

**POWER
AND
INDUSTRIAL
PLANTS**

Industrial boilers

Package &

Bi-Drum Vertical Flow

The logo for STF Boilers features a stylized orange 'S' with a white dot in the center, followed by the letters 'T' and 'F' in a bold, blue, sans-serif font. The word 'Boilers' is written in a smaller, italicized blue font to the right of 'STF'.

STF *Boilers*



LOOKING TO THE FUTURE

RSTF *Boilers*

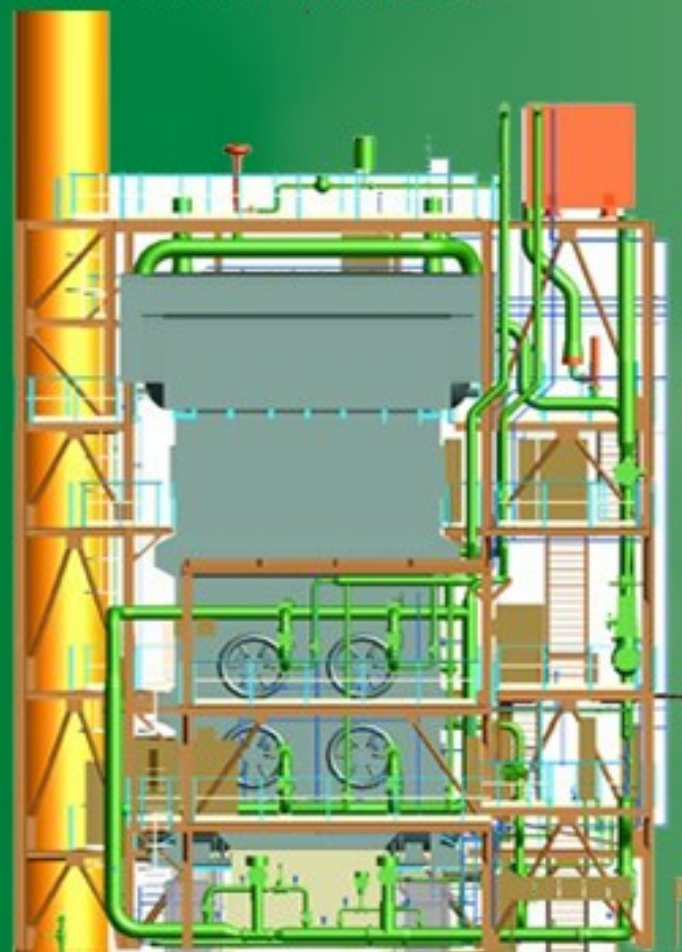


Jebel Ali Power Plant - UAE

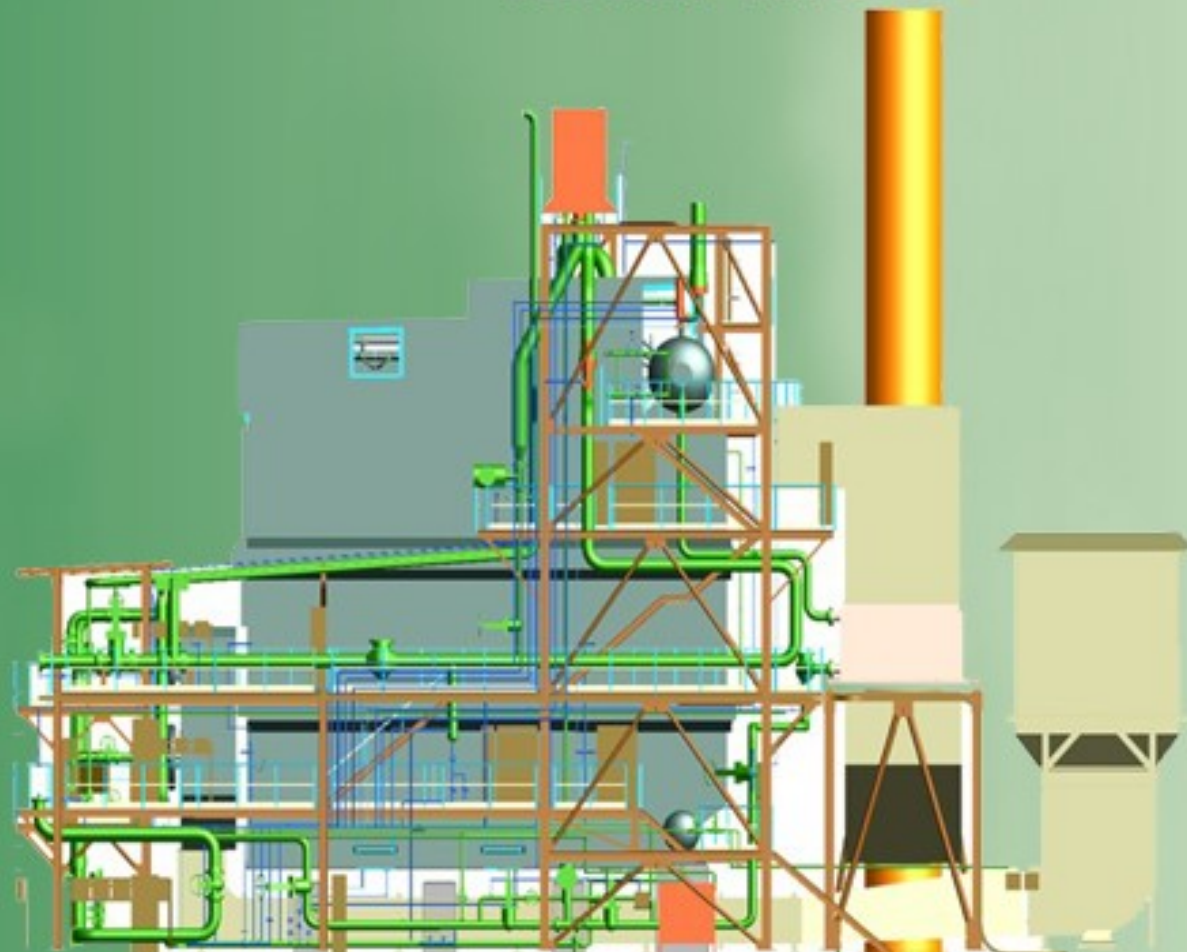
STEAM GENERATORS

STF supplies a full line of Package and Bi-Drum Vertical Flow Boilers designed to meet the most demanding requirements in terms of capacity, performances, emissions, operating flexibility, long term reliability and low maintenance costs.

FRONT VIEW - DANGOTE



SIDE VIEW - DANGOTE



ADDITIONAL FEATURES

MAIN TECHNICAL FEATURES

- *Large oversized furnace*
- *Two drums design*
- *Oversized steam drums with high efficiency internals*
- *MONO-WALL fin tube construction*
- *Convective or radiant super-heater*
- *Fully drainable super-heater*
- *Minimum refractory*
- *Low NOx burners, flue gas recirculation*
- *Fuels: natural gas, light oil, heavy oil, refinery gas, low heating value gases.*

INTEGRATED DESIGN

- *Mass & thermal balances*
- *Noise & vibration analysis*
- *Cabling, conduit & tubing*
- *Instrumentation, BCS, BMS*
- *Piping and valves*
- *Cabling, cable trays & conduit*
- *Racks and structural steel*

OPERATIONAL FLEXIBILITY

- *High turndown*
- *Extended low load operation*
- *Warm/hot stand by*
- *Fast ramping for cogeneration back up*
- *Large load swings*
- *Fuel complex combination firing*
- *Multiple operation conditions*
- *One button start-up*
- *Critical service availability*

OPTIMIZED PERFORMANCES

- *Thermal efficiency*
- *Auxiliary power consumption*
- *Emissions control & abatement*

PACKAGE boilers

Steam capacity range from 50 to 200 tons/h

Steam generation today asks for strict adherence to emission regulations, utilization of alternative fuels, and minimization of operating and maintenance costs.

In this complex scenario, STF is able to provide a complete solution to your steam generation needs.

Our experience diversification of products and commitments to engineering integrity, ensure STF quality, resulting in maximum equipment availability and reliable source of steam for your process, power or heating requirements.

At STF, our focus is on total system integration and optimization.

