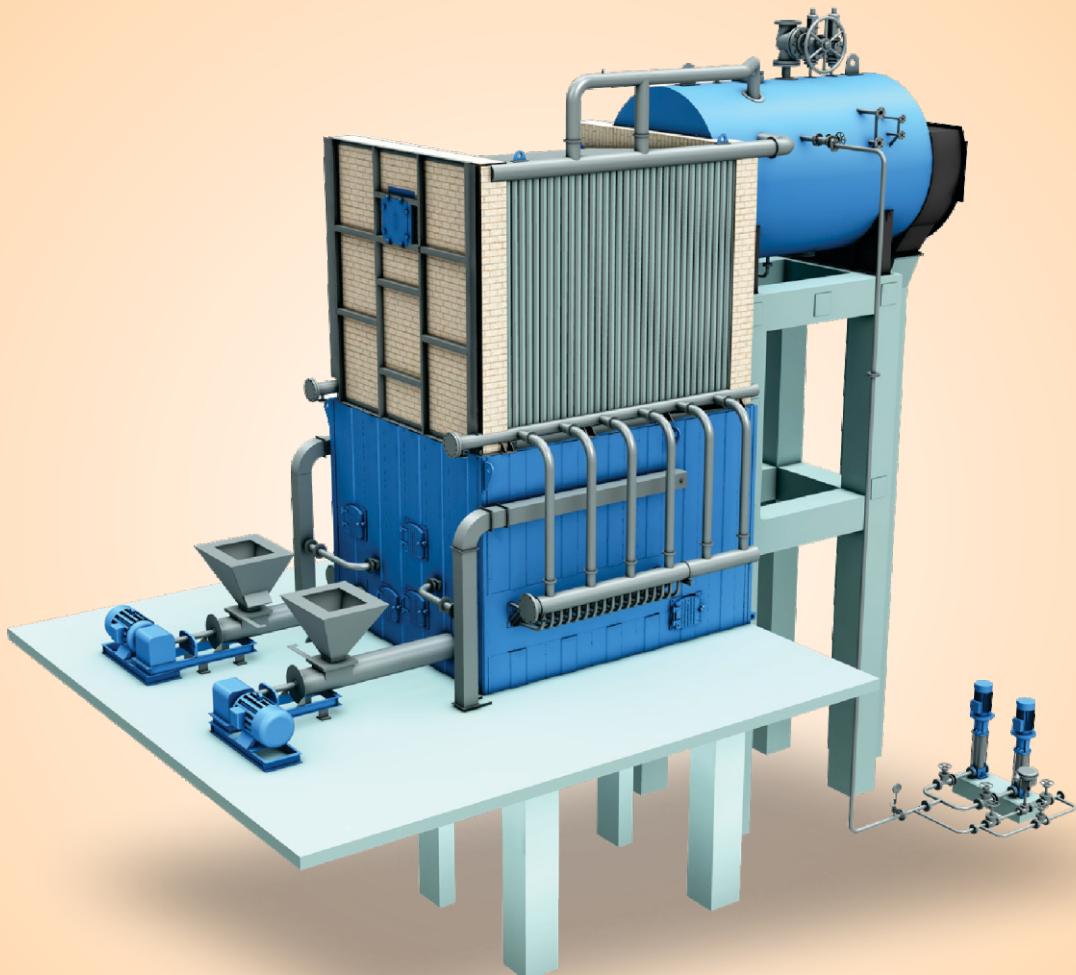


# COMBIPAC®

The Multi Fuel Fired Hybrid Boiler



**Capacity Range**  
4 TPH to 16 TPH

**Standard Design Pressure**  
10.54 & 17.50 kg/cm<sup>2</sup> g

**Heating Business**

## Improving your business is our business

Thermax is an engineering major providing sustainable solutions in the areas of energy and environment. Spanning over 86 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, China, Poland, Denmark and Germany.

As a part of Thermax, Heating business - a strategic business unit 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. Innovated by a strong R&D that focuses on customer applications, we offer a range of heating systems designed to combust wide range of solid, oil & gas fuels including biomass and heavy liquid fuels. Heating SBU helps small and medium firms & fortune 500 companies to reduce energy cost with a worldwide presence of oil & gas based systems in Middle East and Europe, biomass and solid fuel fired equipment in South East Asia and Africa.

