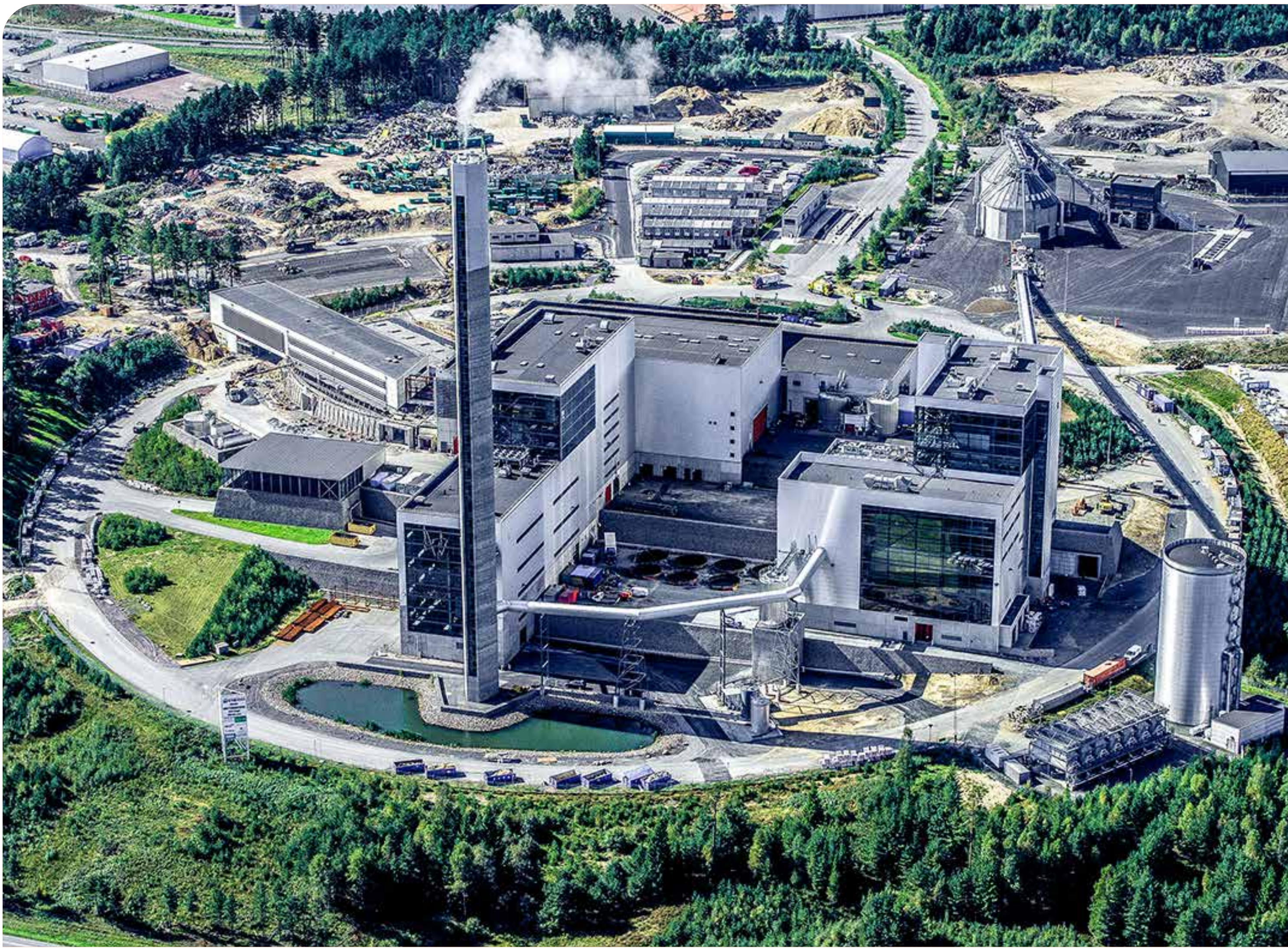
TBWES



Waste to Energy - MSW

Leveraging technology for a
cleaner and greener future

Thermax Babcock & Wilcox Energy Solutions Limited (TBWES)

TBWES, a wholly-owned subsidiary of Thermax Limited provides equipment and complete solutions for generating steam for process and power needs through the combustion of various solid, liquid and gaseous fuels, as well as through heat recovery from turbine/engine exhaust and (waste) heat recovery from industrial processes. TBWES also offers heaters for various applications in the chemical, petrochemical and refinery segments. Its services arm offers renovation and modernization solutions for old boilers and heaters. TBWES has rich experience in indegenising technologies and handling different types of complicated wastes like Spent Coffee Grounds, Spentwash, Palm Waste, Empty Fruit Bunch, Refuse Derived Fuel etc.

