

The Best Keeps Getting Better

Presenting the next gen multi-fuel hybrid boiler: COMBIPAC[®]

Capacity: 4 TPH to 25 TPH

Standard Design Pressure - 10.54/17.5 kg/cm²(g)

Improving Your Business is Our Business.

Thermax is an engineering major providing sustainable solutions in the areas of energy and environment.

Spanning over 88 countries, clients make use of Thermax's business to business solutions for heating, cooling, power and cogeneration plants, waste heat recovery units; systems for water & wastewater management and air pollution control; performance improving chemicals.

Thermax's operations are supported by ongoing Research & Development, tie ups with global technology majors, an international sales & service network spread over 27 countries and state of the art manufacturing facilities in 14 locations including India, Indonesia, Poland, Denmark and Germany.

As a part of Thermax, Heating business offers packaged boilers, thermal oil heaters, waste heat recovery boilers, hot water and air generators. These are available in modular construction as a standard package configuration or a custom design for specific requirements. Innovation focus on servicing customer requirements driven by our strong R&D team enables us to offer a range of heating systems designed to combust wide range of solid, oil & gas fuels including biomass and heavy liquid fuels.

Heating business helps firms small, medium as well as fortune 500 companies to reduce energy cost offering solutions on oil & gas based systems, biomass and solid fuel fired equipment across India, the Middle East, Europe, South East Asia and Africa.

COMBIPAC® (CPF)

Combipac® is a hybrid - smoke and water tube boiler, with fluidised bed combustor (FBC) offering multi-fuel flexibility, best-in-class efficiency & superior response to steam load. FBC provides for uniform distribution and homogenous mixing of fuel and air at steady bed temperature resulting in the consistent and steady combustion parameters, and lower emissions.

Combipac® comes with high standard of instrumentation and a high level of safety interlocks ensuring safe, and reliable operation. This series offers flexibility for a variety of fuels like coal, lignite, biomass / agrowaste including low grade high ash coal.



Fuel Firing Options

Fossil Fuel



Coal



Lignite

Biomass / Agrowaste



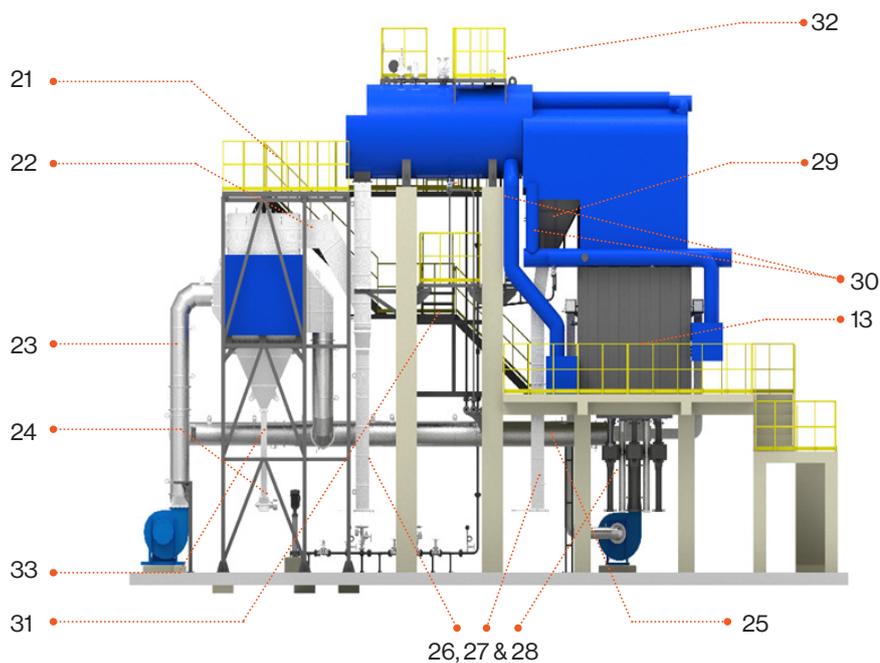
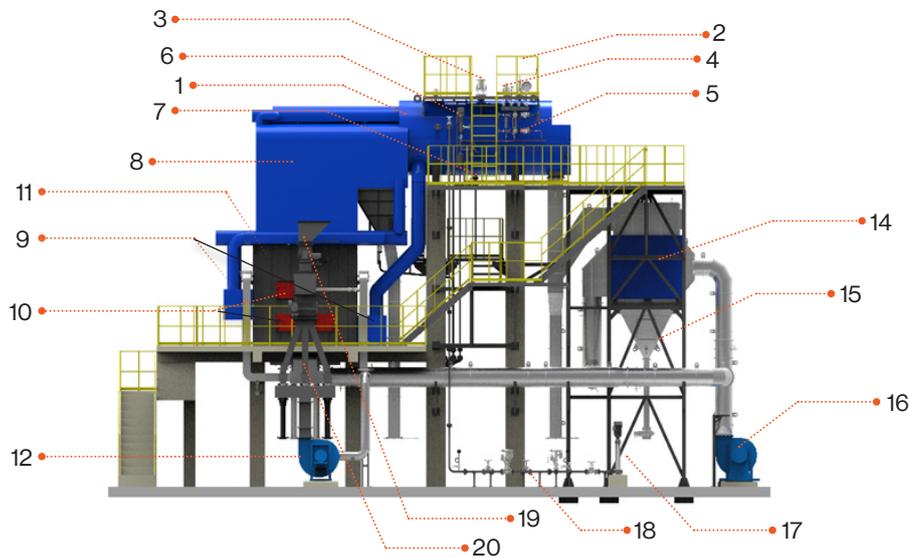
Biomass Pellet



