OSCHATZ
Plants for energy and environment

Non-ferrous Metallurgy

Cooling of hot and sticky dust-loaded process gases




At home in the world

Oschatz – best technology backed by experience

Oschatz is an innovative company operating on a global scale in plant construction, energy recovery and environmental technology. With more than 160 years of experience, Oschatz is today a leading company with reference to the non-ferrous metallurgy, the iron and steel metallurgy, the chemical industry and the environmental technology.

Our customers particularly appreciate our first class global service which goes far beyond installation and commissioning.

Problem solutions for the non-ferrous industry

Oschatz waste heat boilers are used worldwide since decades for all production processes of non-ferrous metals like copper, zinc, lead, nickel or tin. The engineers develop tailor made solutions for our customers based on the specific process demands and needs for every plant and process, fully in line with the overall objective of maximizing productivity and profitability.

The hot and sticky dust-loaded process gases and the various processes in the non-ferrous metallurgy present a challenge for our gas cooling and heat recovery technology. Because of the most advanced production practices for waste heat boilers combined with innovative cleaning systems for effective heat transfer, safe and reliable process waste heat boilers are produced. By future-oriented solutions for the different processes, our customers have the opportunity – even after decades of operation – to increase the process capacity after simple and quick modifications at the boiler.

Transport of a pre-fabricated waste heat boiler downstream flash smelting furnace in South Australia

All Oschatz plants are produced with the most advanced technology so that they run in an optimal and very reliable way even after thousands of operation hours.

Depending on the location of the customers, systems and components are produced in either Istanbul, Turkey, or Nanjing, China: both production facilities are equipped with state-of-the-art production machinery and work naturally in compliance with the international quality standards such as ASME, Pressure Equipment Directive (PED), TRD/AD, ISO 9001, etc. All Oschatz products stand out with highly appreciated qualities and are maintenance-friendly with easy accessibility to the various components.

Processes and solutions

Waste heat boilers for the non-ferrous metallurgical industry

The waste heat boilers in the non-ferrous industry are usually designed as evaporation systems based on the wide range of technical standards valid on a world-wide scale.

Oschatz designs the waste heat boilers with two types of water-circulation systems:

- combined natural and forced circulation (e.g. two-pass vertical boiler with convection pass),
- forced circulation only (e.g. horizontal boiler).

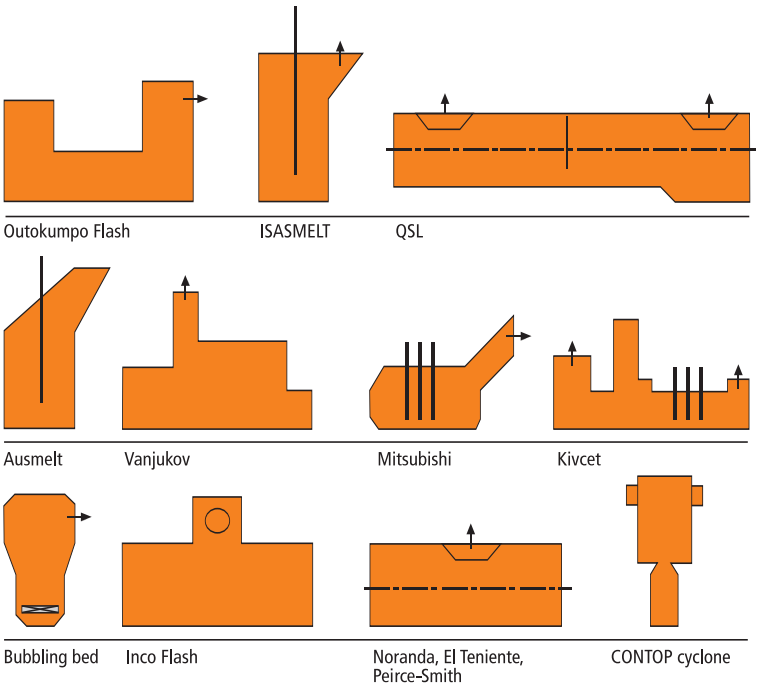
The choice of the waste heat boiler type and water circulation system depends on the geometry and the location of the process furnace outlet.