Total System Integration and optimization are our goals.

By utilizing state-of-the-art automation tools, STF can apply technical and cost factors in a combined value-added analysis satisfying our customers unique needs.

This provides our engineers the necessary degree of freedom to design the best system for each customer by balancing capital and operational costs.

Corporate experts in specialized fields such as combustion, circulation, noise, vibration, metallurgy and global procurement are drawn upon as required to effectively address the most complex project requirements.

Our product focus is supported by the manufacturing and financial resources of the entire STF organization.



Each boiler model contains pre-engineered options like:

- three upper steam drum size options, to minimize cost and optimize performance flexibility, combined to utility quality of drum internals;*
- three boiler bank templates;*
- two boiler bank longitudinal pitches;*
- three super-heater templates x 2 tube ODs.*

Super-heater sections are convective and drainable, with conservative metallurgical design well over operating range and an advanced anti-vibration design.

Three convective banks are provided for the boiler in order to minimize the auxiliary load and maximize the performance.

Package Boilers are capable of burning the majority of Gaseous and Liquid Fuels, either natural or by-products of refinery process.

Gaseous Fuels include Natural Gas, Refinery Process Gases (high hydrogen, tall gas, alcohols), Landfill Gas, CO & Blast Furnace Gas, Coke Gas, Waste Gases.

Liquid Fuels include Oils (No. 2, No. 6 & Bunker C, Diesel, Cracker Bottom, Pitch), Alcohols (Methanol, Ethanol), Waste Liquids.



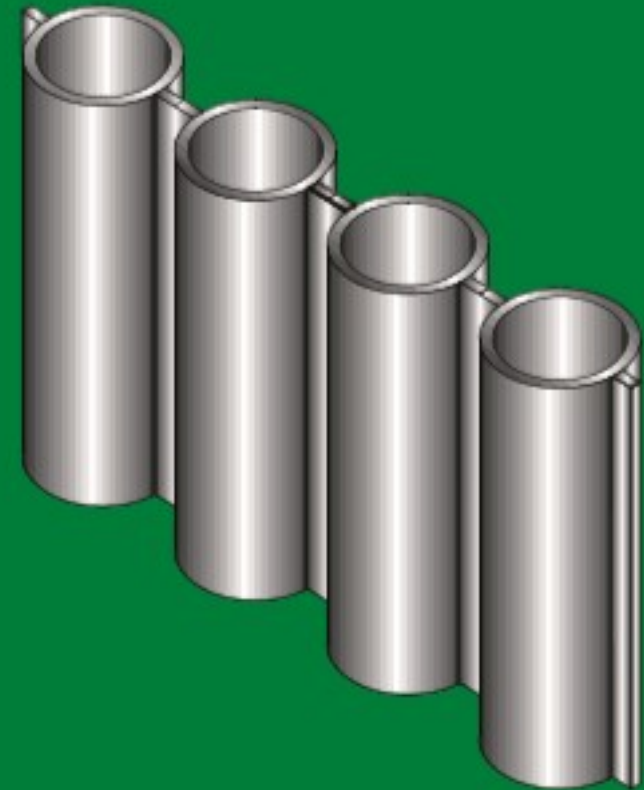
DESIGN AND TECHNICAL FEATURES

MONO-WALL MEMBRANE CONSTRUCTION and FURNACE DESIGN

Boiler wall are designed as mono wall finned tubes, with a high utility grade construction and fins suitably sized to ensure the thermal integrity and gas tight of the furnace.

Utilization of refractory materials is minimized, with a great advantage in terms of boiler reliability, outage planning, maintenance activities.

In addition a complete fuel combustion is assured as flue gases cannot bypass the boiler convective sections.





STANDARD BOILER DETAILS

Steam capacity range from 100 to 455 tons/h

The Bi-Drum Vertical Flow pre-engineered generator has proven itself over the years, reliably meeting the rigorous demands of industrial steam producers.

STF Bi-Drum Vertical Flow present a constant cross of the furnace and boiler bank, whilst setting of the boiler width defines the boiler production in accordance to the design output required by the Client.

The boiler design can be also optimized by pre-engineering design flexibilities and allowance for granting special modifications to standard models.

