

Copper and non-ferrous metals

Furnaces, converters and
process technology

Furnace systems for the copper industry

ANDRITZ METALS supplies turnkey industrial furnace systems, including process know-how for copper and non-ferrous metallurgy.



The primary and secondary copper refining industry relies on furnaces from ANDRITZ Maerz

In copper smelting, we are one of the very few global suppliers to the primary and secondary copper refining sector. The product portfolio includes melting, refining, and casting furnaces for copper and other non-ferrous metals. Our furnaces and converters are used worldwide in the primary and recycling industries, as well as in processing plants. In addition, TBRC converters enable the complex recycling of dust, slag, alloys, and WEEE scrap.

Our process know-how allows efficient manufacturing of quality products in wire, pipe, and shape production, and of anodes used in electrolytic processes. With the ANDRITZ Maerz Direct-to-Wire method, we have additional and particularly efficient process technology available for the production of FRHC copper.

CONTENTS

Tilttable reverberatory and elliptical furnaces	04
Shaft and hearth-shaft furnaces	05
Drum-type furnaces	06
Top Blown Rotary Converter (TBRC)	07
Process technology and optimization	08
Product portfolio and references	10

ANDRITZ METALS long tradition and metallurgical experience in furnace building helps to save operating costs, increase profit by optimizing production processes, and – at the same time – minimizes emissions to meet the most stringent environmental regulations.

Tiltable reverberatory and elliptical furnaces

Advanced melting, refining, and casting for the production of anode and FRHC quality copper from copper scrap

Refining large quantities of copper scrap in a single unit

The ANDRITZ Maerz tiltable reverberatory furnace has proven itself successfully in the secondary copper industry. Large quantities of copper scrap can be melted and refined in a single unit for the production of FRHC and anode copper. Capacities between 60 and 500 tons have been implemented.

the burners using different kinds of fuels, such as natural gas, oil, or others. A central part of the refining furnace is the MAERZ high-pressure refining system, which produces optimal refining results in combination with our process know-how. The use of nitrogen purging further increases the efficiency of the tilting furnace systems. Depending on the process scenario, casting systems such as ingot casters and off-gas treatment systems are offered optionally.



▲ Tilting furnace, Rosskat

Economical solution for smaller capacities

The ANDRITZ Maerz elliptical furnace completes the scope of tiltable furnaces for smaller capacities. Due to the advanced design, smaller furnace capacities starting at 30 tons can also be achieved economically. With their compact dimensions, the elliptical furnaces can be transported pre-assembled to site.



▲ Elliptical furnace

Fire-refining of liquid copper? No problem

Besides copper scrap, liquid copper can also be charged into both furnace types for fire refining. To achieve high melting efficiencies, oxygen technology is applied for

Main features

- Fast and efficient charging and melting of the copper scrap
- Fast and efficient refining system thanks to high-pressure direct blowing of the reaction agent through submerged tuyeres
- Advanced nitrogen purging and oxygen burner technology
- Tilting system permits flexible and safe operation on the charging/deslagging and casting sides
- Environmentally friendly working procedure due to off-gas hoods and slag settling and also to the afterburning chamber
- Can be combined with water quenching systems and waste heat boilers
- Can be combined with new and existing casting systems

Shaft and hearth-shaft furnaces

High-efficiency melting of copper cathodes, scrap anodes, and high-grade copper scrap for copper processing and anode casting – melting rates up to 90 t/h

High-efficiency melting

ANDRITZ Maerz offers shaft and hearth-shaft furnaces for efficient melting of different copper qualities. Our shaft furnace allows highly efficient melting of copper cathodes, anode residues, and high-grade copper scrap, achieved by the nozzle mix burner system with single burner control and the optimized furnace geometry. The

feedstock is charged into the shaft with a skip hoist. Burners are mounted radially around the lower shaft section and provide the melting energy. The waste gases move upwards through the shaft to pre-heat solid scrap in the upper part of the shaft. The liquid copper can be fed to the subsequent process step by means of a ladle or launder. Typical applications can be found in

brass mills and anode casting plants. Additionally, the hearth shaft furnace is equipped with a hearth that allows holding and deslagging of the liquid copper. As a result, medium-quality scrap can also be used. The molten copper is transferred via launders to refining furnaces. The focus for a hearth shaft furnace is on continuous operation and a high daily capacity of up to 1,000 t/d.

Main features

- Fast and continuous melting
- Optimized thermal efficiency of up to 70%
- Preheating of scrap material by counter-current off-gas stream
- Suitable for different scrap qualities
- Advanced and efficient single burner control using nozzle mix burners

▼ Shaft furnace



Drum-type furnaces

Anode furnaces, Peirce Smith converters, and holding furnaces for the primary and secondary copper industries – furnace capacities up to 630 t have been achieved successfully.