### The Multi Solid Fuel Fired Hybrid Steam Boiler

The Combipac (CPFD) is a hybrid smoke and water tube design boiler, with the combustor based on the principle of Fluidised Bed Combustion (FBC). The fuel bed is fluidised by the injection of air from the bottom of the bed, through a set of air nozzles, using a FD fan. This produces a fuel bed resembling a boiling fluid, which helps to achieve uniform mixing and efficient combustion.

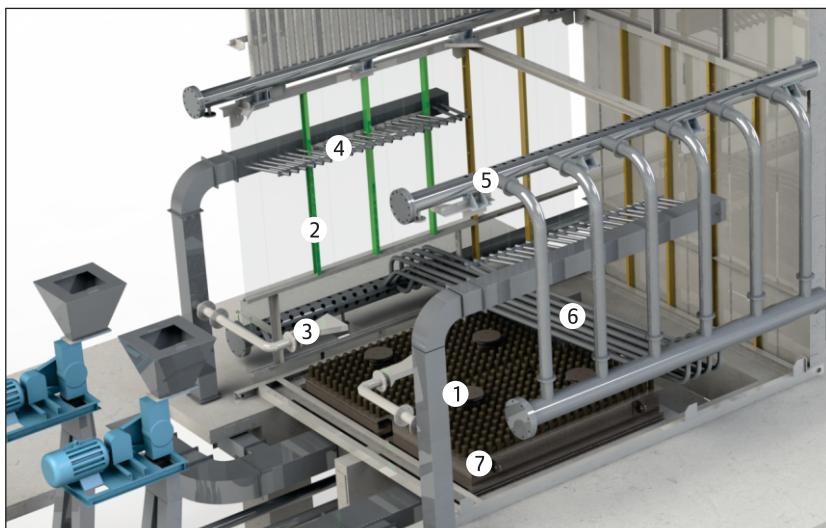
In these Combipac - FBC range of boilers, the higher turbulence levels, better residence time, low excess air and uniform distribution of air and fuel improve overall combustion efficiency, better response to steam load.

These Combipac boilers also offer the flexibility of firing a wide variety of low cost solid fuels like coal, biomass/agro-waste efficiently.

### Salient Features

- Best suited to burn fine particles
- Controlled bed temperature
- Flexibility in operation
- Rapid responses to load
- Maximum unburnt losses
- Ability to handle high ash coal
- Low excess air required hence higher efficiency
- Fully automatic operation
- Uniform heat flux ensuring longer refractory life
- Specially designed air nozzles for optimum performance
- Ability to handle high moisture (upto 35%) on coal.

### Internals

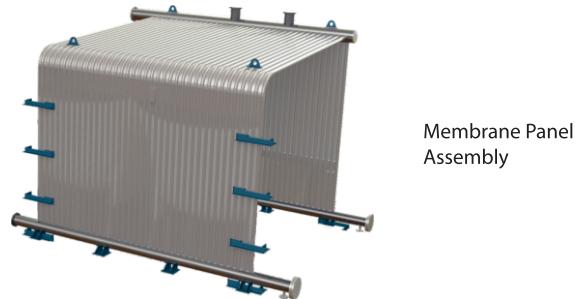


1. Fuel Feeding Nozzle
2. Furnace Structure
3. Fuel Spreader
4. Cycloidal Air Injection System
5. Downcomer
6. I Bed Tubes
7. Air Nozzle

## Membrane Panel Assembly

D-type Membrane Panel :

- Controlled bed temperature
- To achieve water circulation
- Reduces stress concentration on the shell tube plate
- Effective radiative heat transfer due to optimum distance between membrane panel assembly and bed



Membrane Panel Assembly

## Shell Assembly

Efficient and dependable convective pass design :

- Single pass design
- Optimally sized diameter tubes
- Elimination of turning of flue gas in convective bank
- Reduction in tube and tube plate erosion

High steam quality and better load response :