Standard for the selection of a Bi-Drum Vertical Flow Boiler capable to suit the Client requirements, are based on the boiler performance program, the maximum heat volumetric liberation rate allowed, furnace width, maximum flue gas flow, maximum flue gas temperature at the boiler outlet.

Burners are fuel flexible, being capable of burning the majority of Gaseous and Liquid Fuels, either natural or by-products of refinery process.

Gaseous Fuels include Natural Gas, Refinery Process Gases (high hydrogen, tail gas, refinery fuel gas), Landfill Gas, CO & Blast Furnace Gas, Coke Gas, Waste Gases. Liquid Fuels include Oils (normal fuel oil, light fuel oil, diesel), Waste Liquids.

Firing systems are designed and engineered to achieve for all fuels the required combustion parameters with safety, ease of control, reliability, granting that the emissions are within the required limits, with a minimum of maintenance.

Circulation in this type of boilers is provided by the difference in specific gravity of the fluid in the heated circuits (water-steam mixture) and in the downcomer tubes (water only).

SERIES BI-DRUM VERTICAL FLOW



Steam production can vary from 100 tons/hour to 455 tons/hour with superheated steam temperature of 540 °C at the operating pressure of 110 barg, granting the best available technology for the emission using a wide variety of gaseous and liquid fuels.



Bi-Drum Vertical Flow Boilers may be used in the following applications:

- *Chemical Plants, Gas Plants & Petroleum Refineries*
- *Power and Cogeneration Plants & Combined Cycles*
- *Manufacturing Industries & Districts Heating*
- *Sugar Cane & Paper Industries*
- *Desalination Plants.*

STF Bi-Drum Vertical Flow Boilers are bottom supported, with complete water cooled furnace walls, two drums (water and steam) D-style design, with furnace walls and boiler bank tubes "rolled expanded" to the drums.

This design facilitates a controlled expansion of the boiler pressure parts while allowing for the inclusion of a hopper bottom for an easy removal of the ashes.

Gas flow is perpendicular to the steam drum providing uniform heat all cross the drum width, resulting in a steady configuration of the drum level.

Suitable manholes and access doors are installed in water drum (lower) and steam drum (upper) as well as in furnace walls to assure an easy access for inspection and maintenance.

Steam drums are generously sized in diameter allowing an excellent water/steam separation performance, enhanced by the high grade of the drum internals like the Primary Horizontal Cyclones and Integral Chevron Dryers, easy to be installed and removed providing dry steam to the super-heater sections and steam free water to the down-comer system.

Boiler Retention Capacity at MCR and Load Swing Capability are also increased, facilitating an improved response to process demand.

The furnace is designed to assure a Low Volumetric Heat Release Rate combined with an optimized cross section and length, resulting ideally suited for burners Low NOx application.

Large furnace cross section eliminates flame impingement on boiler tubes enhancing furnace longevity, whilst a Conservative Heat Release Rate facilitates low maintenance and long-life tube integrity.

BI-DRUM VERTICAL FLOW



Large oversized drum



Tube to Drum connections details



DRUMS < 63.5 mm < 2½ inches



DRUMS > 63.5 mm > 2½ inches

APPLICATIONS



Site view

DESIGN AND TECHNICAL FEATURES

Boiler walls are designed as tubular membranes, mono wall finned tubes, with a high utility grade construction.

Fins are suitably sized to ensure the thermal integrity of the boiler.

This arrangement, equally effective with pressurized or balanced draft operation, contributes to high levels of boiler efficiency by reducing using of refractory materials, with a great advantage in terms of reliability, maintenance activities, outage planning, minimizing as well casing corrosion and/or gas leakage throughout the life of the steam generator.

Observation and access doors, properly designed, (fixed, pressure tight, air aspirating design) are provided in suitable positions to allow a complete control of the operating conditions of the boiler, an easy access for inspection and maintenance.