The growing need

The growing urbanization and consume mentality has led to challenges of municipal solid waste disposal management in every major city today. We believe in providing greener and cleaner solutions to counter these challenges as per the latest solid waste management rules in the country to deliver our brand promise of Conserving Resources to Preserve the Future.

Our approach has always been to provide indigenized advanced solutions for combusting industrial or agricultural or municipal solid waste to produce energy.

TBWES at a glance

TBWES has tied up with HZI Steinmüller, Germany for addressing the low calorific val-ue norms as received for municipal solid waste combus-tion using the most advanced state of the art technology.

Expertise in manufacturing subcritical and supercritical boilers

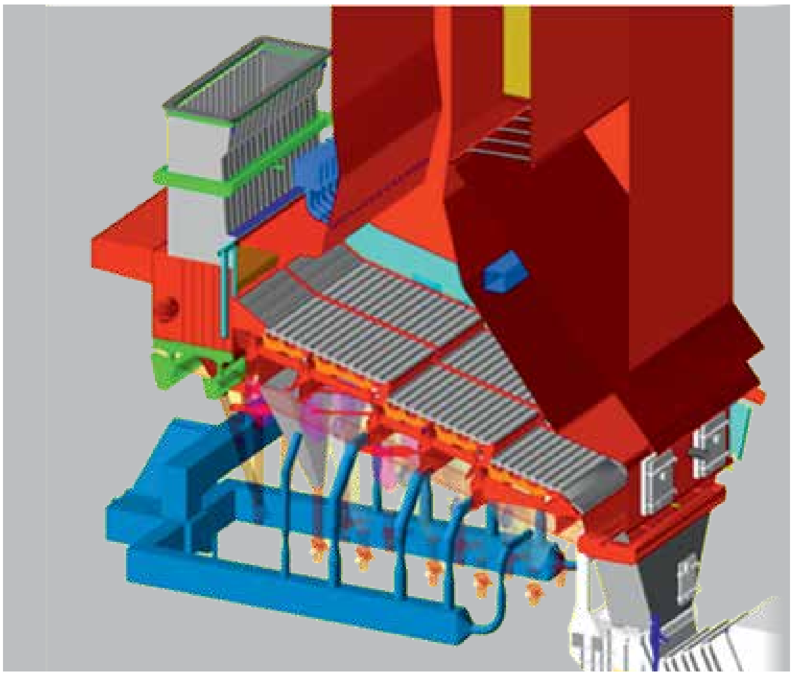
275+ Grate Fired Boilers installed

2,500+ successful boiler installations in 55+ Countries

Advanced Combustion Technology

We bring the state-of-the-art HZI Steinmüller forward acting reciprocating grate technology for the municipal solid waste which becomes the heart of our waste to energy plant. The air cooled reciprocating grate with automatic combustion control performs miraculously as it turns waste into energy. The constant reciprocating motion leads to tumbling action of the inserted waste as it moves through several phases of incineration – from drying at the beginning of the grate to the main combustion zone in the centre of the grate and to the slag burnout at the end of the grate.

The grate can efficiently handle combustibles ranging from household waste with a high level of moisture and low calorific value to high-calorific plastics. The maximum throughput capacity per line is approximately 400,000 tones per year, respectively about 1,200 tones per day.



Optimised Solution

The indegenised robust construction and design of the combustion grate and boiler are extremely dependable. The systems' ease of maintenance ensures that downtime is kept to a minimum. We thereby guarantee the technical optimisation and long lasting efficiency of our waste to energy boilers.

High Availability

Advanced technology is a result of long professional experience and constant pursuit of innovation. The sturdy construction and assured service life improves the availability of the plant.

