



Maerz

**Andritz MAERZ GmbH**  
**COPPER DIVISION**

Furnace systems for the copper industry

# Agenda

**MAERZ®**

- Andritz MAERZ and the Andritz Group
- Industries of application and available services
- MAERZ Drum Type Furnaces / Converters
- MAERZ Tiltable Reverberatory Furnaces
- MAERZ Shaft Furnaces and Hearth-Shaft Furnaces
- MAERZ Elliptic Furnaces
- MAERZ Top Blown Rotary Converter Furnaces
- Auxiliary equipment for furnace systems
- Process optimization and development
- Conclusion

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# Andritz MAERZ GmbH

## Overview

**MAERZ®**

### Company

- Andritz MAERZ GmbH, Düsseldorf, Germany
- Founded in 1911 by Mr. Johannes Maerz

### Business Areas

- Furnaces for the Copper Industry
  - Primary Industry
  - Secondary Industry
  - Processing Industry
- Furnaces for the Steel Industry
  - Continuous Furnaces
  - Batch-Type Furnaces

### Employees

- Approximately 60

### Our Mission

Use our expertise for engineering, know-how and process technology in the area of melting, refining, heating and casting technology for ferrous and copper plants all over the world.



# The Andritz Group

## Overview

**MAERZ®**

### Company

- ANDRITZ AG, Graz, Austria (Group headquarters).
- More than 150 production and service sites worldwide.

### Key figures 2008

- Order intake: 3,705 MEUR.
- Sales: 3,610 MEUR.
- Net income: 147 MEUR.
- Equity ratio: 18.7%.
- Employees: ~13,700 worldwide.

### Products and services

Customized plants, process technologies, and services for the hydropower, pulp and paper, metals, and other industries (solid/liquid separation, feed and biofuel).



**ANDRITZ**  
**Metals**

# Andritz Business Divisions

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## **ANDRITZ** Pulp & Paper

- 37% of Group sales.
- Plants and services for the production of all types of pulp (chemical, mechanical, recycled fiber pulps), paper, board, tissue, and Medium Density Fiberboard (MDF); biomass boilers for power generation.



## **ANDRITZ** Hydro

- 33% of Group sales.
- Electromechanical equipment and services for hydro-power stations – in particular, turbines, hydropower generators, and turbo generators; pumps.



## **ANDRITZ** Metals

- 16% of Group sales.
- Production and finishing lines for metallic strip, especially for carbon and stainless steel.



## **ANDRITZ** Environment & Process

- 10% of Group sales.
- Plants, equipment, and services for solid/liquid separation for municipalities and industries (e. g. mining, chemical and petrochemical industries, food industry).



## **ANDRITZ** Feed & Biofuel

- 4% of Group sales.
- Plants, equipment, and services for the production of animal feed and biomass pellets, especially wood pellets.

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Metals

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# Application in the industry

## Handling copper from matte to cathodes

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PRIMARY INDUSTRY

- Drum Type Furnaces and Converters (PS-Converters)
- Stationary Reverberatory Furnaces
- Top Blowing Rotary Converter Furnaces



SECONDARY INDUSTRY

- Tiltable Reverberatory Furnaces
- Combined Hearth-Shaft Furnaces
- Elliptic Furnaces
- Drum Type Furnaces
- Top Blowing Rotary Converter Furnaces



PROCESSING INDUSTRY

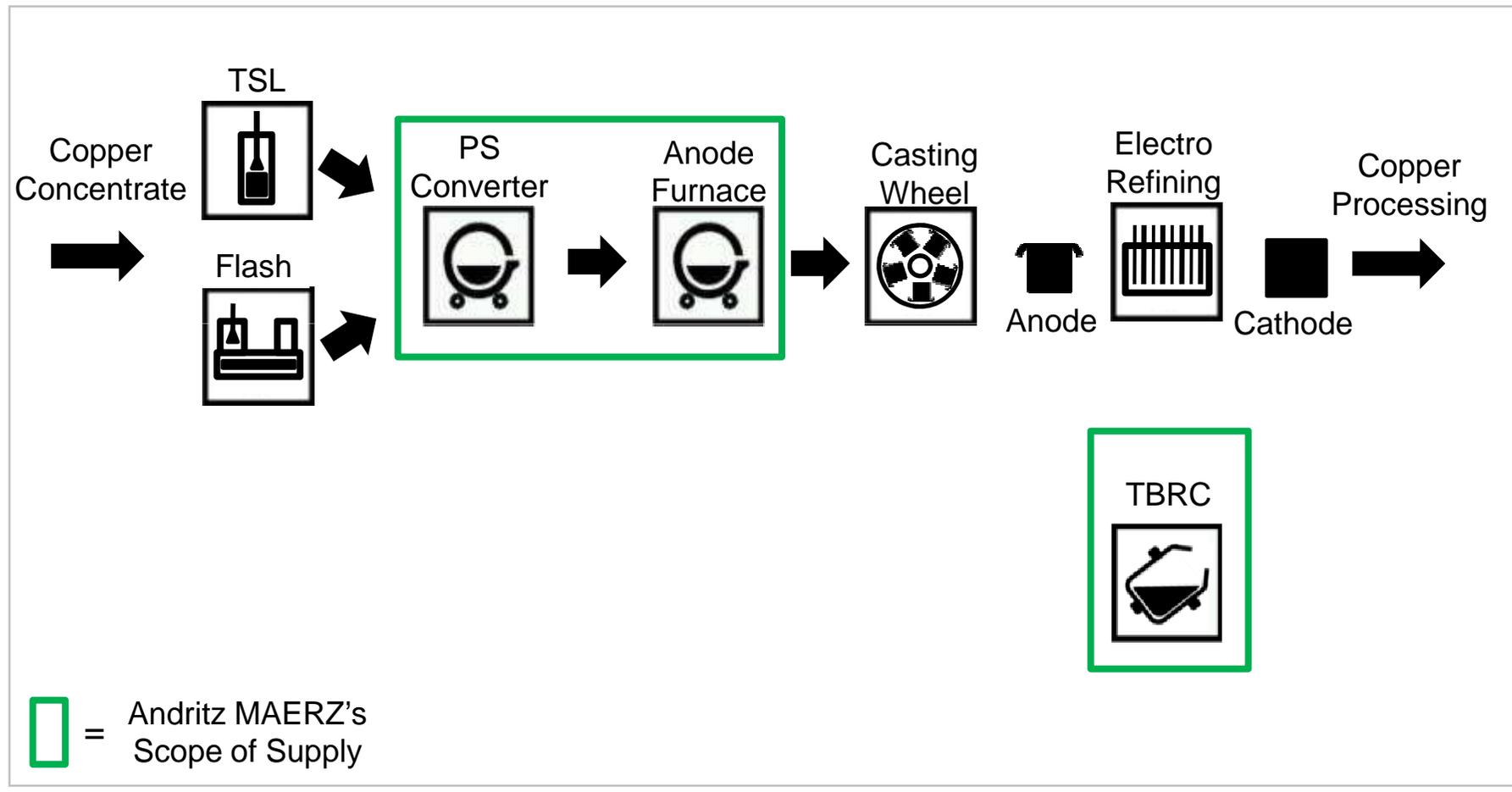
- Shaft Furnaces
- Tiltable Reverberatory Furnaces
- Drum Type Furnaces
- MAERZ "Direct-to-Wire®" Technology for FHRC Copper