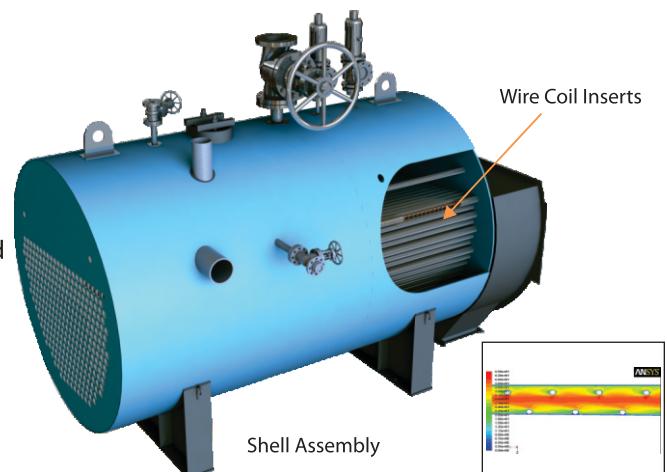
- Higher steam / water interface area and higher freeboard
- Ensure better steam quality
- Large water holding capacity
- Better response to the fluctuating loads

Wire coil inserts :

- Improved flue gas turbulence and velocity
- Improved heat transfer performance

Simple layout :

- Smoke chambers with hinged doors
- Easy cleaning



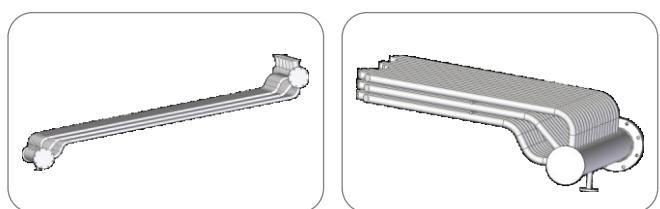
Temperature Profile of Shell Tube

## In-Bed Tubes

The membrane panel in the Combipac CPFD is provided with integrated in-bed tubes to recover heat from the radiation zone and maintain uniform bed temperature.

Salient Features :

- All bends are placed outside fuel bed zone eliminating erosion levels.
- Due to higher pitch, lower air & particle velocity between tubes is achieved ensuring reduction in erosion levels.
- Designed with very high circulation ratio and water velocity to eliminate tube overheating.



Bed Header Assembly

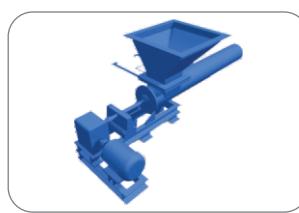
Bed Header Assembly

## Fuel Feeding System

Combipac CPFD fuel feeding offers the flexibility to fire a wide variety of solid fuels in this boiler.

### • Under Bed Feeding (UBF)

The under bed feeding system is suitable for fuels like Rice Husk, Indian Coal, Indonesian Coal, Lignite etc. The under bed feeding system consists of a rotary feeder and a booster fan.



Screw Feeder



Under Bed Feeding System

### • Over Bed Feeding (OBF)

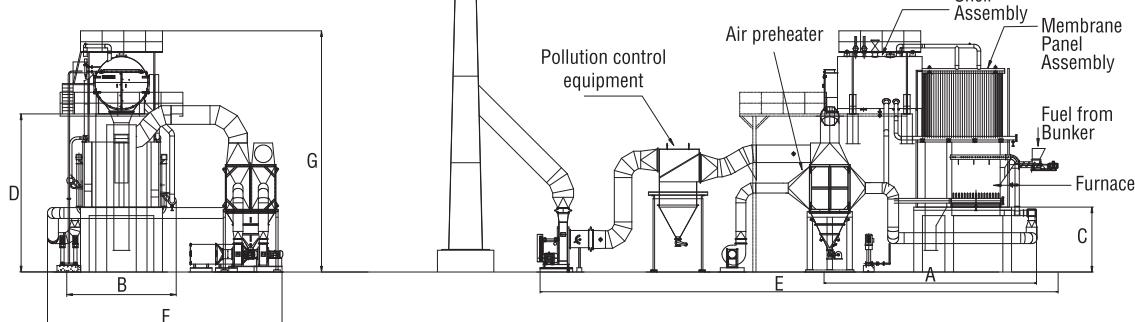
The over bed feeding system in the boiler is by a screw feeder, suitable for fuels like Coals, Paddy Husk, Biomass Pellets and PKS.

