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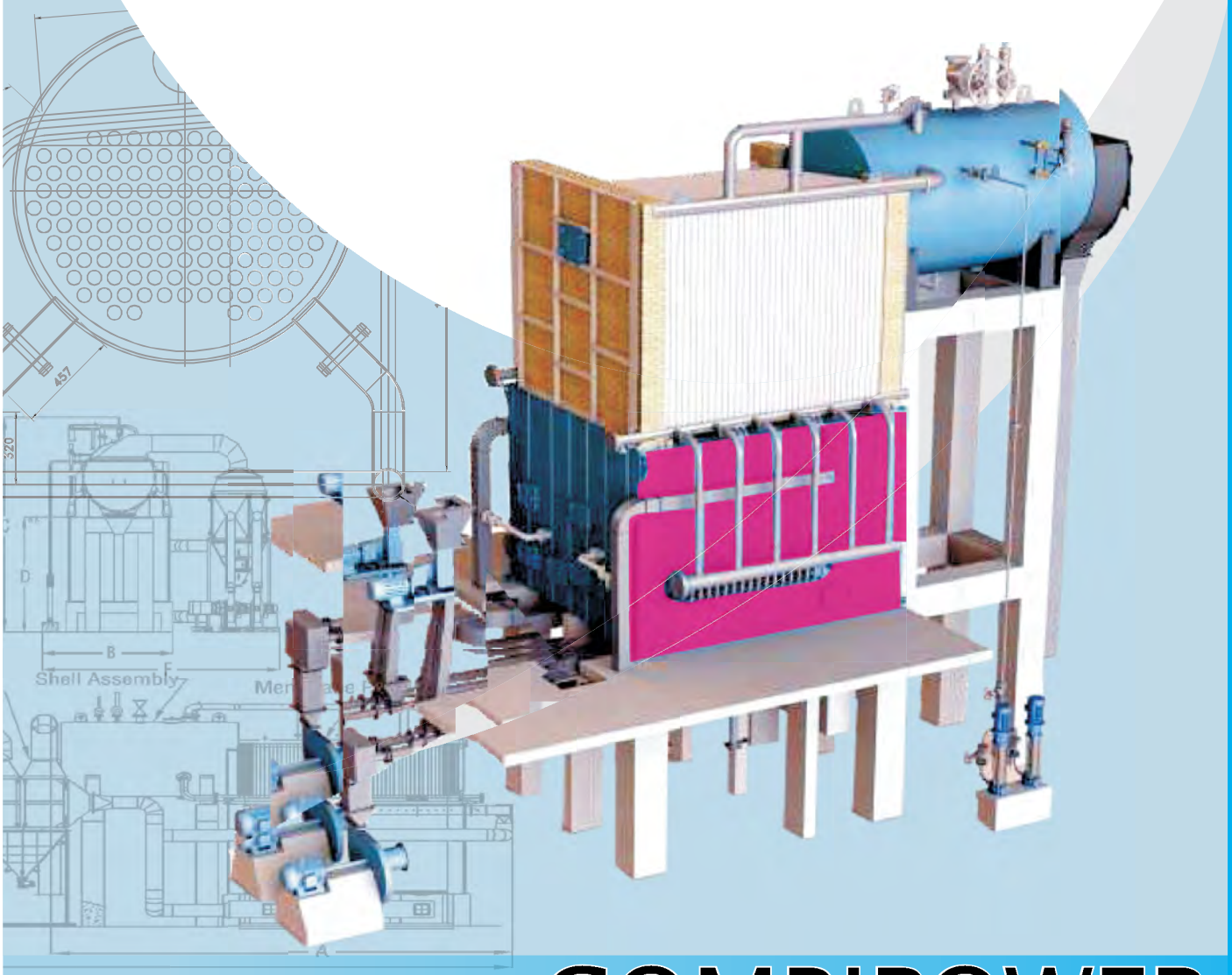
BOILERS PVT. LTD.

PROCESS HEATING SYSTEM



COMBIPOWER

Multi Solid Fuel Fired, Water Wall Membrane Type Steam Boiler With Fluidised Bed Combustor

Capacity Range
1000 Kg/hr TO 20000 Kg/hr

Standard Design Pressure
10.54 & 21.0 Kg/cm^{2}g

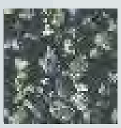
The Combipower-FBC is hybrid smoke tube and water tube type design boiler, with the combustor based on the principle of fluidised bed combustion (FBC). The fuel bed is fluidised by the injection of air form the bottom of the air plenum chamber. through a set of air nozzles using an FD fan. this produces a fuel bed resembling a boiling fluid, which helps achieve uniform mixing and efficient combustion.