On the basis of many years of development and experience Oschatz designs and manufactures:

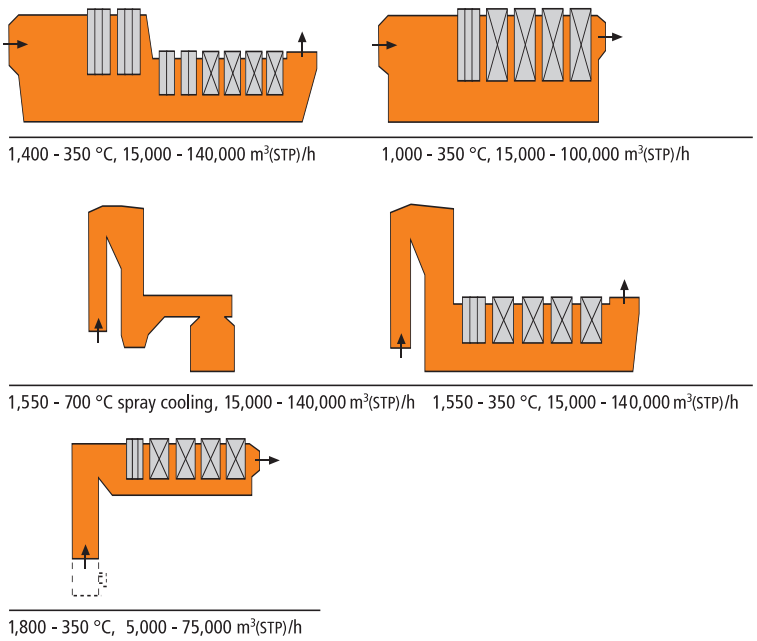
- membrane wall elements,
- evaporator/ superheater screens,
- evaporator/ superheater bundles,
- wall, screen and bundle hammering systems,
- soot blowers for special cases.

The wide range of products available from Oschatz meets the process requirements of the non-ferrous industry all over the world. Oschatz can guarantee a gas cooling performance to meet the customers' demands, based on given gas inlet conditions.

Typical process furnace geometries



Typical WHB geometries





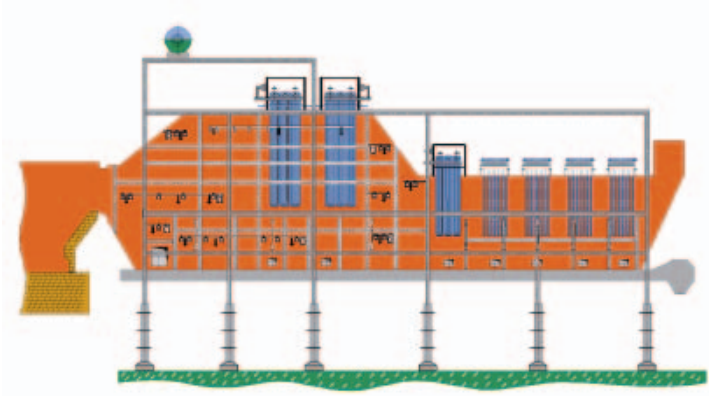

Efficient and profitable

Flash smelting of copper and nickel

Flash smelting of copper and nickel concentrates takes place in a furnace with reaction shaft (Outokumpu flash smelting process). The process gases are cooled in a special waste heat boiler. The products are traditionally processed further on in a converter. Another flash smelting process is the Kivcet process for lead smelting. Here the process gases are cooled with two waste heat boilers. One boiler is installed downstream the smelting furnace, the other boiler is installed downstream the electric furnace.

The waste heat boilers are equipped with membrane walls, screens and bundles. To avoid corrosion in the waste heat boilers the water/ steam-side operating pressure is typically chosen between 40 and 70 bar. Depending on the SO_2/ SO_3 concentration in the process gas it is then assured that the temperature of the boilers' surfaces lies significantly above the sulphuric acid dew point. It is imperative for the boiler surfaces to be kept as clean as possible in order not to exceed the maximal allowed gas temperature for the filter unit. Exactly for this purpose Oschatz has developed and patented a highly efficient hammering system for the cleaning of the boiler surfaces.