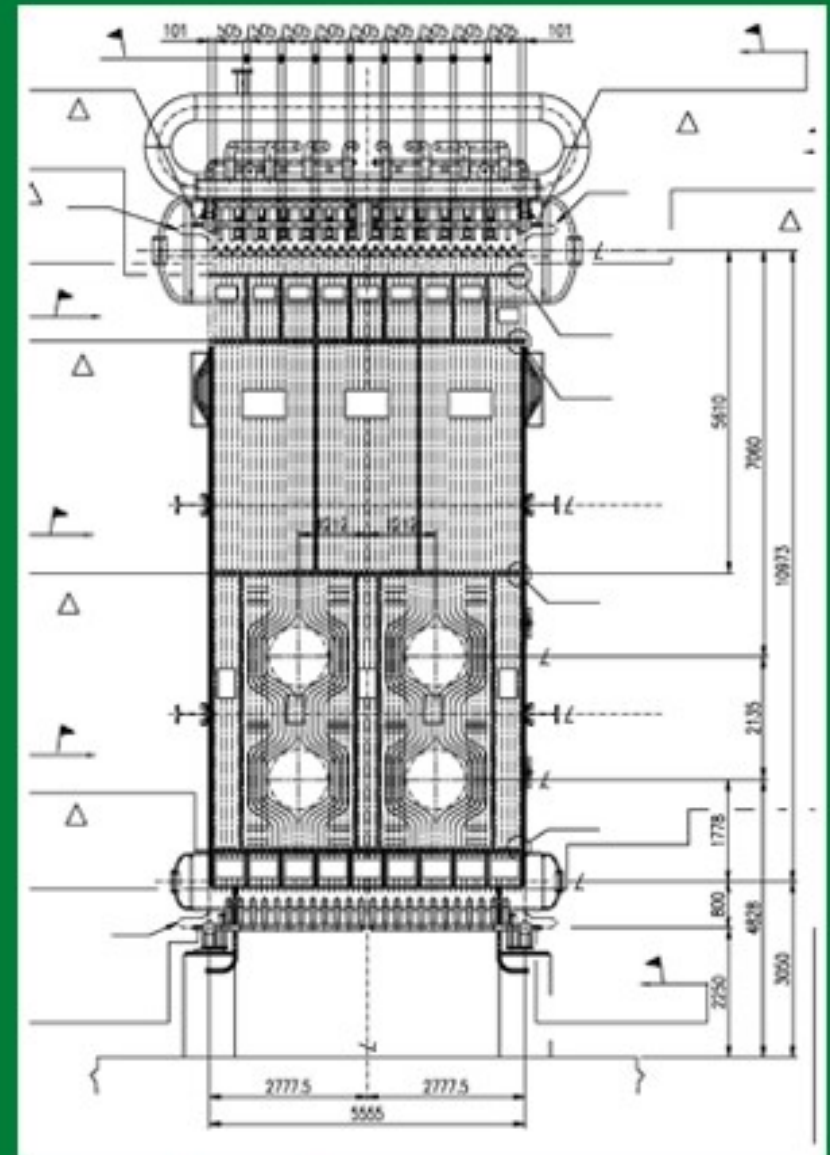
Tubes are bent around all openings (no bifurcation of steam flow), eliminating the risk of possible localized circulation patterns that may cause panel hot-zones leading to tube failure. The furnace walls are made up of shop-prefabricated panels assembled through a continuous welding of adjacent tubes, with or without fins, carried out with single or multiple head submerged arc automatic welding machines.

These panels are matched together during the erection to form a sturdy metal casing that completely encloses the steam generator section, performing a dual function of heat transfer surface and sealing against flue gas leakage.

The gas tight enclosure prevents the flue gas by-passing the furnace to the convection bank, which would lead to a high emission of CO reducing thermal efficiency, maintaining boiler integrity.

Boiler super-heaters may be non drainable or fully drainable, located inside the furnace or in a convective area of the boiler.

Non drainable super-heaters are located inside the boiler furnace, protected from radiation by the tubes of the furnace nose, supported of furnace wall headers, provided with stainless steel side-to-side spacers to guide the thermal expansion of the coil piping.