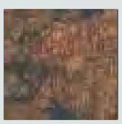
in this Combipower-FBC range of boilers, the higher turbulence levels, better residence time, low excess air and uniform distribution of air and fuel improve overall combustion efficiency.

Combipowre-FBC boilers also offer the flexibility of firing a wide variety of low cost agro-waste and other low grade solid fuels efficiently.

Product offering

- **Capacity:** 2,000 to 20,000 kg/hr
- **Standard Design Pressure:** 10.54 & 21.5 kg/c (models available up to kg/cm^2g)
- **Fuel:** Paddy Husk, Coal, Lignite, Groundnut Shell, Petcoke, Sawdust, Wood Chips and Biomass pellets


Coal

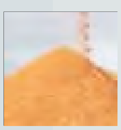

Lignite

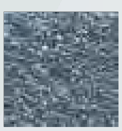

Wood Chips


Paddy Husk


Groundnut Shell


Biomass Pellets


Sawdust


Petcoke

Membrane Panel Assembly

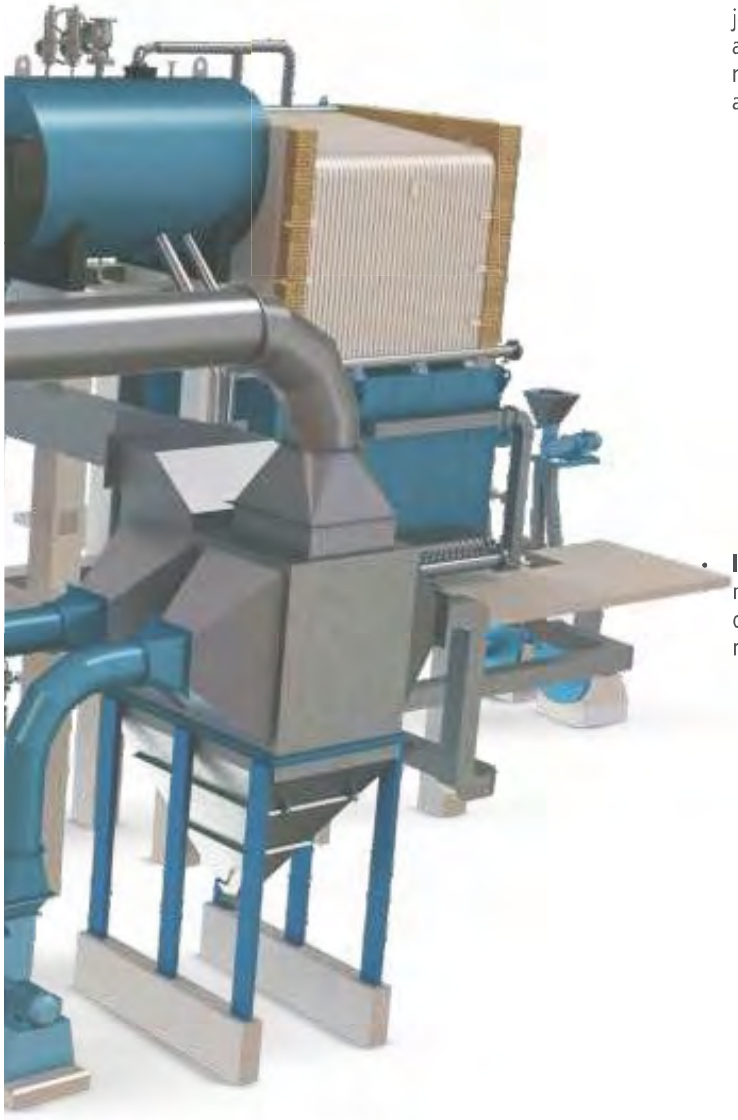
The furnace enclosure in the Combipower-FBC has a unique four side membrane panel design, with integrated in-bed tubes, for optimized heat transfer in the radiation zone.

Salient Features

Type Membrane Panel

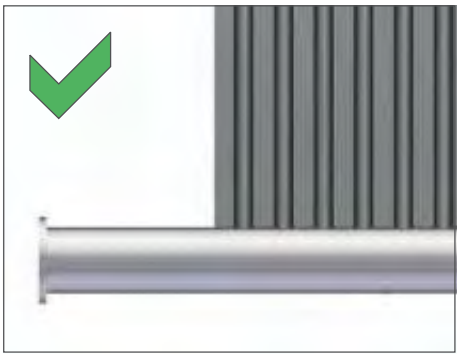
- The CP series has a special four side membrane panel assembly, which connects the in-bed header assembly with membrane panel assembly, to achieve higher circulation and circulating water velocity.
- Eliminates the need for a bigger pipe to connect the membrane panel assembly to the shell, thereby reducing the number of gussets as well as stress concentration on the shell tube plate.
- Distance between the membrane panel assembly and bed is optimised for effective radiative heat transfer. In conventional 3 side membrane panels, the higher distance between membrane panel assembly and bed reduces view factor and the subsequent heat transfer.