## 2. Copper Production Routes

### Primary Industry

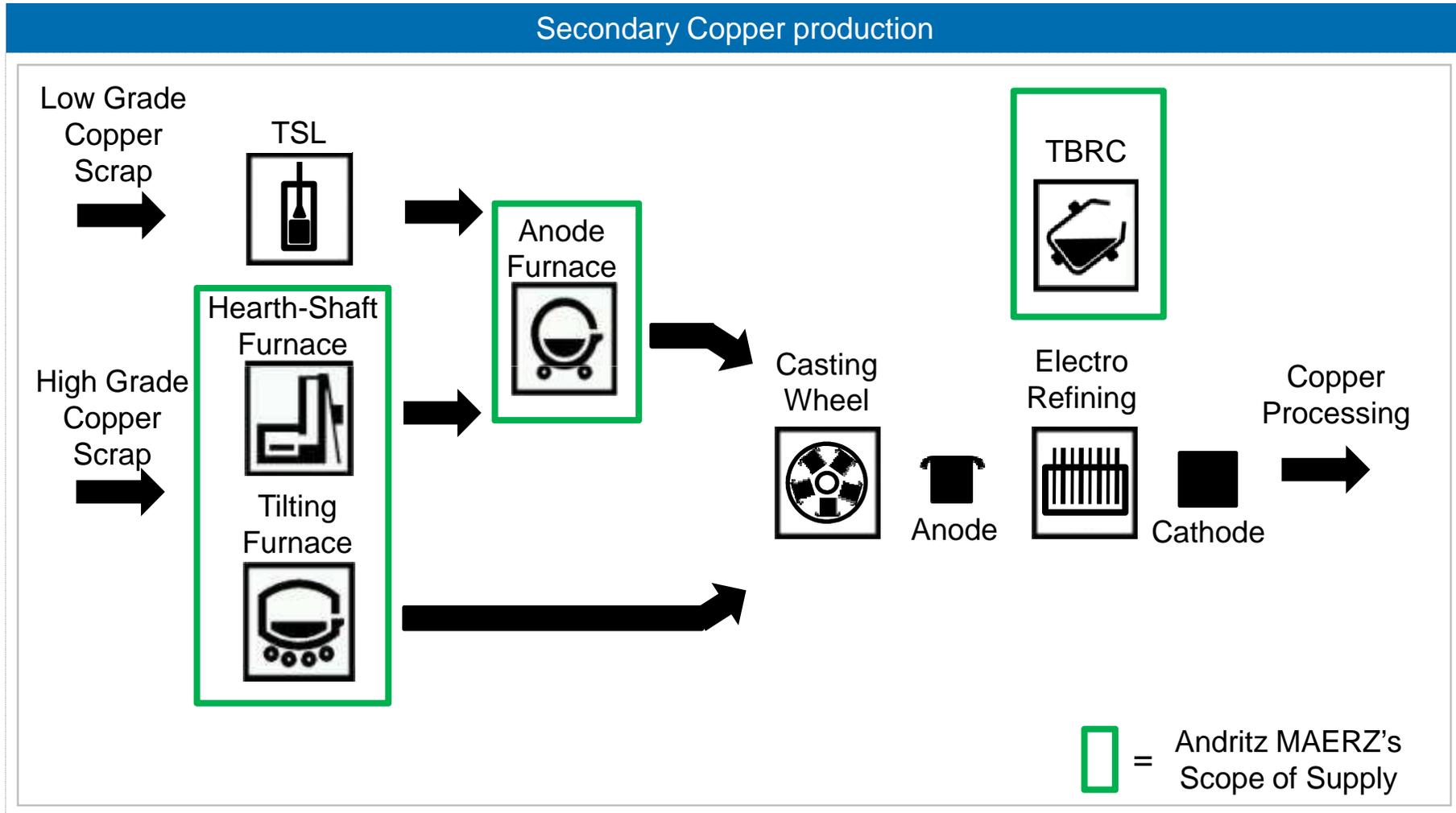
**MAERZ**<sup>®</sup>

#### Primary Copper production



# 2. Copper Production Routes

## Secondary Industry



# The Copper Industry

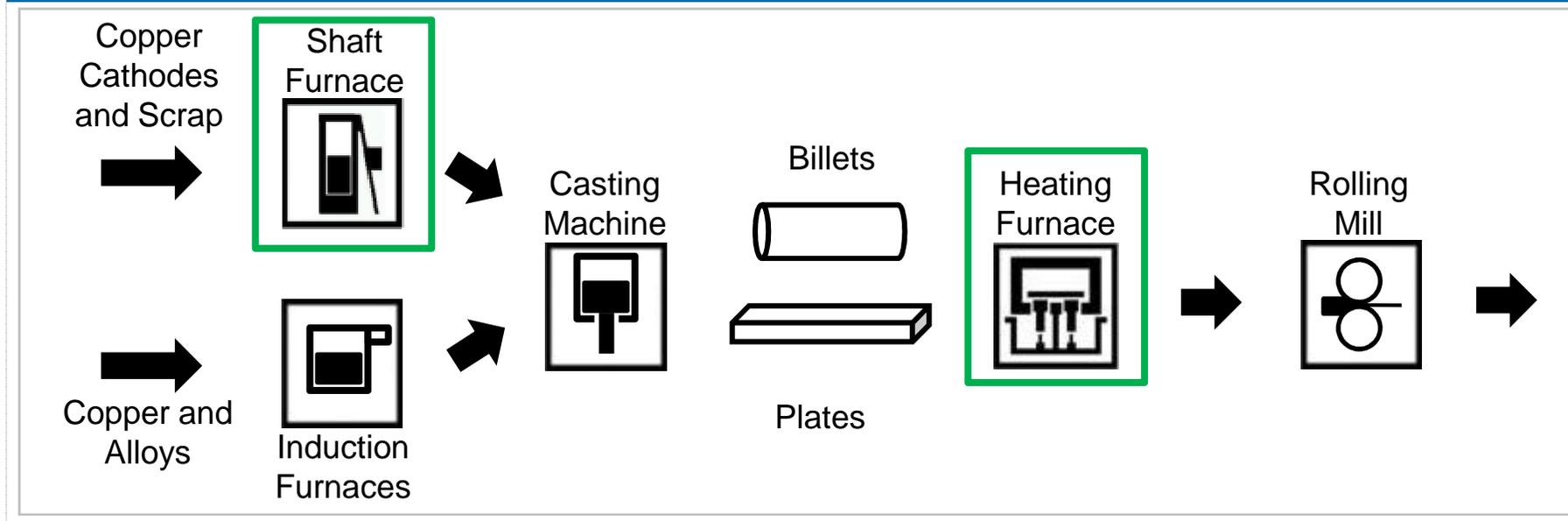
## Processing Industry

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### Copper Tube Production



### Brass Mill



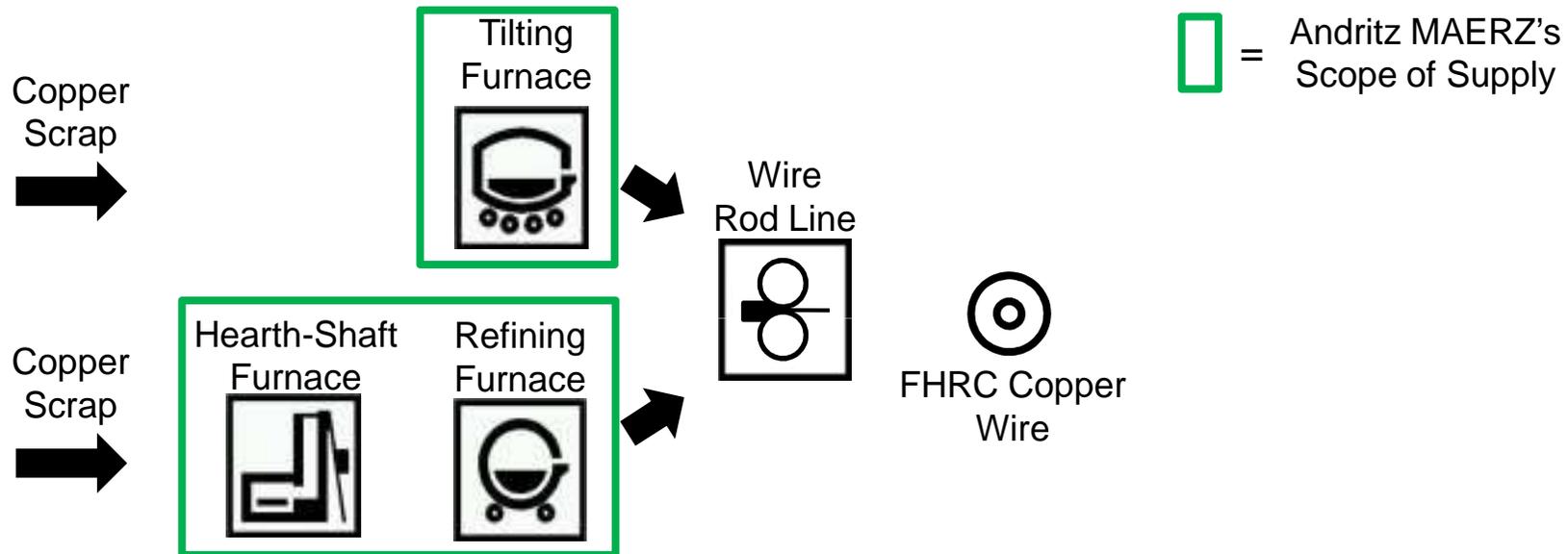
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# The Copper Industry

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## MAERZ Direct-to-Wire® Production

### FRHC Copper Wire Production



**MAERZ Direct-To-Wire® Technology** comprises the following production steps:

**Charging and melting** of copper scrap with a minimum copper content of 92%.

**Refining** (oxidation – deslagging – reduction) of molten copper to FRHC (Fire Refined High Conductivity) copper quality.

**Casting** of FRHC copper into wire rod casting machine.

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# Services available for the industry

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Co-operation with local engineering partners

Co-operation with customers for local supply and quality control

Delivery of Turn-key Furnace Projects

TURN-KEY OR PARTIAL DELIVERY PROJECT

## Engineering

- Basic
- Detail

## Key Equipment

- Combustion system
- Refining system
- Nitrogen purging system
- Off-gas measurement system
- PLC-visualization
- Critical components:
  - Steel structure
  - Refractory
  - Etc.

## Services

- Training
- Commissioning
- After sales service
- Erection
- Optimization
- Development

# Key References

**MAERZ®**

More than 70 Furnace projects realized in the last 30 years...

- Aurubis
- Polish Copper KGHM
- Jiangxi Copper Corp.
- XSTRATA Copper
- OUTOKUMPU
- UMICORE
- Yanggu Xiangguang Copper Smelter
- Mopani Copper Mines
- KAZZINC
- Schwermetall

Germany  
 Poland  
 China  
 Australia  
 Finland  
 Belgium  
 China  
  
 Zambia  
 Kazakhstan  
 Germany



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# Drum Type Furnaces / Converters Data

(Anode) Refining Furnaces and Pierce Smith Converters

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Proven equipment for the primary and secondary copper production

- Furnace capacities between 20 and 630 t realized

## Features

- Fire refining of liquid blister copper
- Desulphurization of blister copper
- Continuous launder charging / batch wise ladle charging
- Holding of liquid copper
- Converting of copper matte