Optimal Burnout

Each combustion zone has individual combustion air control as well as individual grate velocity for transporting the waste. Both features are controlled by our advanced combustion control system. In order to achieve even better burnout quality, our grate system works with grate steps which ensure that the waste is repeatedly broken up and mixed during the combustion process. This the most optimum burnout meeting to all the stringent global standards.

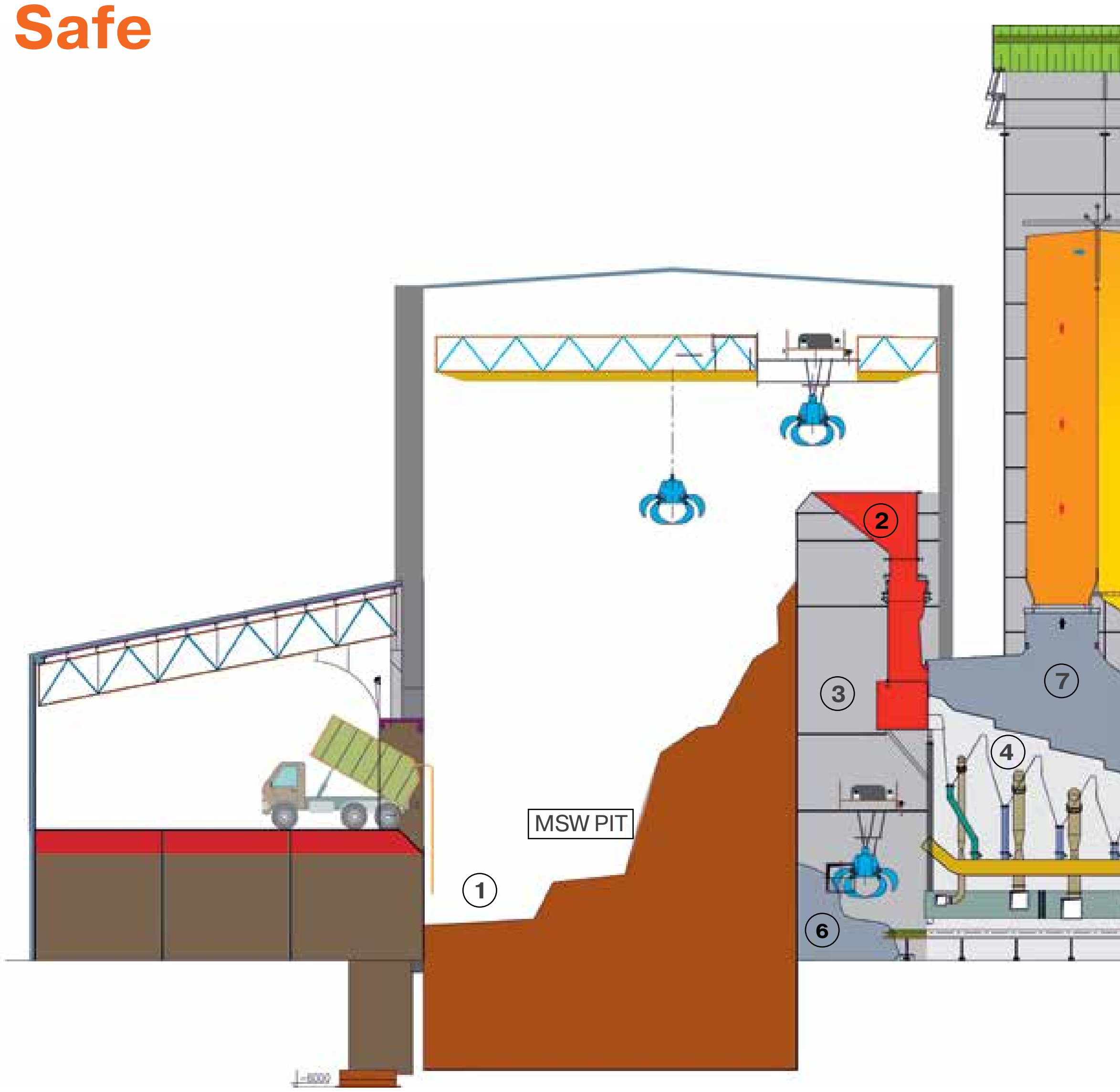
Waste Destruction

The main task of the combustion system is to destroy all organic compounds contained in the waste, this is achieved by providing the necessary combustion air, furnace temperatures and residence times.