Membrane panel assembly



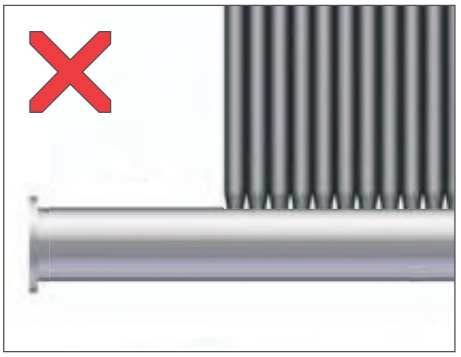
Tube-Strip-Tube construction

- In Combipower-FBC membrane panel assembly tubes are joined with strips to provide additional heat transfer area and to eliminate flow restriction. Also reduction in the number of tubes yields higher circulation velocity and avoids phase stratification



Tube-strip-tube welding

- In Tube-Tube construction the circulating velocity is reduced due to more number of tubes which can lead to overheating. Hence this type of construction is not recommended.



Tube-tube welding

Shell Assembly

Salient Features

- **Efficient convective pass design**
  The Combipower-FBC shell is of single pass design, with tubes of optimally sized diameters eliminating the turning of flue gas in the convective bank, thus reducing tube and tube plate erosion.

- **Better steam quality and load response**
  Higher steam/ water interface area and higher freeboard ensure better steam quality. The Combipower shell is also designed for large water holding capacity, thus ensuring better response to fluctuating loads.

- **Simple layout**
  The placement of smoke chamber with hinged doors reduces complexity in the layout and facilitates easy cleaning.

Shell assembly

Fluidised Bed Combustor (FBC)

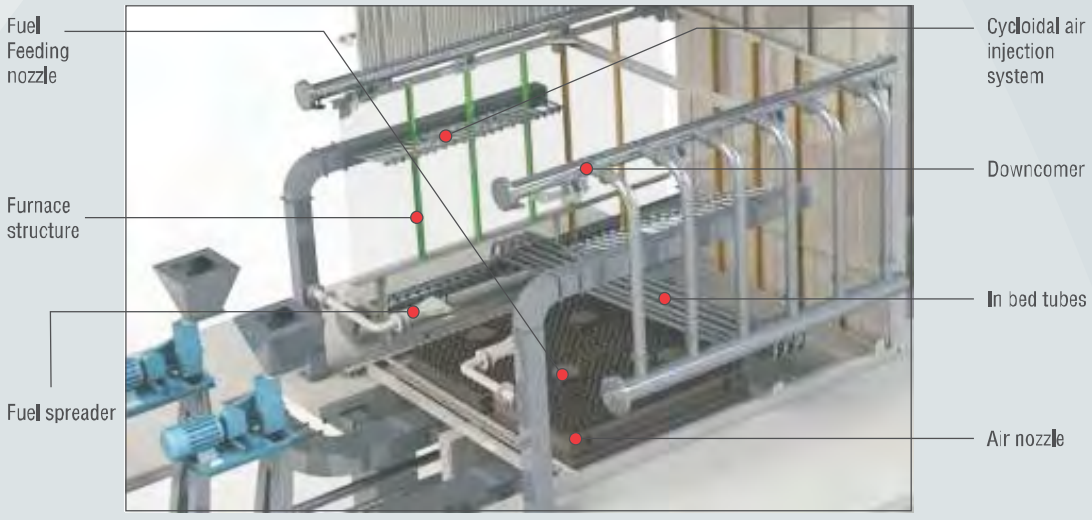
The combustion zone in the Combipower-FBC comprises a plenum chamber with a set of air nozzles, air distribution system and settling chamber.

- **Cycloidal air injection**
  The boiler comes with the unique Cycloidal Air Injection Technology, that improves combustion efficiency. The cycloidal motion of secondary air aids in achieving higher residence time of fuel in the combustion chamber. This technology also improves turbulence in the furnace, and reduces the amount of excess air required for combustion of fuel.

- **Air distribution nozzles**
  The air nozzles and furnace region have been designed to optimise Time (residence), time), Temperature (furnace temperature) and Turbulence, thereby facilitating high levels of combustion efficiency.

- **Settling chamber**
  Helps to collect heavier particles and unburnt fuel in the furnace region, thus safeguarding the convective bank from choking, and also preventing flame impingement on the tube plate due to fuel carryover.