## Advantages

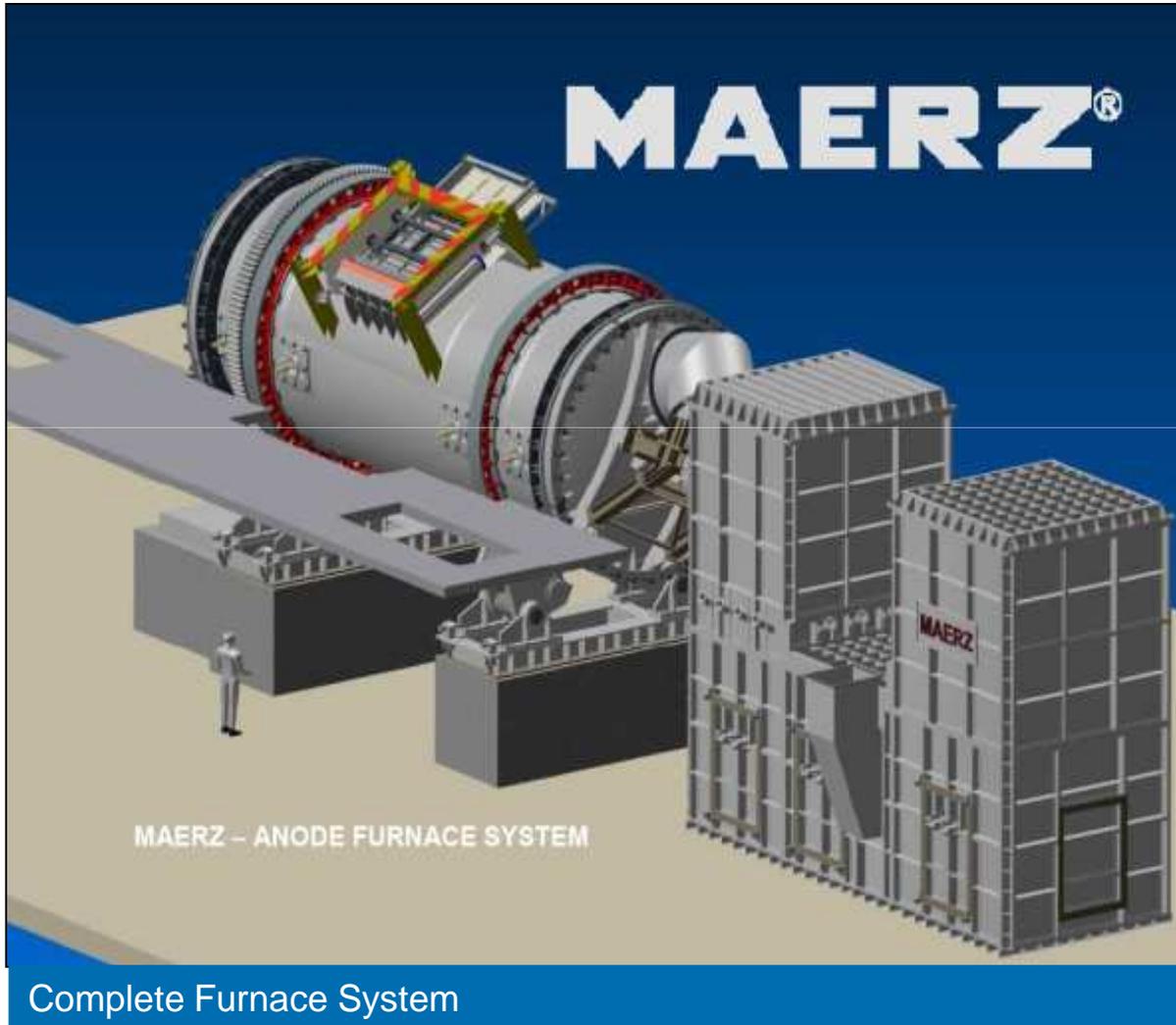
- Different kinds of fuel used for combustion and refining
- Single aggregate for refining and casting
- Flexible operation by optimized furnace movement
- Less personnel required
- Low production costs



# Drum Type Furnaces / Converters Design

(Anode-) Refining Furnaces

**MAERZ®**



Complete Furnace System

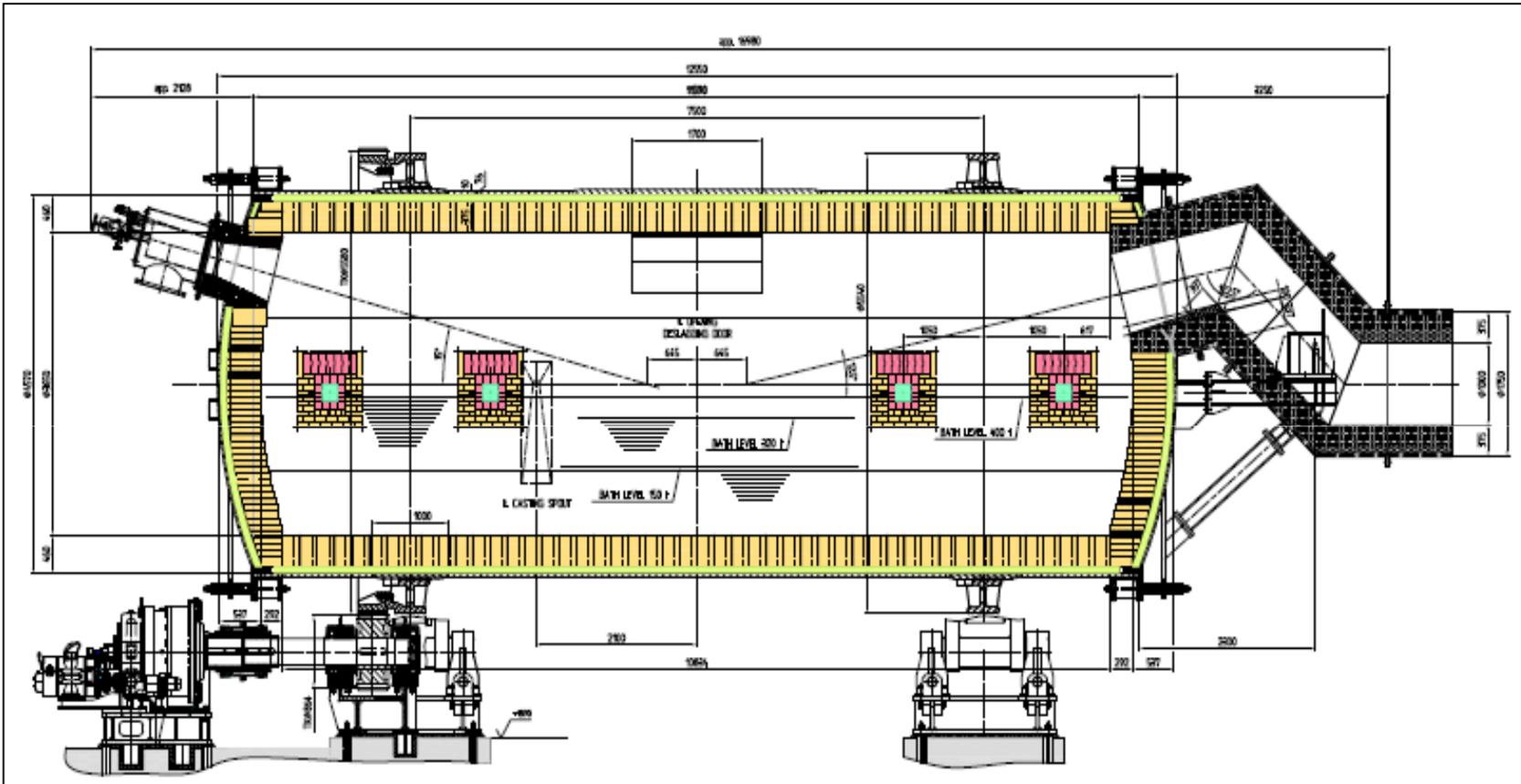


Charging Door

# Drum Type Furnaces / Converters Design

**MAERZ®**

(Anode-) Refining Furnaces

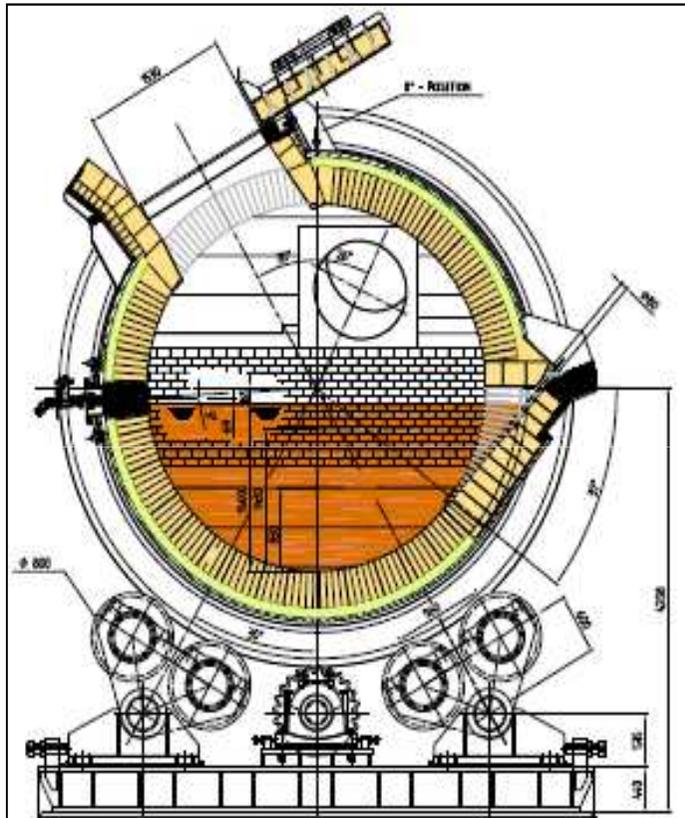


Side View

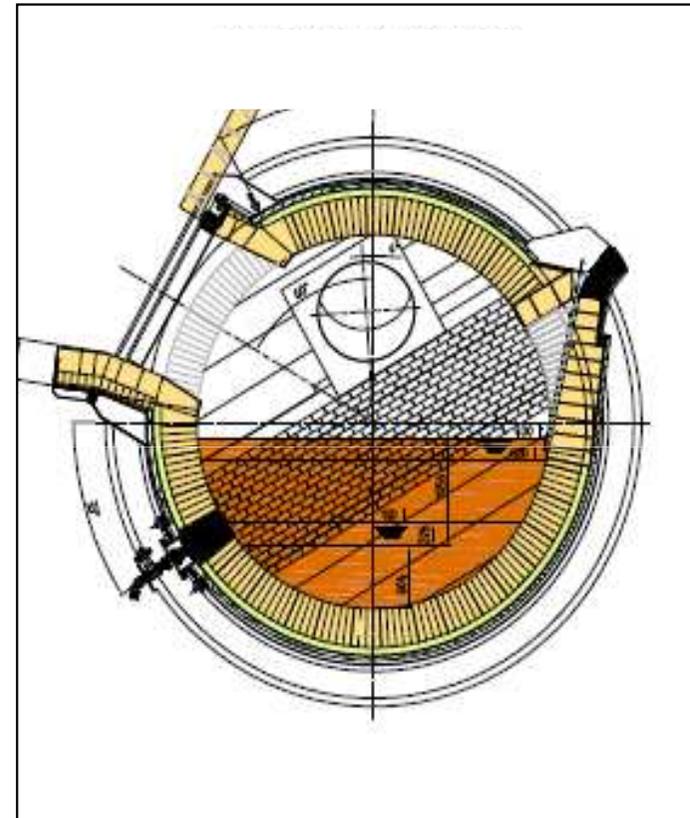
# Drum Type Furnaces / Converters Design