Waste heat boiler downstream flash smelting furnace in Olympic Dam, Australia



Flash smelting furnace with waste heat boiler

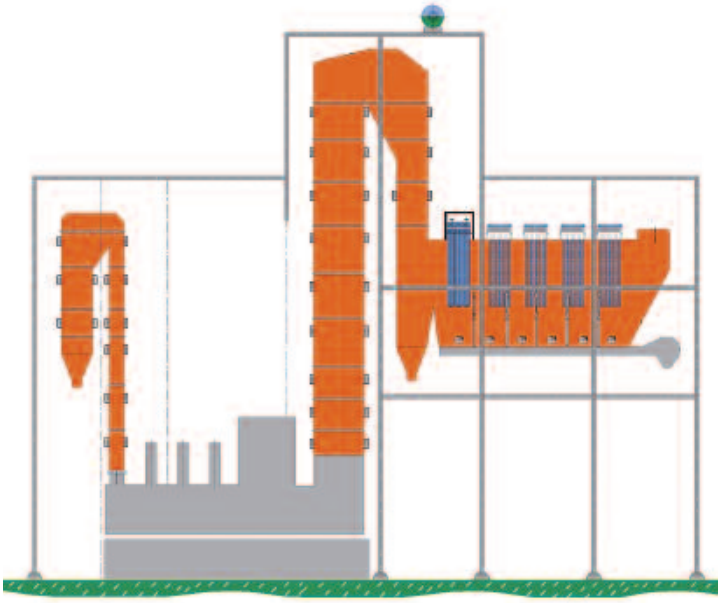
Design range

Offgas rate	15,000 - 140,000	m³(STP)/h
Offgas temperature at boiler inlet	1,250 - 1,400	°C
Offgas temperature at radiation chamber end	600 - 800	°C
Sulphation air	2,300 - 21,000	m³(STP)/h
Offgas temperature at convection section end	350 - 400	°C
Feed water temperature	105 - 140	°C
Steam pressure	40 - 70	bar
Steam temperature	250 - 285	°C
Steam rate	10 - 90	t/h

Waste heat boiler assembly in the workshop

In principle the horizontal waste heat boiler downstream Outokumpu flash smelting process consists of a radiation chamber in which the gas is cooled down to 600 °C – 800 °C and an adjacent convection part in which convection heating surfaces are installed. For the Kivcet process each radiation chamber of both boilers consits of two vertical shafts. The convection part is also horizontal. The typical gas outlet temperature is approximately 350 °C.

The succesful handling of the thermal expansion of the boilers in smelter conditions is an essential factor for maximum availability and avoidance of leakages. This is realised by flexible pendulum supports that keep the boilers in position. Thereby the horizontal forces are minimised and the boiler screens and bundles are essentially better accessible for maintenance works.



Kivcet furnace with waste heat boilers

Design range

Reaction shaft

Offgas rate	20,000 - 25,000	m³(STP)/h
Offgas temperature at boiler inlet	1,200 - 1,300	°C
Offgas temperature at radiation chamber end	550 - 700	°C
Offgas temperature at convection section end	350 - 400	°C
Feed water temperature	105 - 140	°C
Steam pressure	40 - 70	bar
Steam temperature	250 - 285	°C
Steam rate	20 - 40	t/h

Electric furnace

Offgas rate	5,000 - 10,000	m³(STP)/h
Offgas temperature at boiler inlet	1,300 - 1,350	°C
Offgas temperature at radiation chamber end	550 - 700	°C
Offgas temperature at convection section end	350 - 550	°C
Feed water temperature	105 - 140	°C
Steam pressure	40 - 70	bar
Steam temperature	250 - 285	°C
Steam rate	2 - 10	t/h