Combustion chamber assembly



In-bed tubes

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

Salient features

- In the Combipower s in-bed header design, all bends have been placed outside the fuel bed zone. This helps eliminate erosion problems.
- The in-bed header tube in the Combipower with its higher pitch, helps to achieve lower air and particle velocity between in-bed header tubes.
  This also helps to reduce erosion problems.
- The Combipower in-bed header has been designed with very high circulation ratio and water velocity, to eliminate tube over heating problems.

Bed header assembly

Bed header assembly

Under bed feeding system

Screw feeder

Fuel feeding system

Combipower comes with various fuel feeding options, which offer 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.
- **Over Bed Feeding (OBF)**

  The over bed feeding system in the boiler is suitable for fuels like Indian coal and paddy husk. The over bed feeding system consists of a screw feeder.

Safety and Instrumentation

- Combipac comes with high standard instrumentation and a high level of safety interlocks that ensure safe and reliable operation of the boiler. Safety interlocks provided with the standard unit monitor flue gas temperature, outlet steam pressure and water level in the shell.

Level Gauge

Pressure Gauge

Level Controller

Pressure Switch

Optional accessories

A range of optional accessories can be provided with the Combipac CPFD to further enhance efficiency, control outlet emission levels, automate operations and increase safety interlocks.

- **Pollution control equipment**

  Pollution control equipment such as Multiclone Dust Collector (MDC), Tream cyclone and Electrostatic Precipitator (ESP) can be provided to control particulate emission levels.
- **Automation**

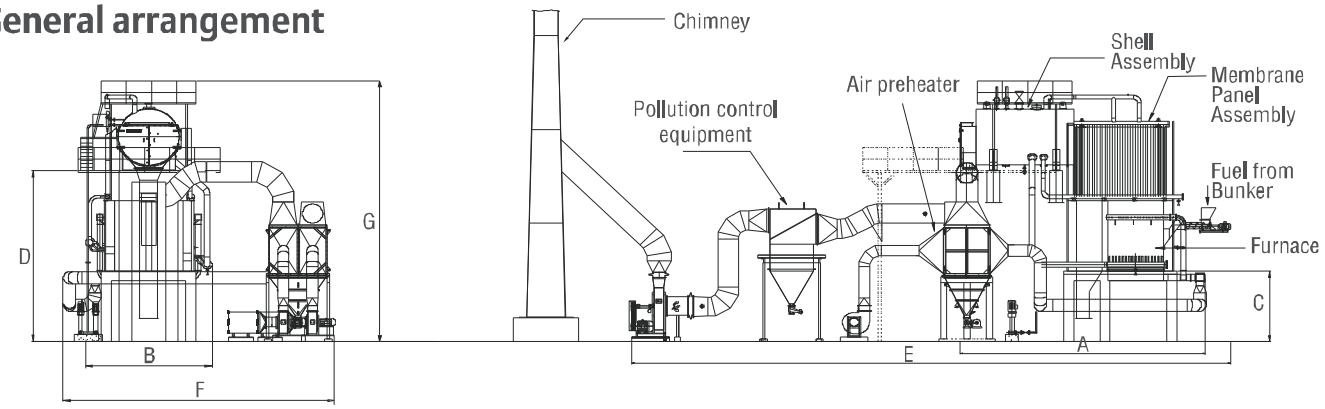
  High levels of automation to control water level, steam flow and water flow can be offered as add on scope. Also, Programmable Logic Control (PLC) with Supervisory Control and Data Acquisition (SCADA) system can be offered.

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^2g	10.54 / 17.5						
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						
Indian coal	%	86						
Indonesian coal	%	86.5						
Lignite	%	84.5						
Fuel Consumption		Underbed / Overbed						
Husk **(NCV-2900)**	kg/hr	657	876	1059	1314	1752	2190	2628
Indian coal **(NCV-5500)**	kg/hr	342	456	570	684	912	1140	1368
Indonesian coal **(NCV-5800)**	kg/hr	322	429	536	643	858	1073	1287
Lignite **(NCV-2800)**	kg/hr	684	912	1141	1369	1825	2282	2738
Connected load (10.54 / 17.5)					**With APH & MDC**			
Under Bed firing		38/40	48/50	69/73	90/92	109/119	135/139	171/178
Over Bed firing		36/38	39/49	58/62	75/77	90/100	114/118	149/157
Dimensions								
A	mm	9841	10430	10651	11130	10786	13318	10754
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
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
Furnace*	tonne	33.0	38.0	47.5	55.5	72.0	77.0	77.0

Note : Design Std-IBR. Efficiency is Calculated Based on NCV of Husk as 2900 kcal/kg. above mentioned weight & dimensions may vary with actuals. Please refer to offer document for more details.

General arrangement



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