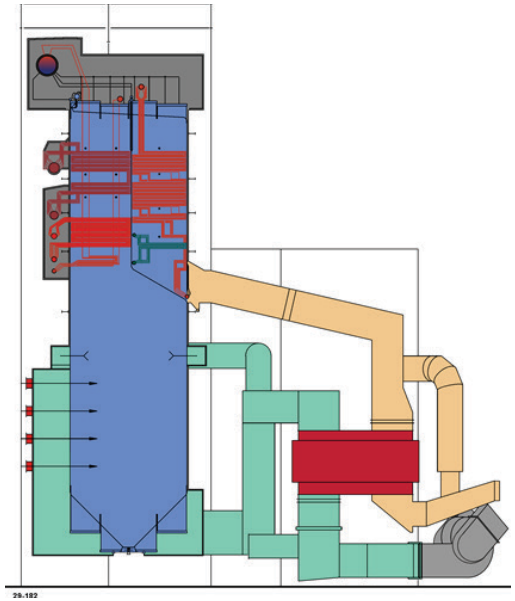
Location: St James Parish, Louisiana, U.S.
Customer: Air Liquid
Start-Up Year: 2018
Capacity: 260 tph
Fuel: Natural Gas + Purge Gas

Conoco

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

Utility Oil & Gas Boilers

- Supplied 310 (42 GWe) of field erected oil/gas boilers worldwide over the last 65 years
- Sub and supercritical designs
- Unit capacities up to 1000 MWe
- High availability demonstrated
  - 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
  - Soot blowers are strategically placed to provide effective cleaning
  - Cavities and access doors are provided in all major tube banks for inspections and maintenance
- Wide range of fuel experience
  - Crude oils
  - Refinery heavy residue, light oils and distillates
  - Natural, refinery and process gases
  - Blast Furnace gases
  - Coke oven gas



REFERENCE PROJECTS

Suez Gulf Units 1-2, Port Said Units 1-2

Location: Suez Gulf and Port Said, Egypt
Customer: Electricite de France
Start-Up Year: 2003
Capacity: 4x341 MWe
Fuel: Mazot oil or gas

Khabat

Location: Khabat, Iraq
Customer: POSCO Engineering & Construction Ltd.
Start-Up Year: 2015
Capacity: 2x164 MWe
Fuel: Residual and diesel oil

PT Kracatau

Location: Cilegon, Indonesia
Customer: POSCO Engineering & Construction Ltd.
Start-Up Year: 2006
Capacity: 2x100 MWe
Fuel: Blast furnace, gas and diesel oil