Economical and clean

Lance smelting and converting of copper, nickel, lead, zinc and tin

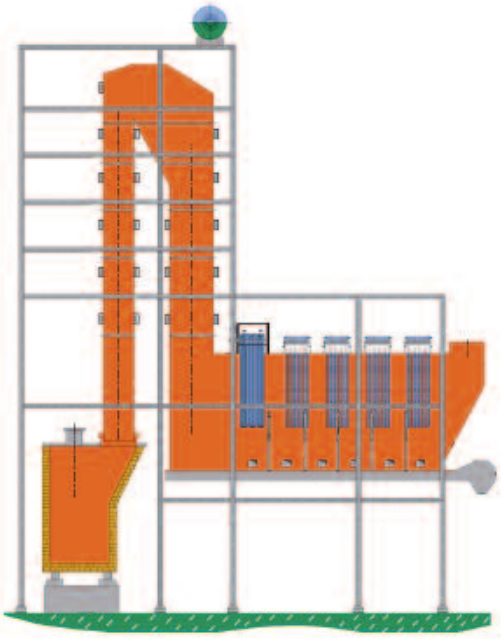

Waste heat boiler downstream ISASMELT furnace in Mount Isa, Australia

In the in-bath lance smelting technology for the recovery of copper, nickel, lead, zinc and tin, the process gas has a temperature range between 1,200 °C to 1,550 °C. The gas is directed into a waste heat boiler to be cooled and to change the dust properties from the molten to the dry phase. Depending on the concept of the whole plant the process gas is cooled down between 600 °C and 900 °C in a two-pass vertical boiler or down to approx. 350 °C in a three-pass vertical/ horizontal boiler. The dust is partly separated in the waste heat boiler.

OSCHATZ
Know-how

The further dust separation takes place in a baghouse or an electrostatic precipitator. When saturated steam is not used, it is condensed in an air cooled condensator which is installed above the steam drum. While using recycling material, the steam pressure and temperature can be lower as the acid dew point is lower, too.

The first part of the waste heat boiler uptake is made even and smooth on the inside so accretions can fall off easier. This part can also be removed for access to the furnace and boiler. An evaporation cooled furnace roof operating above the acid dew point has a longer life time than water cooled roofs and is easy to remove. A relief door is arranged at the top of the furnace. It can also be used as a pressure relief door to control small pressure fluctuations of the offgas.


ISASMELT furnace with waste heat boiler

Design range

Offgas rate	15,000 - 140,000	m³(STP)/h
Offgas temperature at boiler inlet	1,200 - 1,550	°C
Offgas temperature at radiation chamber end	600 - 900	°C
Offgas temperature at convection section end	350 - 400	°C
Feed water temperature	105 - 140	°C
Steam pressure	40 - 70	bar
Steam temperature	250 - 285	°C
Steam rate	10 - 90	t/h

Innovative and cost-effective

Leach residue smelting and fuming of zinc

Originally, in the in-bath lance smelting technology, the brick-lined furnaces and hoods are surrounded by a water cooled jacket. Oschatz supplies a furnace and hood cooling that is integrated into the evaporation system of the waste heat boiler.

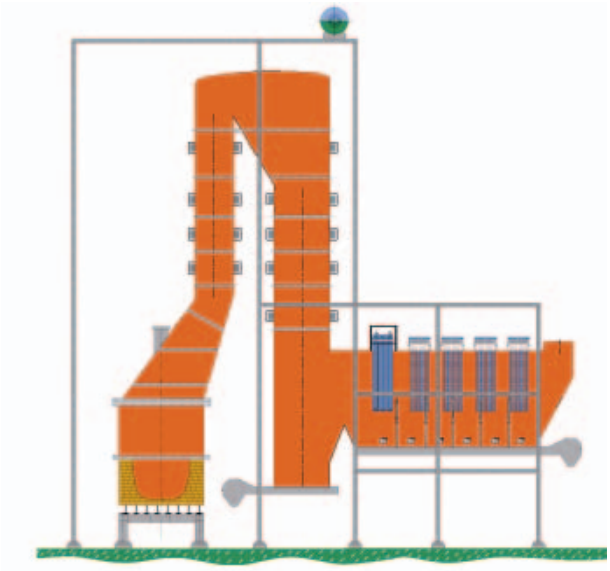
These components are designed as gas-tight welded membrane walls. In order to protect the membrane walls from excessive heat load, they are equipped with studs on which a thin castable layer is applied. The lifetime of these components comply with the usual average lifetime of boiler pressure components.