High Versatality

The air cooled reciprocating grate can accommodate wide range of wastes with varying calorific value and sizes. The modular construction ensures ease of change of grate bars even in the existing systems.

Waste to Energy Process: Clean and Safe



Waste Pit

The waste delivered to the plant is stored in the waste pit 1 and homogenised by the grab crane. The crane then transports the mixed waste to the feeding hopper 2 . Through the chute the waste arrives at the ram feeder 3 which pushes the waste on the combustion grate as required by the firing control.

Reciprocating Grate

The waste combustion process takes place on the grate 4 which comprises of grate bar rows. The grate bar rows are arranged overlapping one behind the other. Every second row moves alternately back and forth. The waste and later the courser ash material is transported by these rows to the end of the grate where the ash is discharged into the bottom ash extractor.

Bottom Ash Extractor

The ash extractor 5 is partially filled with water resulting in an air sealing between the environment and the furnace. The ash falling from the grate is cooled in the water bath and conveyed by the ram of the slag extractor to a vibrating conveyor which transports the slag to the slag bunker 6 .

Combustion on Grate

The plant operator monitors the combustion process on the grate 7 . The air supplied for combustion (primary air) is controlled from the below grate. To obtain an optimal burnout of the flue gases, additional air (secondary air) is injected above the grate. In the boiler the hot flue gases are then cooled down to the required flue gas temperature for ensuring better life of superheaters.