Rice Husk

Key Components

Standardised balance of plant (BOP) and pre-engineered layout provides a one-stop solution ensuring high quality, safe, ergonomic operation & hassle free installation. (Installation- offered optionally)

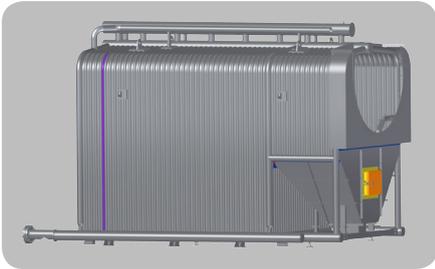


- 1 Boiler Shell
- 2 Boiler Trim Access Platform*
- 3 Main Steam Stop Valve
- 4 Safety Valves
- 5 Level Gauge Glass Assembly
- 6 Level Controller
- 7 Blow Down Valve
- 8 Membrane Panel Assembly
- 9 In-Bed Header Assembly
- 10 Access Doors
- 11 Bottom Structure
- 12 Booster Fan Assembly*
- 13 Furnace
- 14 Air Pre-heater Assembly (APH)
- 15 APH Support Structure*
- 16 FD Fan Assembly
- 17 FW Pumping System
- 18 Feed Pipe Assembly
- 19 Overbed Fuel Feeding*
- 20 Underbed Fuel Feeding*
- 21 Smoke Tubes Access Platform*
- 22 Flue Gas Ducting*
- 23 Primary Air Ducting*
- 24 APH Rotary Airlock Valve
- 25 Combustion Air Ducting*
- 26 Ash Drain Port (Shell)*
- 27 Ash Drain Port (MPA)*
- 28 Ash Drain Port (Bed)*
- 29 Ash Settling Chamber
- 30 Riser & Downcomer Assembly
- 31 Staircase for Platforms (Steel)*
- 32 Railings for Platforms (Steel)*
- 33 Ash Drain Port (APH)*

Note:

- * Items are part of optional scope of supply
- * Kindly refer scope of supply document for details of balance of plant equipment
- * ID fan is part of standard scope of supply

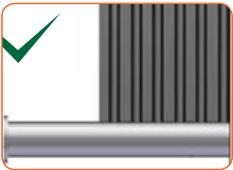
Key Components of COMBIPAC®



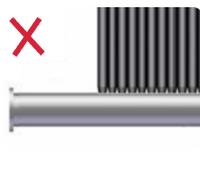
Membrane Panel Assembly (MPA)

Water wall panels provide a water-cooled, leak-tight enclosure for combustion gases, ensuring proper residence time, effective radiative heat transfer and lower furnace exit temperature.