OSCHATZ
Know-how

Compared to this the time interval for the brickwork relining of an originally water cooled construction normally lasts less than a year.

The engineering concept developed by Oschatz leads to significantly less shutdown intervals resulting in significantly reduced production losses and therefore assures a better economic efficiency of the whole plant.

Two-pass vertical waste heat boiler



Ausmelt furnace with waste heat boiler

Design range

Smelting furnace

Offgas rate	15,000 - 120,000	m³(STP)/h
Offgas temperature at boiler inlet	1,250 - 1,800	°C
Offgas temperature at boiler outlet	350 - 900	°C
Steam pressure	30 - 70	bar
Steam rate	11 - 90	t/h

Fuming furnace

Offgas rate	5,000 - 80,000	m³(STP)/h
Offgas temperature at boiler inlet	1,300 - 1,550	°C
Offgas temperature at boiler outlet	350 - 750	°C
Steam pressure	30 - 70	bar
Steam rate	4 - 60	t/h




Future-oriented technology

Cyclone smelting and waste heat boiler for zinc residue and steel dust recycling

Smelting reactor, CONTOP®-system by Siemens VAI

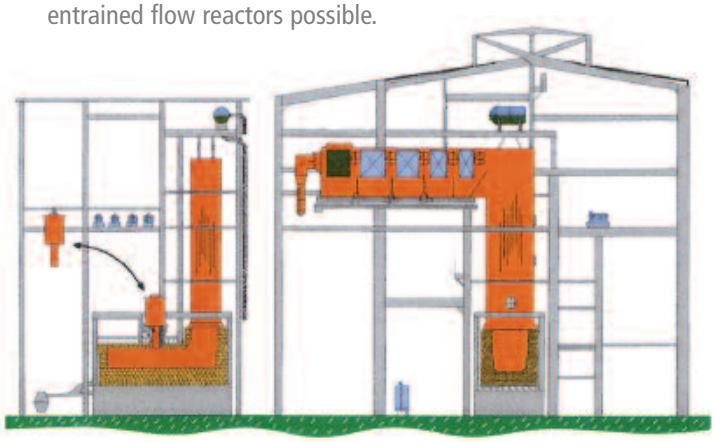
The metallurgical treatment of residues in the non-ferrous metallurgical industry becomes more and more important. Smelting in a cyclone constitutes a future-oriented technology for the recovery of the metal contained in the residues. This technology has been used for iron, lead, copper and zinc and is based on the well-established CONTOP®-system of the non-ferrous metallurgy. In the present application the cylone serves for recycling of steel flue dust and Zn retort residues containing ZnO and PbO.

The steel mill dust and zinc retort residues are wastes that contain Zn and Pb, other heavy metals, coal and slag formers (CaO, SiO_2 and FeO). The dust and residues need to be cleaned and deposited in an environmentally acceptable way. During the process the residues are melted to a slag in a cyclone, Zn and Pb are fumed. The fumed metals are post-combusted in a waste heat boiler to oxides and recovered as dust from the gas flow.

The gas cooling system for the smelting and fuming cyclone and the waste heat boiler for this process have been supplied by Oschatz. Only a small quantity of mechanical dust results from the cyclone smelting. As the cyclones are connected to an evaporation system, the thermal load is better handled than with a cooling water system, and the surface temperature of the cooling tubes is always kept above the dew point of H_2SO_4 and HCl.

Benefits:

- very high energy density,
- optimal reaction conditions and mass and heat exchange by high turbulence intensity,
- reduced reactor dimensions with high throughput,
- high smelting temperatures (> 2.000 °C) are possible, for instance in reactions with oxygen enrichment,
- larger particle size than in comparable entrained flow reactors possible.