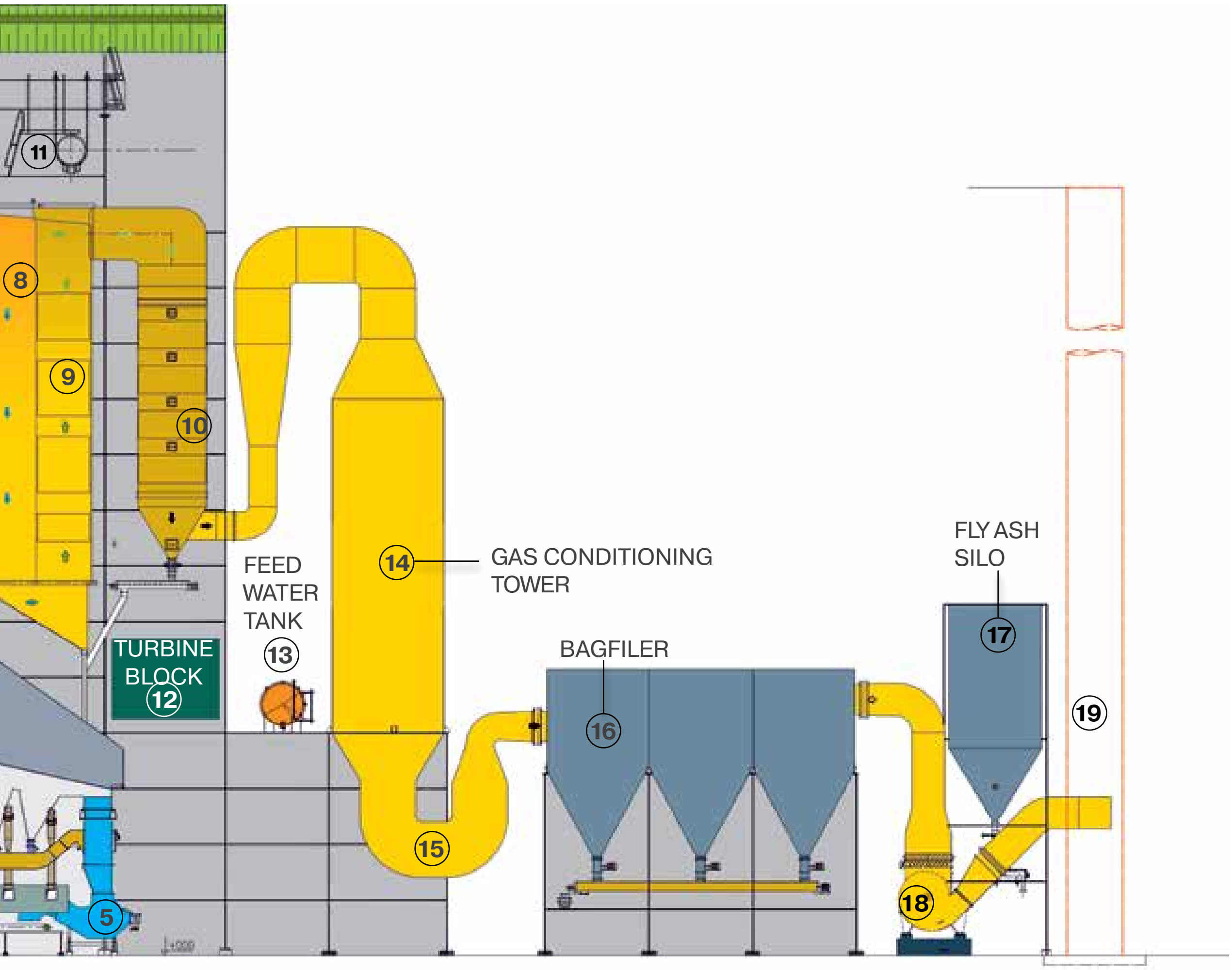
Boiler

The heat of the flue gases is used to heat the feedwater in the economiser 10 . The boiler feedwater is then fed into the steam drum 11 which feeds the evaporator operated in natural circulation.

The water-steam mixture arising in the walls of the boiler radiation passes (evaporator) 8 is separated in the steam drum into water and steam 11 . The steam is directed to the superheater heating surfaces 9 . After heating up to the specified temperature, the live steam is led to the turbine 12 .

Turbine

Inside the turbine 12 , the superheated steam is expanded in turbine to generate power and is then condensed. The



electricity is fed into the grid. The condensate is collected in the feed water tank (13) and finally returned to the boiler. Alternatively, part of the energy can be fed to local or district heat networks or used as process steam (combined heat and power production).

Gas Conditioning Tower

The flue gas is introduced into the Reactor Duct (15) via evaporative cooler which is a typical Gas Conditioning Tower (GCT) (14), where the temperature of the gas reduced by spraying water through spray nozzle in the controlled way. Upon entering the reaction duct, the flue gas comes into intimate contact with hydrated lime and activated carbon which absorbs and neutralises and neutralize the SO_2 and other acid gases contained in the flue gas stream.

The systems pneumatically injects the hydrated lime and Powdered Activated Carbon (PAC) from a storage silo into the flue gas ductwork before the gas enters the Fabric Filter (16). If required the gases are recirculated to improve the capture efficiency.

Bag Filter

The flue gas enters the fabric filter inlet manifold where it is distributed between the operating fabric filter compartments where final particulate removal is performed, along with secondary SO_2 removal as the gas passes through the collected dust and un-reacted reagent deposits on the filter bags.

The Pulse Jet Fabric Filter (Bag House) is designed to provide continuous particulate collection. Further disposal of the dust collected from the Fabric Filter is sent for disposal through pneumatic conveying system to the residue silo (17) for disposal.

ID-Fan

The resistance across the system is overcome by the Induced Draft Fans (18) located downstream of the Bag Filter. Gases from the Induced Draft Fan are exhausted through the Stack. The ID fan ensures sealing of flue gasses and helps to maintain the balance draft.

Stack

The cleaned flue gas is leaving the process to atmosphere via the stack (19). The stack is normally a RCC construction, however sometimes steel flues or steel stacks may also be provided.

Automatic Combustion Control

Automatic Combustion Control (ACC) is a signal box that ensures the complex task of providing correct adjustment for the actual combustion process is achieved. The combustible material is extremely heterogeneous and can lead to large variations in terms of the amount of heat and pollutants released.

ACC ensures that the waste is combusted in an optimum fashion and maximum steam output capacity is achieved with consistent steam quality while observing all regulatory limits. The quantity, temperature, and distribution of the air supplied to the incineration process, as well as the speed of the feeder and grate, are the parameters that influence the quantity of steam, the oxygen content in the flue gas and the position of the combustion on the grate. We ensure uniform release of heat even for hetrogenous waste through efficient control of these parameters.