**MAERZ®**

(Anode-) Refining Furnaces



Neutral Position

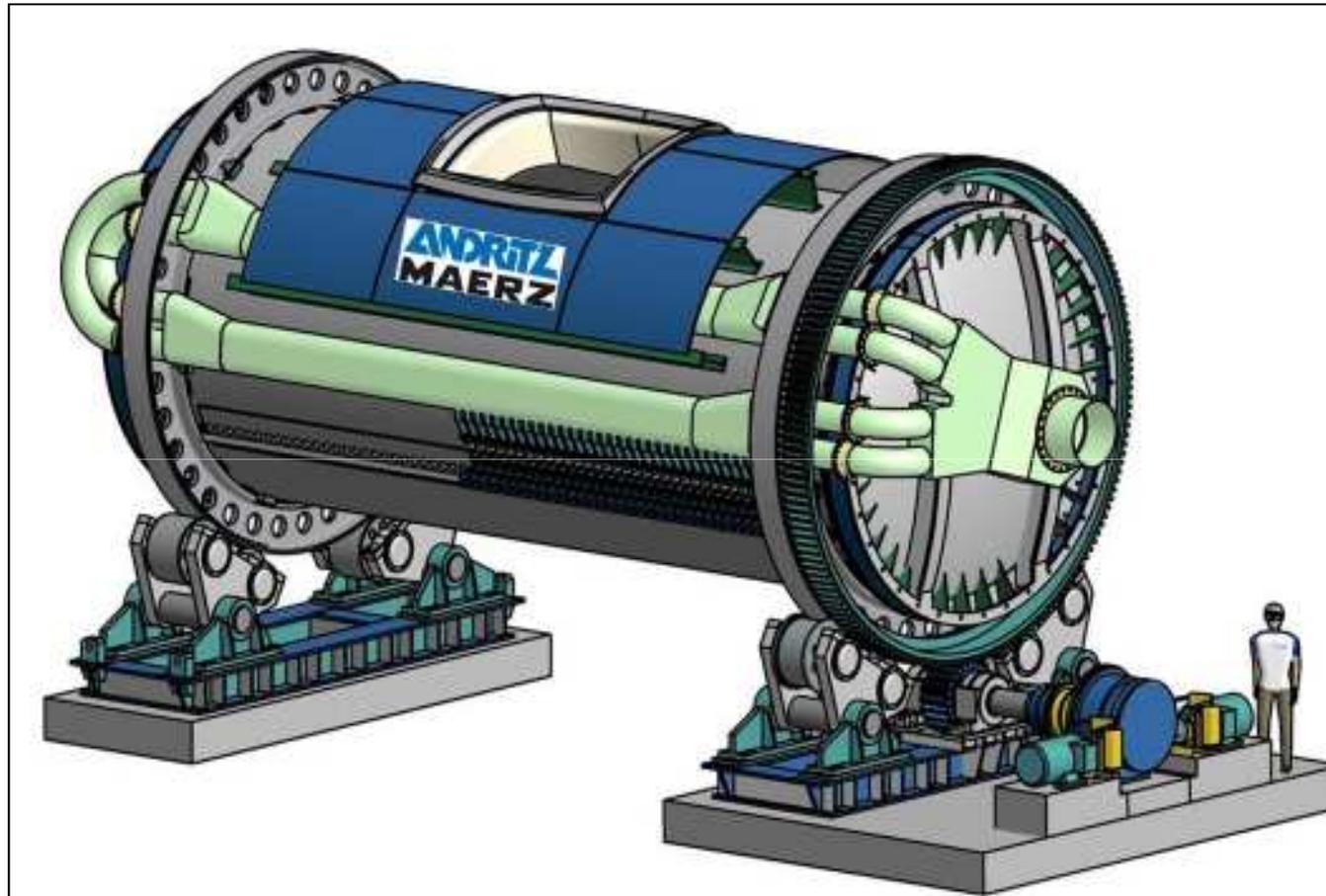


Refining Position

# Drum Type Furnaces / Converters Design

**MAERZ®**

Peirce Smith Converters

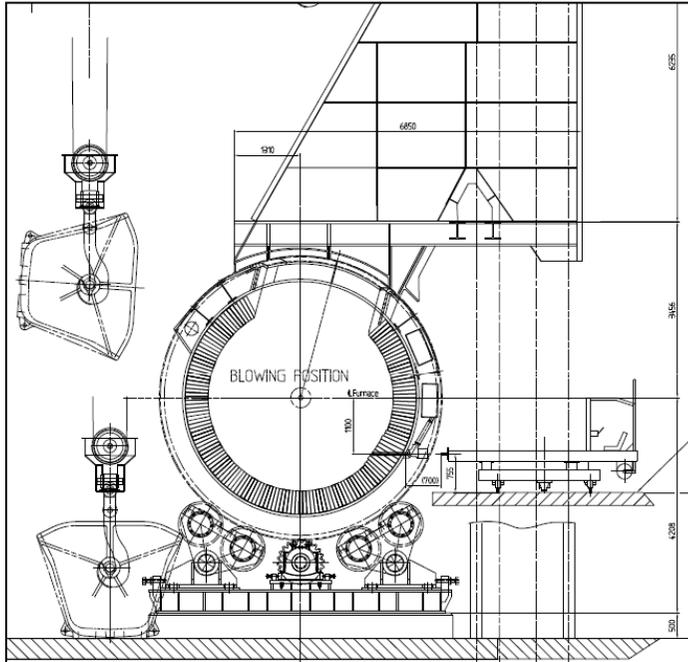


MAERZ Peirce Smith Converter

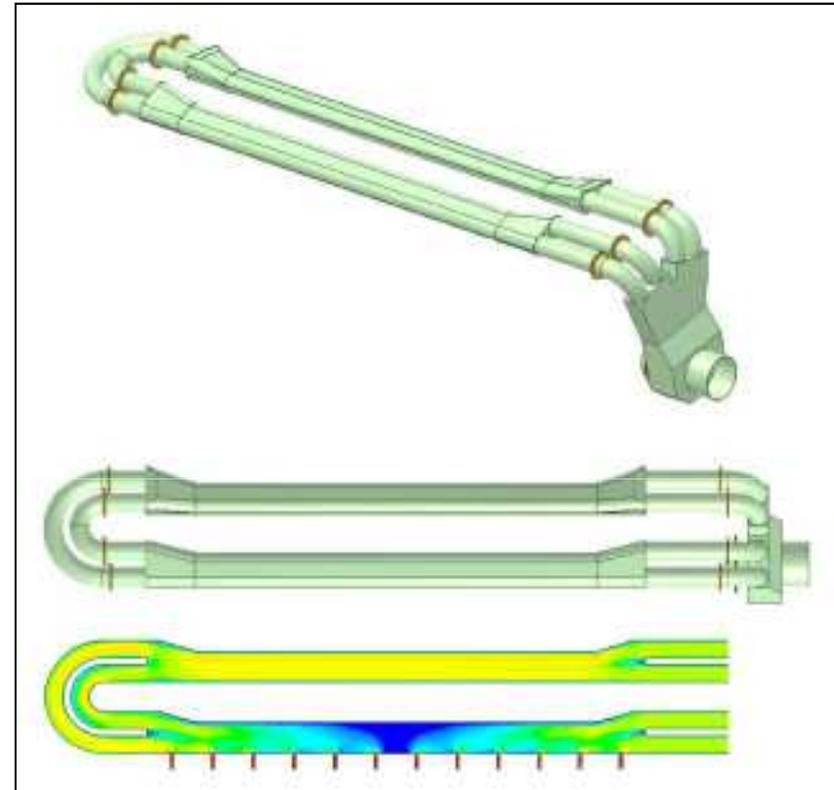
# Drum Type Furnaces / Converters Design

**MAERZ®**

## Peirce Smith Converters



Converter in Blowing Position



MAERZ Blast Air System

# Drum Type Furnaces Drive Unit

(Anode-) Refining Furnaces and Peirce Smith Converters

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Drive Unit for 400 t Drum Type Furnace

- Main Speed 0,33 rpm
- Casting Speed 0,0001 rpm
- Emergency Speed 0,025 rpm
- Total Gear Ratio  $i = 4.500$
- Total Teeth Force 550 kN
- Main Motor Power 90 kW

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# Drum Type Furnaces / Converters References