Steel dust and zinc residue recycling with cyclone smelting and waste heat boiler

Design range

Cyclone smelting

Cyclone diameter	1 - 3	m
Feed rate of solids	10 - 100	t/h
Offgas temperature at cyclone outlet	1,200 - 1,800	°C
Steam pressure	30 - 70	bar
Steam rate	3 - 10	t/h

Waste heat boiler

Offgas rate	5,000 - 50,000	m^3(STP)/h
Dust at boiler inlet	0.7 - 7	t/h
Offgas temperature at boiler inlet	1,200 - 1,800	°C
Dust at boiler outlet	0.8 - 8	t/h
Offgas temperature at boiler outlet	240 - 380	°C
Steam pressure	30 - 70	bar
Steam rate	6 - 60	t/h

Highly efficient

Fluidized bed roasting for zinc, pyrite (gold) and copper

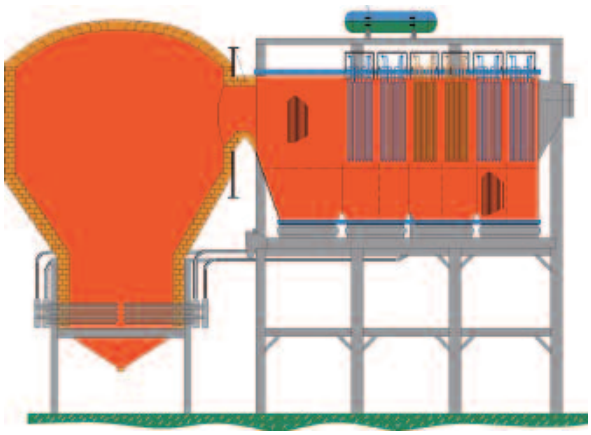
Roasting of zinc, pyrite and copper concentrates is carried out in fluidized beds. For this process Oschatz supplies waste heat boilers including the coils for the fluidized beds. The hot roaster gases (800 to 1,000 °C) with a high dust load (up to 400 g/Nm^3) are cooled in Oschatz boilers down to approximately 350 °C.

In general these boilers are being equipped with cooled tube walls, evaporation screens and convection superheater screens. Because of the gas composition of the process and the corresponding dust characteristics, a steady operation of the waste heat boilers can only be achieved by highly efficient heating surface cleaning systems which do not require a maintenance shutdown for the whole plant.

OSCHATZ Know-how

The high dust load of the gases of up to 400 g/Nm^3 requires the development of highly effective mechanical cleaning systems. Cleaning of boiler heating surfaces by the Oschatz hammering system has been proven to be very successful.

Waste heat boiler downstream roaster for gold recovery in Newmont, USA



Fluidized bed roaster with waste heat boiler

Design range

Offgas rate	15,000 - 120,000	m^3(STP)/h
Offgas temperature at boiler inlet	800 - 1,000	°C
Offgas temperature at boiler outlet	350 - 400	°C
Feed water temperature	105 - 140	°C
Steam pressure	42 - 70	bar
Steam temperature	250 - 400	°C
Steam rate of boiler	6 - 50	t/h
Fluidized bed cooling coils	3 - 50	t/h




Innovative and reliable

Cleaning of waste heat boiler cooling surfaces

The Oschatz boiler hammering cleaning system is the result of 50 years of development and experience. The special patented hammering system provides an extraordinary cleaning effect for slag and dust, without damaging the boiler.

OSCHATZ
Know-how

Oschatz hammers hit the heating surfaces of the boiler within the tensile strength limits of the steel. Hammer, anvil, boiler and buckstays are not overstressed, without any plastic deformation of the steel when subject to high impacts.