Dangote Power Plant

SHOP PREFABRICATION

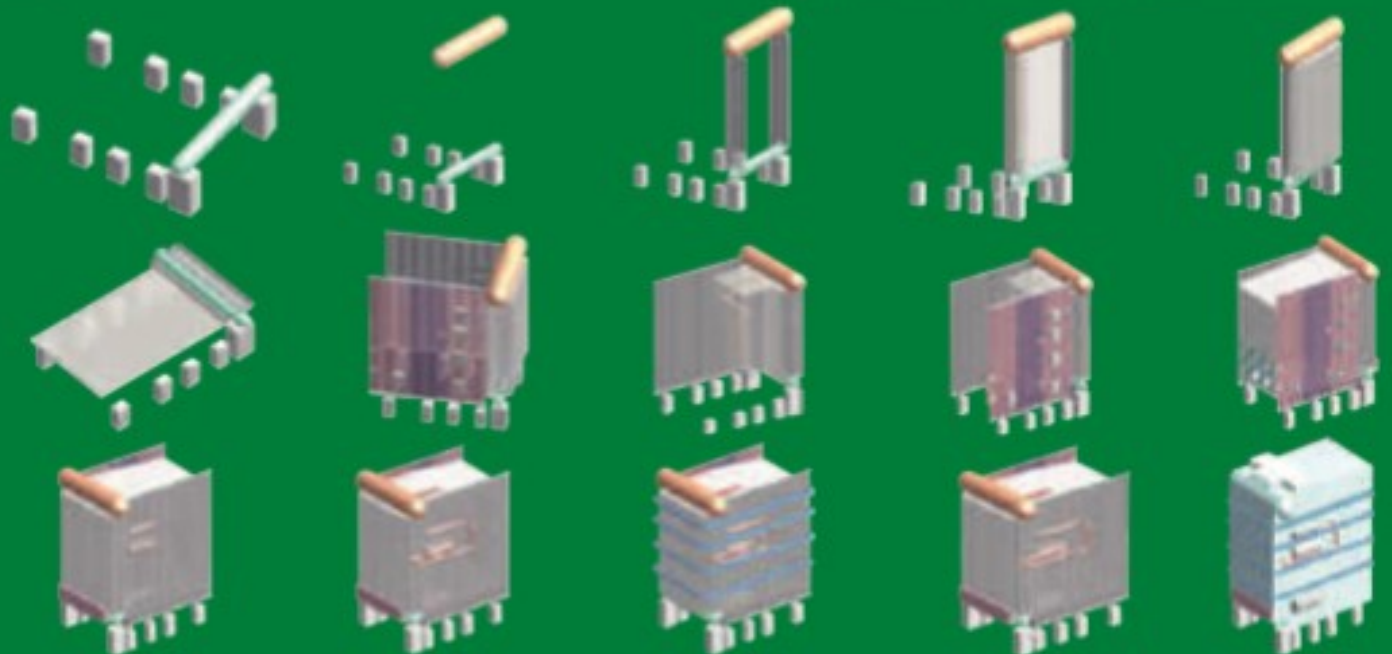
STF Bi-Drum Vertical Flow Boilers can be shipped to site in different configurations:

- disassembled components, loose tubes and panels;
- boiler bank completely assembled, loose tubes and parts;
- completely assembled.

Major boiler components may be delivered at site as follows:

Steam Drums (water and steam drums): supplied as single pieces, internal details (cyclones and chevron dryers) installed.

Super-heater headers are supplied as single pieces, stubs welded, whilst super-heater coils are delivered fully prefabricated, ready to be welded to the header stubs.



Typical and Complete Sequence Assembly

Furnace Right and Left Side Walls, Front Wall, Rear Wall, Roof and Floor Walls: supplied in complete panels of tubes, ready to be assembled and welded at site to form the boiler furnace.

Tubes are ready to be expanded into the steam/water drums and/or welded to the adjacent walls panels. Upper and lower headers of furnace side panels, provided with nozzles to be welded to risers and down-comers, are already welded to the panels.

Riser Tubes: supplied as single spools, bent, cut and bevelled for welding to the steam drum and/or side wall header nozzles.

Boiler Bank Front Wall, Intermediate Wall, Rear Wall, Internal Tubes: to be supplied at site by longitudinal welding to form the complete boiler bank. Tubes ends are already to be expanded into water/steam drums.

TRANSPORT TO SITE and ERECTION





Jebel Ali Power Plant - UAE



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