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COMPANY

COUNTRY

CAPACITY

- KGHM
- Lurgi Metallurgy for Codelco
- Aurubis (Enlargement)
- Mansfelder Kupfer und Messing
- Yanggu Xiangguang Copper Smelter
- Mopani Copper Mines
- KAZZINC

Poland

2 x 250 t

Chile

3 x 300 t

Germany

400 to 450 t

Germany

1 x 320 t

China

2 x 630 t

Zambia

2 x 400 t

Kazakhstan

2 x 200 t

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# Tiltable Reverberatory Furnaces Data

**MAERZ®**

## Proven equipment for secondary scrap recycling

- Furnace capacities between 50 and 500 t realized

## Features

- Melting of copper scrap
- Refining of lower grade copper scraps
- Production of anode copper → casting wheel
- Production “Direct-to-Wire” FRHC Copper → rod casting line

## Advantages

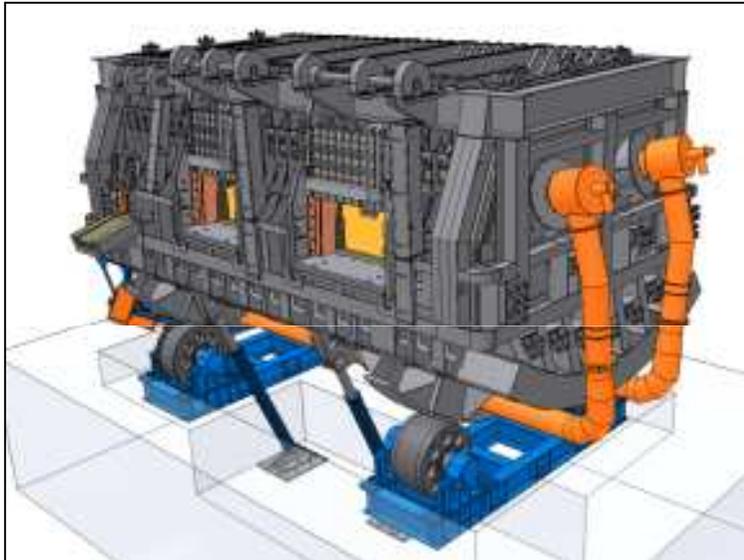
- Single aggregate for melting, refining and casting
- Different kinds of fuel used for combustion and refining
- Quick and efficient melting
- Flexible operation by optimized furnace movement
- Less personnel required
- Low production costs
- Ease of maintenance
- Environmental friendly process



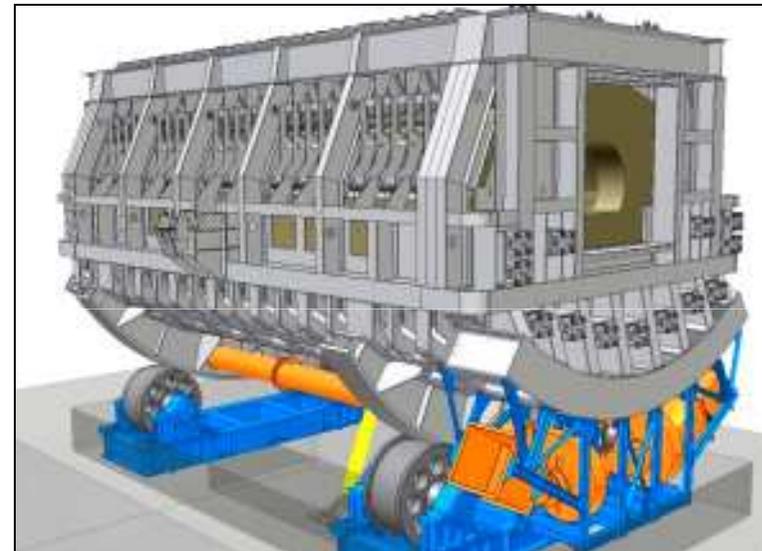
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# Tilting Furnaces Design

**MAERZ**<sup>®</sup>



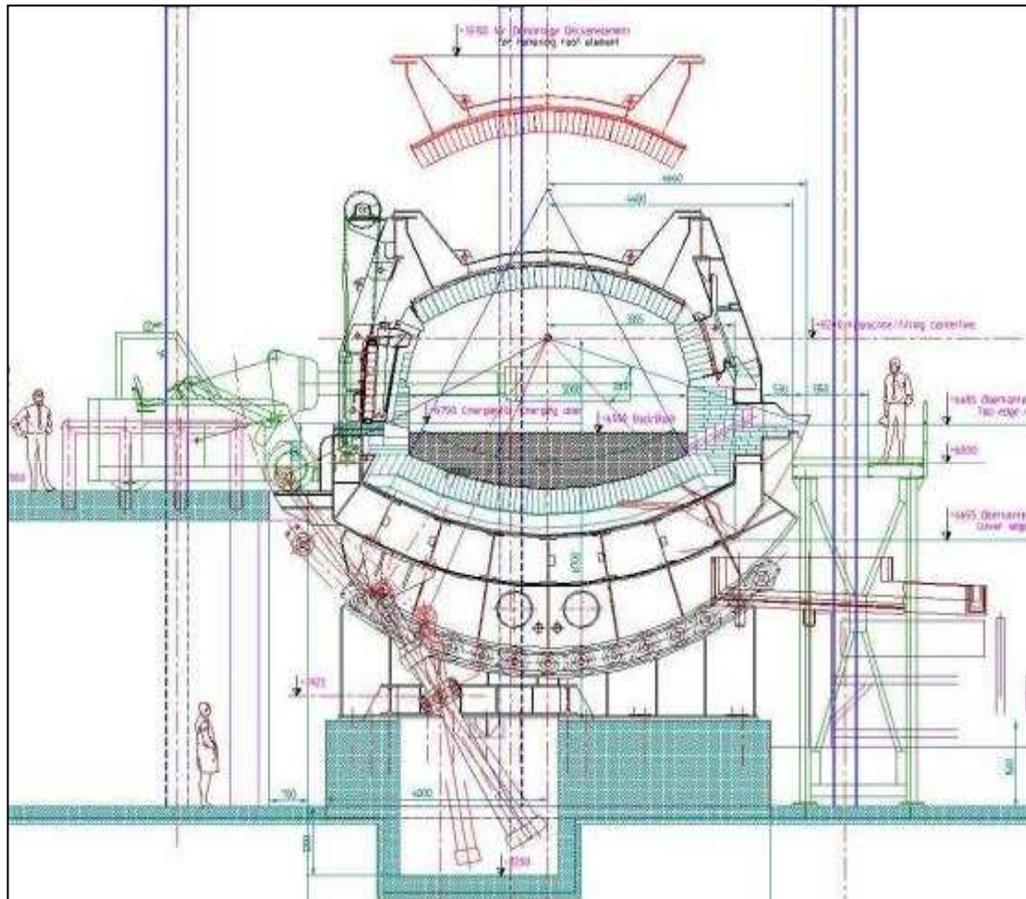
Charging and Melting Position



Charging and Melting Position Side View

# Tilting Furnaces Design

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Charging of the furnace



Hydraulic Cylinder

# Tilting Furnaces Design

**MAERZ**<sup>®</sup>

Process steps



Melting &  
Charging

Oxidation

Deslagging

Reduction

Casting

# Tilting Furnaces Main References

**MAERZ®**

COMPANY	COUNTRY	CAPACITY
▪ Southwire Company	USA	1 x 400 t
▪ Southern Peru Copper	Peru	2 x 330 t
▪ ASARCO	USA	1 x 305 t
▪ Nassau Recycle Corp.	USA	3 x 300 t
▪ Sumitomo Electric Ind.	Japan	1 x 100 t
▪ La Farga Lacambra	Spain	1 x 55 t
▪ LG Metals	South Korea	1 x 100 t
▪ Sun Jin Metals	South Korea	2 x 55 t
▪ Hüttenwerke Kayser	Germany	1 x 350 t
▪ Kyshtym Electrolytic Plant	Russia	1 x 350 t
▪ Jiangxi Copper Corp.	China	1 x 350 t
▪ Novgorod Metallurgical Plant	Russia	1 x 180 t

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# Shaft & Hearth-Shaft Furnaces Data

**MAERZ®**

## Proven equipment for anode scrap and cathode re-melting

- Furnace melting rates between 10 and 65 t/h realized

## Features

- Continuous melting
- Shaft furnaces → melting for rod casting and brass mills
- Hearth-shaft furnaces → transfer to (drum-type) refining furnace via launders
  - Production of anode copper → casting wheel
  - Production “Direct-to-Wire” FRHC Copper → rod casting line

## Advantages

- Quick and high efficiency melting
- Optimized thermal efficiency
- Preheating of charging material
- Different kinds of fuel used for combustion and refining
- Flexible regulation of melting rate
- Less personnel required
- Low production costs
- Ease of maintenance