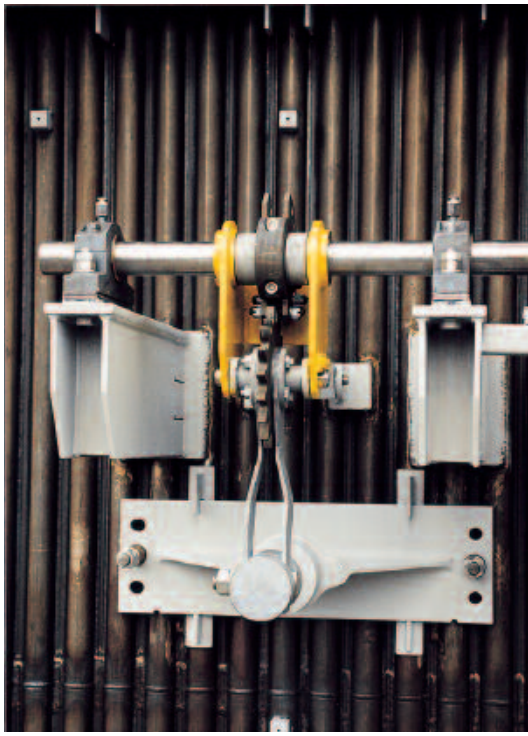
Oschatz hammers hit on well-defined points permitting maximum acceleration and have a variable cleaning vibration frequency.

Oschatz offers three types of heating suface cleaning systems for:

- boiler walls,
- screens,
- evaporator bundles.

For the boiler wall cleaning system a hammer hits an anvil that is directly mounted on the boiler wall. For a screen bundle each screen has its own hammer positioned outside of the boiler at the top. This hammer hits in the direction of the gas flow. The bundles are hammered at the bottom with one hammer hitting two bundle layers.

The Oschatz hammering cleaning system is used successfully for the dust removal in waste heat boilers downstream flash smelting, ISASMELT, Ausmelt and roasting processes.



Test unit of a cooling surface cleaning system

Know-how and activities

Oschatz special know-how	Examples
Gas-handling system analysis	Material and energy balances/equipment selection
Process	Smelting, converting, sulphation, post-combustion
Post-combustion and sulphation	Dosing and mixing tests for combustion air
Cleaning of cooling surfaces	Life-time tests of surface and hammering system (patent)
Corrosion and erosion	Corrosion and erosion tests
Infiltration air reduction	Pressure air sealing
Capacity increase and modernization	Screens, bundles, bed cooling elements, boiler enlargement
Furnace and reactor cooling	Evaporation-cooled cyclone, furnace and roof cooling

Fast and customer-oriented

Our production facilities in Turkey and China

The Oschatz production facility in Nanjing, China

Istanbul, Turkey

Oschatz has been manufacturing boilers and waste heat systems, i.e. heat recovery, at its workshop in Istanbul since 1997, for customers located all around the world. The production facilities at Gebze-Kocaeli, located on a 21,000 m² (226,000 ft²) site on the immediate outskirts of the Turkish metropolis, offer 5,000 m² of floor space – plenty of room in which to manufacture vessels with a maximum diameter of 6.5 metres to ASME, TRD/AD and ISO 9001 standards and in compliance with the EU's Pressure Equipment Directive (PED). In an initial expansion phase scheduled to be completed in 2010, production is being relocated and expanded. 50 kilometres from our present location, we are constructing four new factory buildings with a production area of 10,000 m² (108,000 ft²) on a 60,000 m² (646,000 ft²) site located immediately next to the sea.

Nanjing, China

To be able to supply the markets in Asia, Australia and Oceania faster and more cost-effectively, Oschatz has built a second production facility in Nanjing, China. The production began in October 2005. A second expansion phase at this facility was completed only three years later in the summer of 2008. In seven production halls with a total floor space of 15,000 m² (161,000 ft²), located on a 50,000 m² (538,000 ft²) site with good connections to the port of Changjiang, Oschatz now manufactures waste heat boilers and cooling stacks in accordance with the Chinese GB, ASME, PED, TRD/AD and ISO 9001 standards. 650 people are now employed here – under European management – in production, design, finance and procurement.

The new Oschatz production facility near Istanbul, Turkey

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OSCHATZ
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Oschatz GmbH
Westendhof 10-12
45143 Essen
Germany

Tel. +49 201 1802-0
Fax +49 201 1802-165
www.oschatz.com