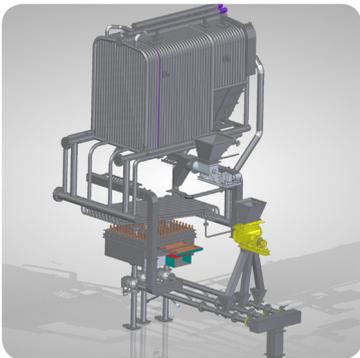
- Higher residence time ensures complete combustion, hence better efficiency
- Lower FOT ensures lower fouling and slagging, providing better uptime
- Tube-strip-tube design achieves higher heat transfer area, along with higher circulating velocity thereby, avoiding phase stratification
- Tubes without flow constrictions ensure lower pressure drop & improved circulation ratio



Tube-Strip-Tube Weld
(by Thermax)



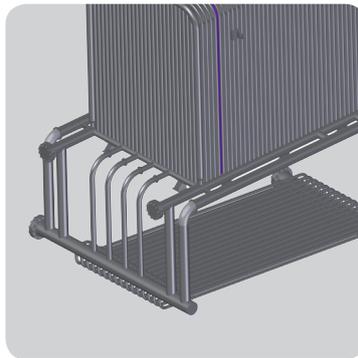
Tube-Tube Weld
(by others)



Fuel Feeding System

Ensures that a variety of fuel is fed with uniform distribution over the combustor area at a controlled rate commensurate with steam load requirement.

- Availability of options - UBF or OBF or UBF + OBF ensures multi-fuel flexibility protecting customers against fluctuations in fuel availability & cost
- Right combination of feeding type & fuel nature ensures the most efficient & trouble-free operation. E.g. OBF for husk, UBF for high moisture coal



In-Bed Coils

Transfers the heat from fuel bed to circulating water in order to maintain the bed temperature at an optimum level. Reduces need of higher excess air to cool the bed.

- High heat transfer coefficient leads up to 40% heat absorption
- Minimises clinker formation, slagging & lowers NOx emissions
- Design with bends outside bed & high pitch minimises erosion
- High circulation ratio & water velocity eliminates tube overheating



Shell Assembly

Provides an enclosure to the convective smoke tubes & required water hold-up along with large steam water interface & high freeboard.

- Generates high quality steam with better response to fluctuating steam loads
- Single pass design, eliminates flue gas reversal resulting in lower erosion
- Tube coil inserts enhances heat transfer

Smart Control Options

Thermowiz™

User Comfort

Touchscreen graphical operator interface



MIS Reporting

Real-time trends, facility for data logging on a USB drive



Networking

Embedded ports on ethernet serial, CANOpen protocols



Program Modification

Modification

Facility to download revised programs through a USB drive



Stay Connected

Via web-gate using a PC browser. Remote access on smart phones/tablets



Auto Combustion Control System

Amount of fuel to be fired & required combustion air changes with variation of process load on the boiler. Higher than necessary air results in excess air loss, whereas lower air results in unburnt losses. Hence, it is important to accurately maintain the air to fuel ratio in order to respond to fluctuating load as well as to maintain better efficiency at part load.

Scope includes:

- Pressure sensor to map the variation in process load
- VFD operated feeders to accurately maintain fuel firing rate
- Pneumatically actuated combustion air damper for modulating airflow
- PID controller to interpret the load on boiler and to actuate the control elements



Auto Draft Control System

For safe operation of a solid fuel fired boiler, it is important to ensure the passage of flue gasses through the boiler while maintaining a negative draft. The draft requirement varies with change in process load on the boiler. More than necessary draft allows higher excess air to pass through the system thus, increasing loss in efficiency & higher power consumption.

Scope includes:

- Pressure sensor to map the variation in draft
- VFD operated ID fan to accurately maintain draft
- PID controller to interpret draft in the system and actuate control element



Drum Level Control System

Water level control is the most important concern area for boiler management. If the water level of boiler drops below a specified limit, it can lead to serious mechanical failure. ON/OFF systems are employed in small capacity manually operated boilers, but they have serious limitations like slow response, more wear & tear, variance in steam pressure & water carryover.

- **Single element control:** Employs level transmitter & control valve mechanism along with PIC controller to accurately maintain the water level.
- **Two element control:** This operates on two loops. The primary loop works on the error in water level and is comparatively slow. The secondary loop works directly on steam demand and has a faster response.
- **Three element control:** A third loop is superimposed on the previous calculations by measuring the actual flow rate of feedwater into the boiler. This system is often deployed where water level fluctuations cannot be tolerated.