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# Shaft Furnace Design

**MAERZ®**



Furnace Layout



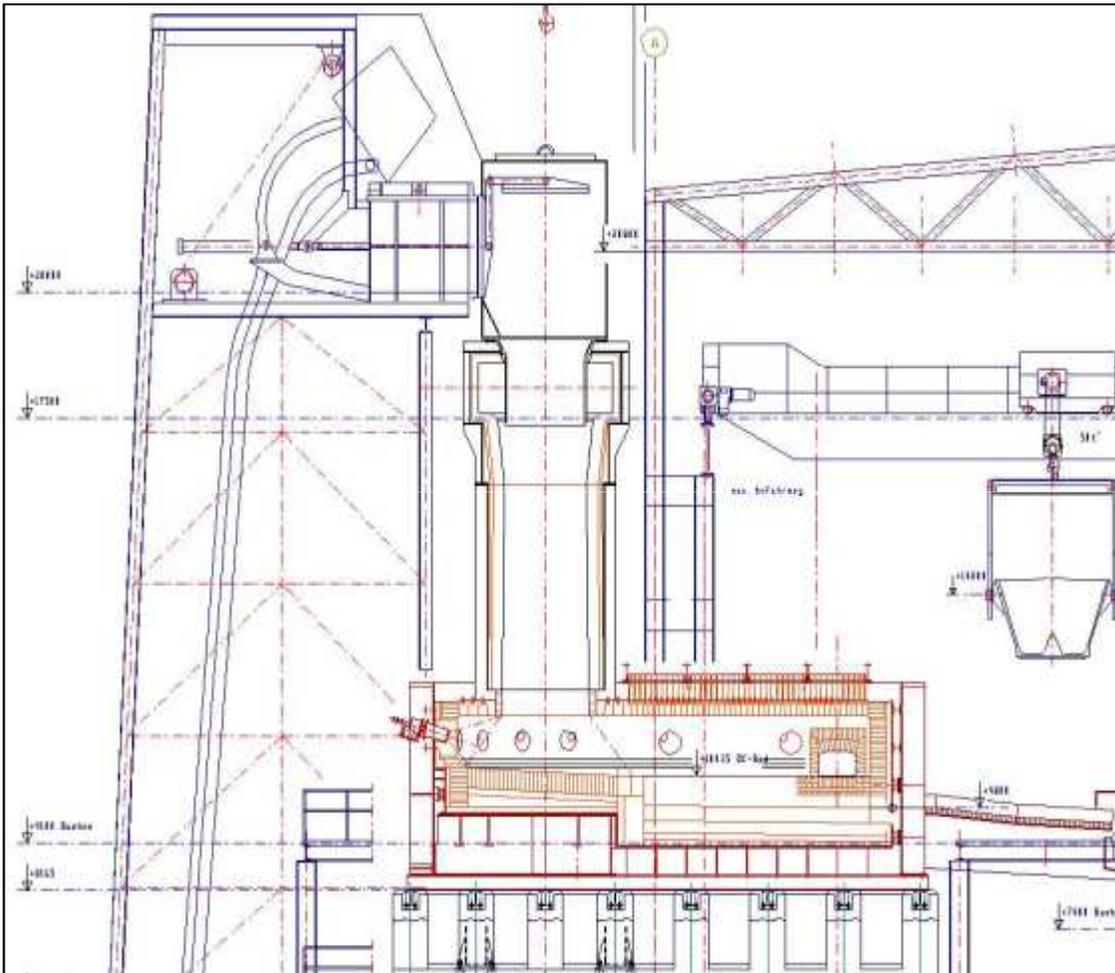
Furnace Shell



Gas Manifolds

# Hearth-Shaft Furnaces Design

**MAERZ®**



Furnace Layout



Hearth Area



Hearth Area

# Shaft & Hearth-Shaft Furnaces References

**MAERZ®**



COMPANY	COUNTRY	CAPACITY
▪ Aurubis	Germany	1 x 50 t/h
▪ UCA	Belgium	1 x 14 t/h
▪ Sun Jin Metals	South Korea	1 x 20 t/h
▪ Sarkuysan	Turkey	1 x 15 t/h
▪ MKM	Germany	1 x 30 t/h
▪ Mueller Copper Tube	USA	1 x 20 t/h
▪ KM Europa Metal AG	Germany	1 x 45 t/h
▪ XSTRATA Copper	Australia	1 x 65 t/h
▪ Yanggu Xiangguang Copper	China	1 x 40 t/h
▪ Schwermetall	Germany	1 x 10 t/h

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# Elliptic Furnaces Data

**MAERZ®**

## New development for primary and secondary industry

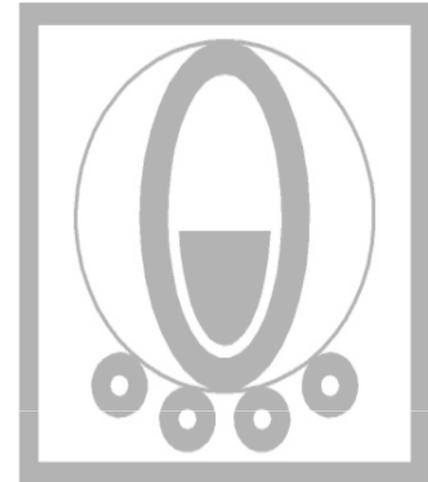
- Furnace capacity between 20 and 50 t

## Features

- 100% liquid blister or 100% solid scrap input
- Production of anode copper or FHRC Copper

## Advantages

- High thermal efficiency for melting similar to a tilting furnace
- High metallurgical efficiency for refining similar to a drum –type furnace
- Decrease of metallurgical treatment times
- Decrease of media consumption
- Flexible operation by optimized movement and adjustment of furnace shape according to the process step
- Single aggregate for melting, refining and casting
- Different kinds of fuel used for combustion and refining



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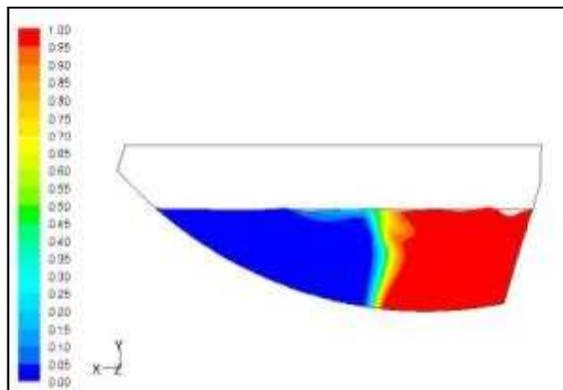


# Elliptic Furnaces Design

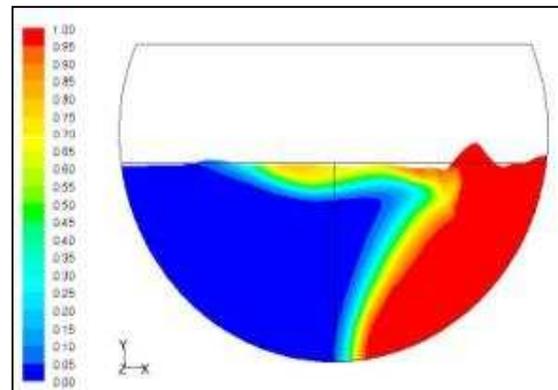
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Comparison of the mixture of the copper melt for Anode Rotary Furnace, Reverb Furnace and Elliptic Furnace in refining position.

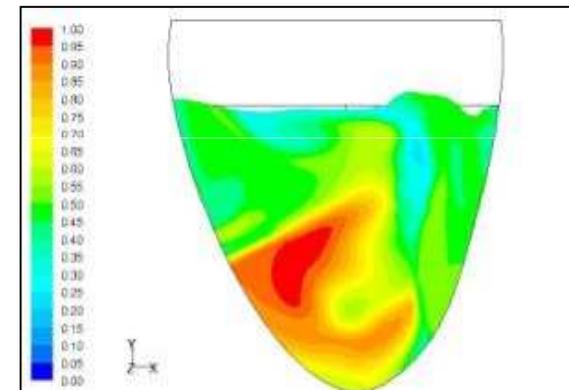
- Mixture rate of the copper melt during the refining period after 23 seconds:



Reverberatory Furnace : 4,0 %



Anode Rotary Furnace : 19,2 %



Elliptic Furnace : 53,9 %

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# Top Blown Rotary Converter Furnaces Data

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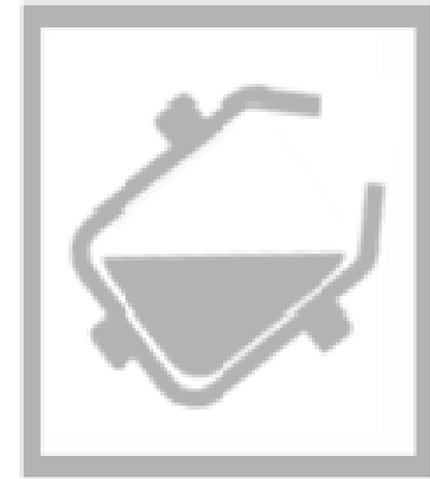
Recycling and waste treatment in primary and secondary industry

## Features

- Recycling of all kind of residuals in anode copper production
  - Dry anode slime, different types of slags
  - Copper Scrap
- Separation of precious metals
- Exchangeable furnace units
- Rotation speed of up to 15 min<sup>-1</sup>