Waste to Energy Boiler

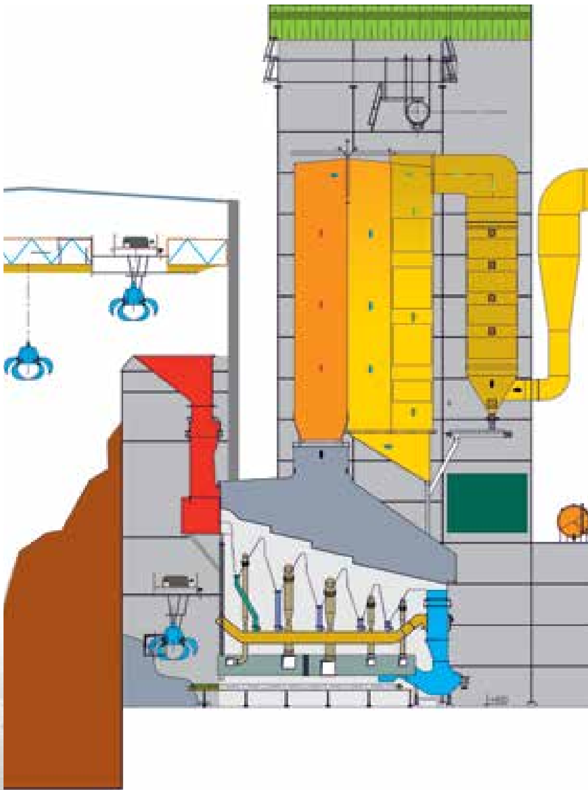
The modern waste to energy plants not only reduce the waste volume by 90%, but are also designed to extract maximum possible energy from waste. The combustion process releases the energy bound within the waste. This energy is recovered with the help of a waste to energy boiler or steam generator positioned after the combustion stage. A boiler is a complex steam generator system that meets the special operating requirements in terms of corrosion, fouling, slagging, stress, part load behaviour, and system dynamics.

As the hot flue gases flow through the boiler, they are cooled and this heat absorbed is eventually converted to steam. The feed water, is initially heated up in the economiser, then evaporated in evaporator and water wall panels. The saturated steam is finally superheated in the superheaters. The steam so produced is then used to produce power and heat.

The first two passes are empty with Water Cooled Panels to reduce the flue gas temperature entering superheaters. The third pass has modules of Superheaters and Evaporator Coils arranged horizontally. The fourth pass is economizer with bare tube horizontal coils enclosed with casing.

The furnace along with first pass is sized for complete combustion and to ensure proper residence time is met to prevent formation of the dioxin/furans.

In our systems the sequence, layout, and construction, as well as the protection of the heating surfaces, all take special account of risk factors including fouling, slagging, corrosion, and erosion.



HZI Steinmüller References - 600+ Reference Plants Globally

Klaipeda/Lithuania

- Fuel: Municipal waste, biomass
- Throughput rate: 1 x 864 TPD
- Scope of delivery: Furnace, steam generator
- Commissioned: 2013

Rüdersdorf/Germany

- Fuel: Refuse-derived fuel
- Throughput rate: 1 x 790 TPD
- Scope of delivery: Furnace, steam generator, flue gas cleaning
- Commissioned: 2008

Hefei/China

- Fuel: Municipal waste
- Throughput rate: 2 x 500 TPD
- Scope of delivery: Furnace, adiabatic combustion chamber, steam generator
- Commissioned: 2013

Feixi/China

- Fuel: Municipal waste
- Throughput rate: 4 x 500 TPD
- Scope of delivery: Furnace, adiabatic combustion chamber, steam generator
- Commissioned: 2020

Oberhausen/Germany

- Fuel: Municipal waste
- Throughput rate: 1 x 600 TPD
- Scope of delivery: Furnace, steam generator, electrostatic precipitator
- Commissioned: 2006

RZR II Herten/Germany

- Fuel: Municipal waste
- Throughput rate: 2 X 420 TPD
- Scope of delivery: Turnkey plant
- Commissioned: 2008

Conserving Resources,
Preserving the Future.

Air Pollution Control

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