# Technical Specifications

Description	Unit	CPFD-40	CPFD-60	CPFD-80	CPFD-100	CPFD-120	CPFD-140	CPFD-160
Capacity (kg/hr F&A 100 deg C)	kg/hr	4000	6000	8000	10000	12000	14000	16000
Design pressure (SVLOP)	kg/cm <sup>2</sup> g				10.54 / 17.50			
Fuel				Husk/ Indian Coal/ Indonesian Coal/Lignite				
Fuel feeding system				Auto - Underbed / Overbed				
Combustion system				Fluidised Bed Combustion				
Furnace compartments		1					2	
Efficiency (Underbed / Overbed)	%			As Per BS 845 Part -1 NCV Basis				
Husk	%			85 / 84				
Indian coal	%			86 / 85.5				
Indonesian coal	%			86.5 / NA				
Lignite	%			84.5 / NA				
Fuel Consumption				Underbed / Overbed				
Husk	kg/hr	876/887	1314/1330	1753/1773	2191/2217	2629/2660	3067/3103	3505/3547
Indian coal	kg/hr	585/588	878/881	1171/1175	1464/1469	1756/1763	2049/2056	2342/2350
Indonesian coal	kg/hr	446/NA	669/NA	892/NA	1115/NA	1338/NA	1561/NA	1784/NA
Lignite	kg/hr	741/NA	1111/NA	1482/NA	1852/NA	2223/NA	2593/NA	2964/NA
Connected load (10.54 / 17.5)				With APH & MDC				
Under Bed firing		40/43	58/61	75/77	94/103	117/121	141/148	161/168
Over Bed firing		32/34	47/50	60/62	76/85	96/100	119/127	130/137
Connected Load (10.54 / 17.5)				With APH & Cyclomax or Bagfilter				
Under Bed firing		48/50	69/73	90/92	109/119	135/139	171/178	180/188
Over Bed firing		39/41	58/62	75/77	91/100	113/117	149/157	150/157
Dimensions								
A	mm	9841	9900	10651	11130	12000	12900	11950
B	mm	4600	4829	5449	5300	5500	7249	7369
C	mm	3000	3000	3000	3000	3000	3000	3000
D	mm	6515	6370	7040	6905	7295	7495	7505
E	mm	23000	24000	24400	25000	25000	27000	25063
F	mm	8220	8704	9654	9955	10675	12544	12804
G	mm	9040	9045	10084	10100	10870	10990	11000
Chimney top diameter	mm	600	700	800	900	1000	1100	1150
Dry weight (10.54 / 17.5)								
Boiler shell	tonne	4.5 / 5.0	6.0 / 6.5	7.5 / 8.5	9.0 / 10.0	12.5 / 14.0	14.0 / 16.5	17.0 / 19.0
Furnace*	tonne	32.0	37.0	46.0	54.0	70.0	75.0	75.0
Flooded weight (10.54 / 17.5)								
Boiler shell	tonne	10.0 / 10.5	12.0 / 12.5	16.0 / 17.0	19.0 / 20.0	26.0 / 27.5	29.5 / 32.0	34.5 / 36.5
Furnace*	tonne	33.0	38.0	47.5	55.5	72.0	77.0	77.0

Note: Design standard-IBR. Efficiency is calculated based on NCV of Husk as 2900 kcal/kg, Indian coal as 4300 kcal/kg, Indonesian coal as 5600 kcal/kg and Lignite as 3450 kcal/kg. \*Furnace weight includes furnace structure, membrane panel and refractory. Above mentioned weights and dimensions may vary with actuals. Please refer to offer document for more details.

## General Arrangement



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### Thermax Business Portfolio

- Heating
- Cooling
- Power
- Air Pollution Control
- Chemicals
- Water and Wastewater Solutions
- Solar
- Specialised Services