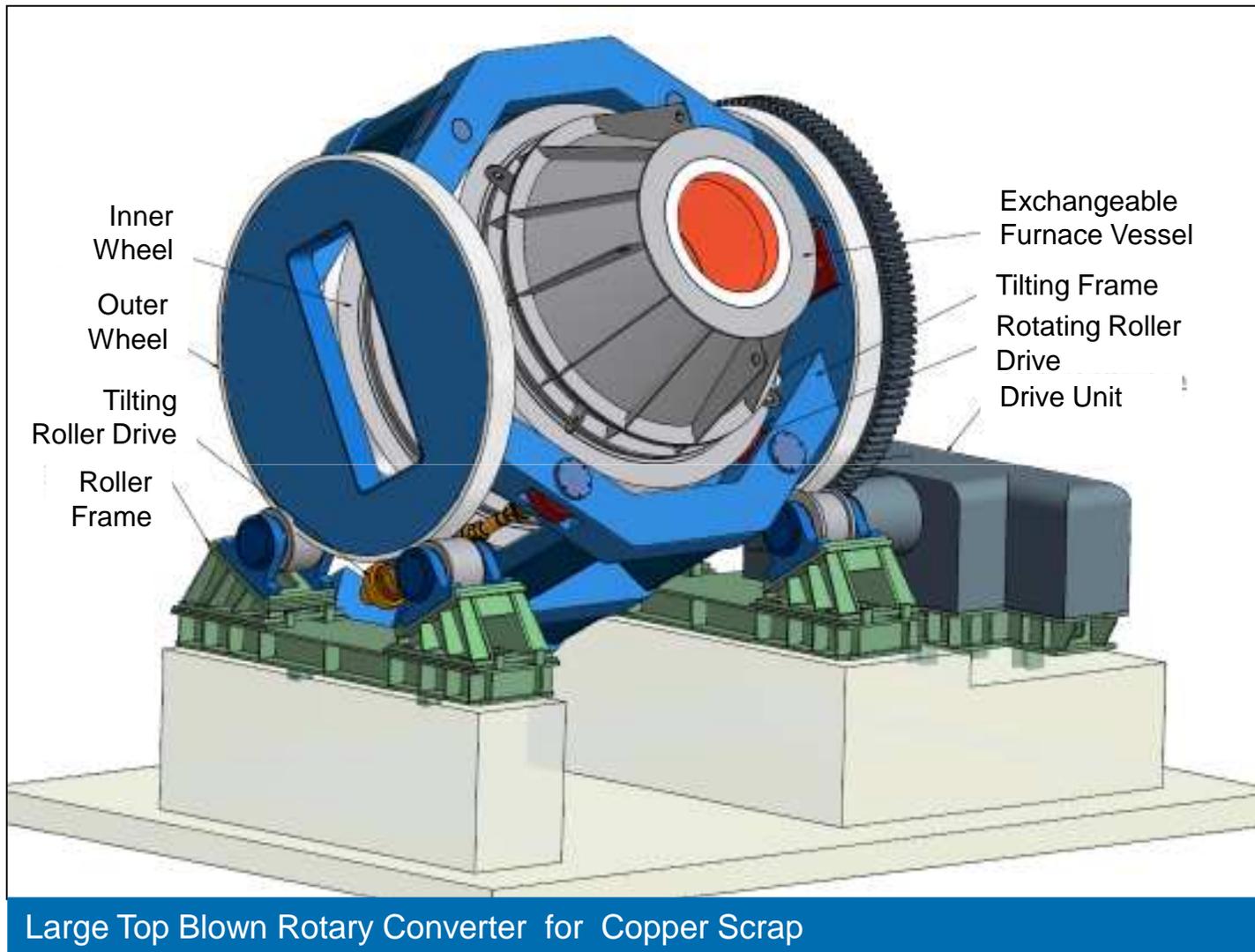
## Advantages

- High thermal efficiency
- High metallurgical efficiency
- Decrease of metallurgical treatment times
- Flexible operation by wide range of feedstock
- Single aggregate for melting, refining and casting
- Construction based on proven MAERZ equipment
- Quick exchange of the furnace unit for relining



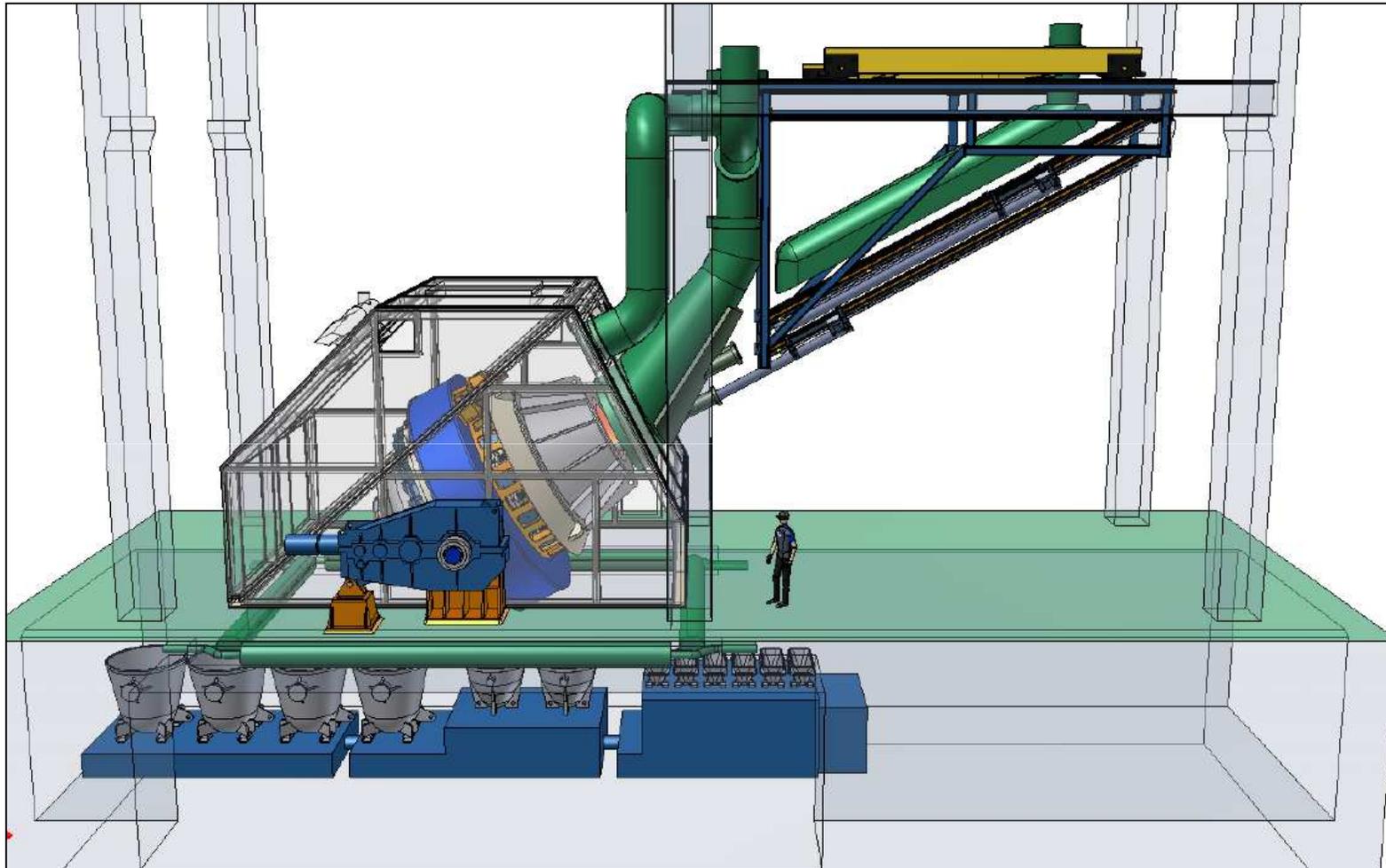
**ANDRITZ**  
**Metals**

# Top Blown Rotary Converter Furnaces Design **MAERZ**<sup>®</sup>



Large Top Blown Rotary Converter for Copper Scrap

# Top Blown Rotary Converter Furnaces Design **MAERZ**<sup>®</sup>



TBRC for Precious Metals Plant with Auxiliaries

# TBRC References

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 **Aurubis**

COMPANY

COUNTRY

CAPACITY

▪ Aurubis

Germany

1 x 40 t

**ANDRITZ**  
**Metals**

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# Auxiliary equipment for furnace systems

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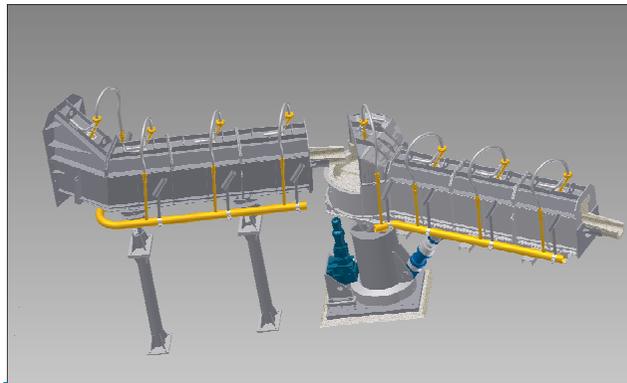
Supplying the necessary auxiliary equipment

## Features

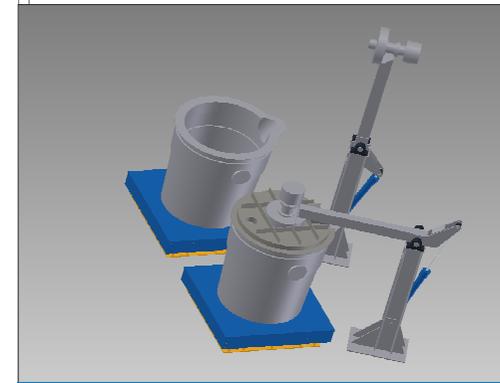
- Stationary and movable connecting launders
- Launder burner systems for different fuels
- Charging equipment for copper scrap and other feedstock
- Process visualization and automatization
- Scale stations for ladle weight measurement
- Ladle transportation systems



Charging Equipment



Launder Systems



Ladle Scales and Burners

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# Process Optimization and Development

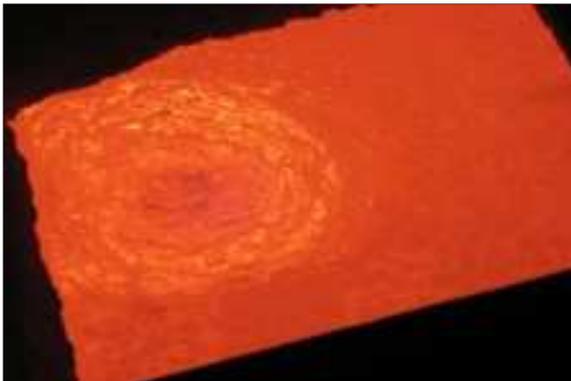
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## Metallurgical Improvement

The metallurgical process is defined and established by the chemistry of the available feed materials and the product specifications. The operation must provide effective removal of impurities to produce the required product quality.