Note: Above controls are part of optional scope of supply

What Makes the New COMBIPAC® Better than the Best?



All side enclosed membrane panel assembly

- Up to 40% reduction in refractory by replacement of front and rear furnace refractory wall with water wall
- Reduces refractory installation and maintenance cost
- Reduces loss of efficiency due to air ingress caused by refractory wall wear and tear
- Up to 100% additional radiative heat transfer area
- Reduces potential fouling in smoke tubes due to lower furnace exit temperature
- Higher HTA clubbed with lower heat flux ensure better life even with low grade coal



Integral ash settling chamber in MPA

- Novel design with reversal ensures better ash settlement reducing ash carryover to smoke tubes
- Additional HTA lowers shell inlet temperature
- Reduction in fouling in smoke tubes leading to higher uptime
- Improves tolerance for fouling fuel by lowering FOT thus improves fuel flexibility



Inline IBH orientation

- Up to 60% higher heat transfer area
- Improved flow distribution in MPA
- Improved life of MPA
- Lower bed temperatures result in lower emissions and a reduction in clinker formation



Standardised balance of plant options

- Pre-engineered to the engineering standards
- Safe access and ergonomic operation
- Single point responsibility ensures hassle free installation
- High quality of material
- Smart layouts lead to compact footprints

Major Applications



Textile Processing



Drugs & Pharma



Edible Oil



Dairy



Chemical

Technical Specifications

Description	Unit	CPF-40	CPF-60	CPF-80	CPF-100	CPF-120	CPF-140	CPF-160	
Steam Output F&A 1000 C	kg / hr	4000	6000	8000	10000	12000	14000	16000	
Design Pressure (SVLOP)	kg / cm ² g	10.54 / 17.5							
Fuel		Rice Husk / Indian Coal / Indonesian Coal / Kutch Lignite							
Fue Feeding System		Underbed / Overbed							
Combustion System		Fluidised bed combustion							
Furnace Compartments		1			2				
Efficiency (UBF / OBF)		As per BS 845 Part-1 NCV basis							
Rice Husk	%	85 / 84							
Indian Coal	%	86 / 85.5							
Indonesian Coal	%	86.5 / N/A							
Kutch Lignite	%	84.5 / N/A							
Fuel Consumption		Underbed/Overbed							
Rice Husk	kg / hr	876 / 887	1314 / 1330	1753 / 1773	2191 / 2217	2629 / 2660	3067 / 3103	3505 / 3547	
Indian Coal	kg / hr	585 / 589	878 / 883	1171 / 1178	1464 / 1472	1756 / 1767	2049 / 2061	2342 / 2356	
Indonesian Coal	kg / hr	446 / N/A	669 / N/A	892 / N/A	1115 / N/A	1338 / N/A	1561 / N/A	1784 / N/A	
Kutch Lignite	kg / hr	741 / N/A	1111 / N/A	1482 / N/A	1852 / N/A	2223 / N/A	2593 / N/A	2964 / N/A	
Connected Load (10.54 / 17.5)		With APH and Cylomax or bag filter and RAV for APH and Cyclomax							
UBF	kw	46 / 48	67 / 71	86 / 88	105 / 115	131 / 135	167 / 175	173 / 180	
OBF	kw	39 / 41	58 / 62	75 / 77	91 / 100	113 / 117	149 / 157	150 / 157	
Dimensions (OBF + UBF)									
Width	m	8.4	8.5	8.9	9.1	9.4	9.6	10.0	
Length	m	15.7	16.6	17.8	19.9	20.7	21.1	21.4	
Height	m	10.8	10.8	11.1	11.1	11.4	11.7	11.8	
Chimney Top Diameter	mm	600	700	800	900	1000	1100	1150	
Dry weight of Single Largest Module	kg	4106	5565	7553	8579	9842	11738	13797	

Notes:

- Efficiency and fuel consumption is calculated as per the analysis of fuel mentioned in the offer. It may vary as per variation in fuel specifications. Kindly refer offer document for more details.
- Weights & dimensions mentioned in the table may vary
- N/A - Not applicable

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Boiler and Heater



Absorption Cooling



Air Pollution Control



Process Heating



Solar



Water & Waste Solutions



Power Generation



Process Cooling



Chemicals



THERMAX

Sustainable Solutions in
Energy & Environment

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