### Examples

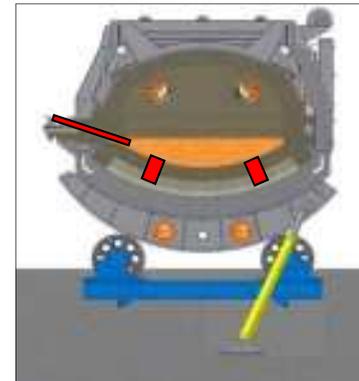
- Installation of purging elements (Nitrogen or Nitrogen - Hydrogen)
- Installation of optimized tuyere systems



Nitrogen purging



Purging equipment



Tuyere system

# Process Optimization and Development

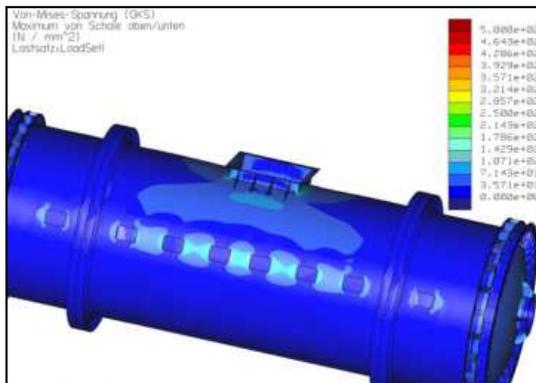
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## Cost Improvement

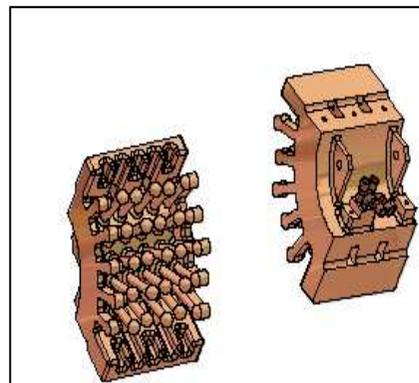
Conversion cost must be minimized by the effective use of technology to control the costs of material handling, direct processing, and disposable by-products.

### Examples

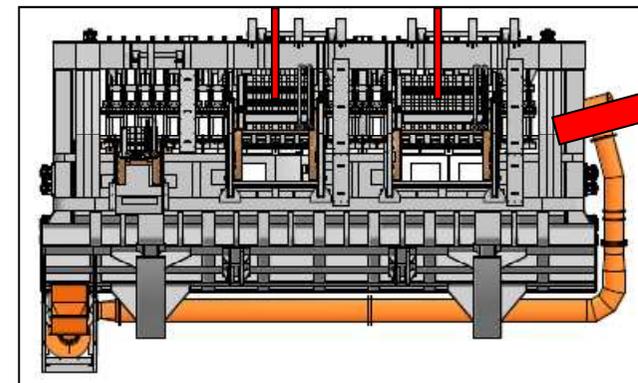
- Increase of furnace capacity
- Increase of refractory lifetime
- Alternative fuels or reductants and optimized burner controls
- Increase of melting capacity



FEM Simulations



Cooling Elements



Burner optimization

# Process Optimization and Development

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## Quality Improvement

A predictable and repeatable product quality is required. Even with different feed material the quality has to stay identical.

### Examples

- Process control systems
- Visualization of the process
- Monitoring of the process parameters
- Use of metallurgical improvement



Movement visualization



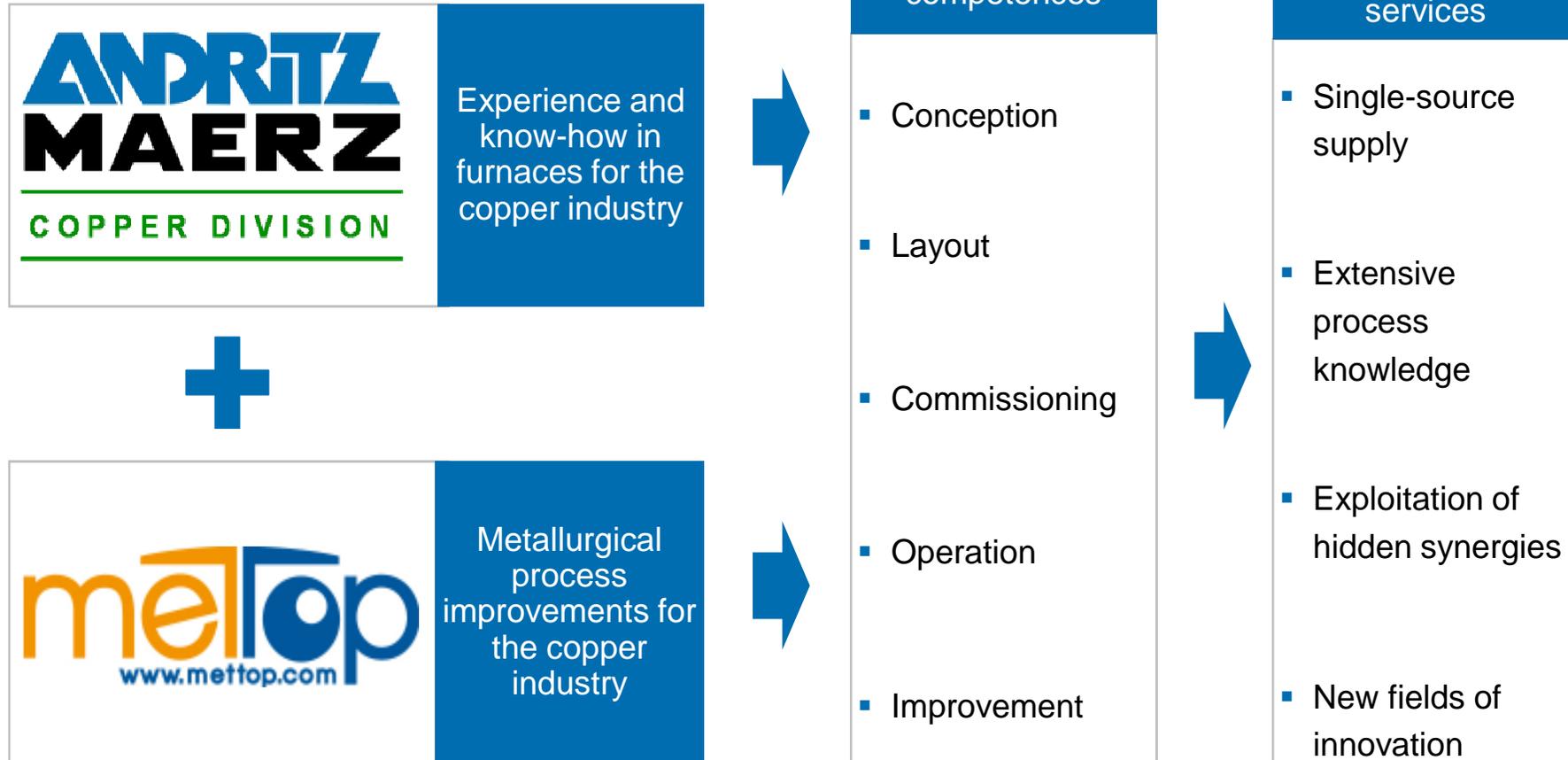
Temperature visualization



Process optimization

# Co-Operation with Mettop

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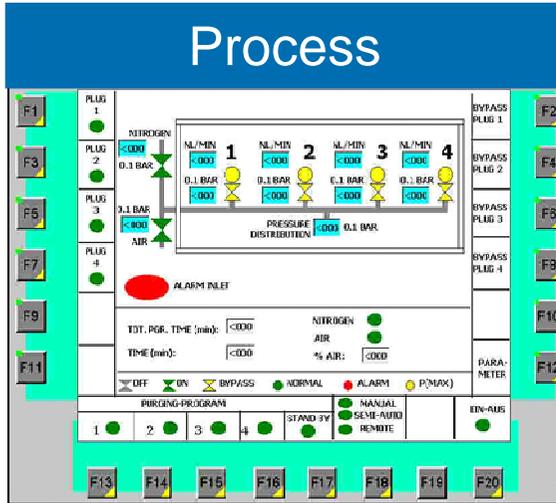
# Agenda

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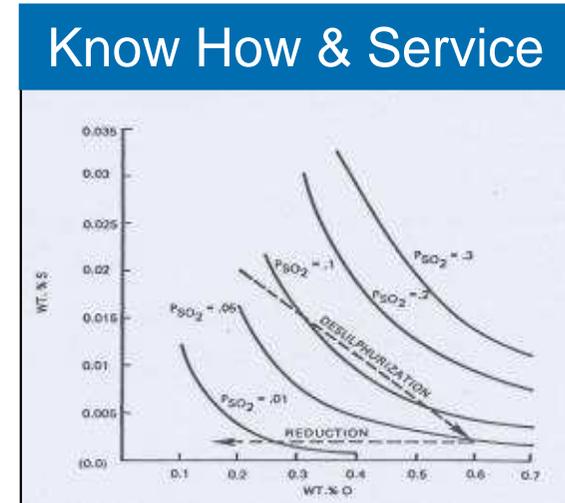
- Andritz MAERZ and the Andritz Group
- Industries of application and available services
- MAERZ Drum Type Furnaces / Converters
- MAERZ Tiltable Reverberatory Furnaces
- MAERZ Shaft Furnaces and Hearth-Shaft Furnaces
- MAERZ Elliptic Furnaces
- MAERZ Top Blown Rotary Converter Furnaces
- Auxiliary equipment for furnace systems
- Process optimization and development
- **Conclusion**

# Professional solution

**MAERZ®**



**CUSTOMER  
BENEFIT**



**ANDRITZ  
Metals**

Thank you for your attention

**MAERZ®**



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