One of the world's largest anode furnace designed by ANDRITZ Maerz

MAERZ drum-type furnaces are mainly used for refining of liquid copper from upstream melting furnaces in primary and secondary metallurgy. They can be used as anode furnaces, holding furnaces, or Peirce Smith converters. Drum-type furnaces can also be designed to handle a certain amount of solid scrap input. The system is charged either in batches, by a ladle through the charging and deslagging door, or continuously via launder. All drum-type furnaces feature a drive system with main and emergency drive using a redundant brake system and a robust planetary gear box. The emergency drive can be designed as hydraulic, pneumatic, AC or DC drive depending on the customer's requirements.

Oxygen burner technology as well as hood systems for capturing secondary emissions ensure optimum energy efficiency and minimal environmental impact. Furnace off-gases are directed through a closed, so-called "goose-neck connection" into the slag settling chamber for further treatment.

The MAERZ refining and tuyere system together with nitrogen purging result in a further increase in the efficiency of the furnace systems offered.

With a capacity of 2 x 630 tons, ANDRITZ Maerz has also designed some of the largest anode furnaces worldwide.

Main features

- Safe and robust drive system with high rotation speeds as well as frequency-controlled drives
- Redundant brake system
- Minimized emissions due to closed furnace connection to the slag settling chamber and secondary hoods
- Efficient high-pressure refining system
- Ladle and launder charging possible
- Advanced nitrogen purging and oxygen burner technology
- Optimized bustle main pipe for optimum blast air distribution in the PS converter



TBRC – top blown rotary converter

The top blown rotary converter is a highly efficient multi-purpose melting and refining unit for copper and non-ferrous metallurgy.

TBRC capacities are offered for a working volume of up to 25 m³

Our top blown rotary converter (TBRC) is a general purpose unit for copper and non-ferrous metallurgy. One central feature of the TBRC is its consistently high melting and refining efficiency. Typical input materials are copper scrap, WEEE scrap of different qualities, especially printed circuit boards, dust, slag, lead production alloys containing precious metals, and anode slime from copper electrolysis. Depending on the purpose, different water-cooled lances are used for melting, oxidation, reduction, or flue dust feeding. Furthermore, the lances can be equipped with camera or temperature measurement systems.

The variable rotation speed of the vessel in combination with the oxygen technology used is responsible for the high efficiency achieved. Due to the rotating movement during the melting process, the hot lining is continuously turned over underneath the cold material charged to the converter, thus providing optimized heating efficiency. Additionally, the refining process is accelerated by continuous mixing in the bath. For casting or deslagging, the whole converter vessel can be tilted to cast into launders or ladles. With our advanced design, tilting angles of 360 degrees are possible. To minimize the downtimes for refractory repairs, it is also possible to replace the TBRC vessel with a newly lined vessel within a short time.

To complete the TBRC system's optional extras, off-gas hoods and ladle transport systems can be added. Depending on the application, the TBRC can be built in different sizes and designs.



▲ TBRC, Aurubis AG

Main features

- Recycling of copper scraps and alloys, dusts, slags, WEEE scrap and anode slime treatment
- High melting and refining efficiency with short cycle times
- Oxygen technology for melting and refining
- Maintenance-friendly design for lances and drive systems
- Fully enclosed design available to minimize secondary emissions

Process technology and optimization

Our process includes Direct-To-Wire technology for the production of FRHC copper used to make rods, shapes, and billets, as well as the ANDRITZ Maerz WEEE recycling technology for metallurgical WEEE recycling.

Customized solutions are offered as part of the process technology and optimization. These include the metallurgical design of refining processes for the primary and secondary industries, as well as for the processing of copper.

Direct-to-Wire for FRHC copper

One successful process offered is the Direct-to-Wire (DTW) technology, a fire refining process for optimized production of liquid fire-refined, high-conductivity copper (FRHC copper) for rod, shape, or billet production from copper scrap. The liquid FRHC copper can either be cast directly into the final product, such as rods, shapes, and billets, or it can be cast into an intermediate product for later use as a certain kind of cathode substitute.

The DTW technology uses an advanced slag design for optimum refining results and it can be integrated into existing or new production plants. This technology can be implemented using different furnace concepts according to the individual requirements and depending on the required production capacity, ranging from 30 to 1,000 t/d.

Another innovative process is the WEEE recycling technology for metallurgical recycling of shredded printed circuit boards

(PCB). Using the TBRC, shredded PCBs can be recycled along with other copper-containing materials to produce blister copper rich in precious metals. This blister copper is then processed further using our elliptical and reverberatory furnace refining technologies.

Tailor-made processes and engineering packages for furnace optimization and cost reduction

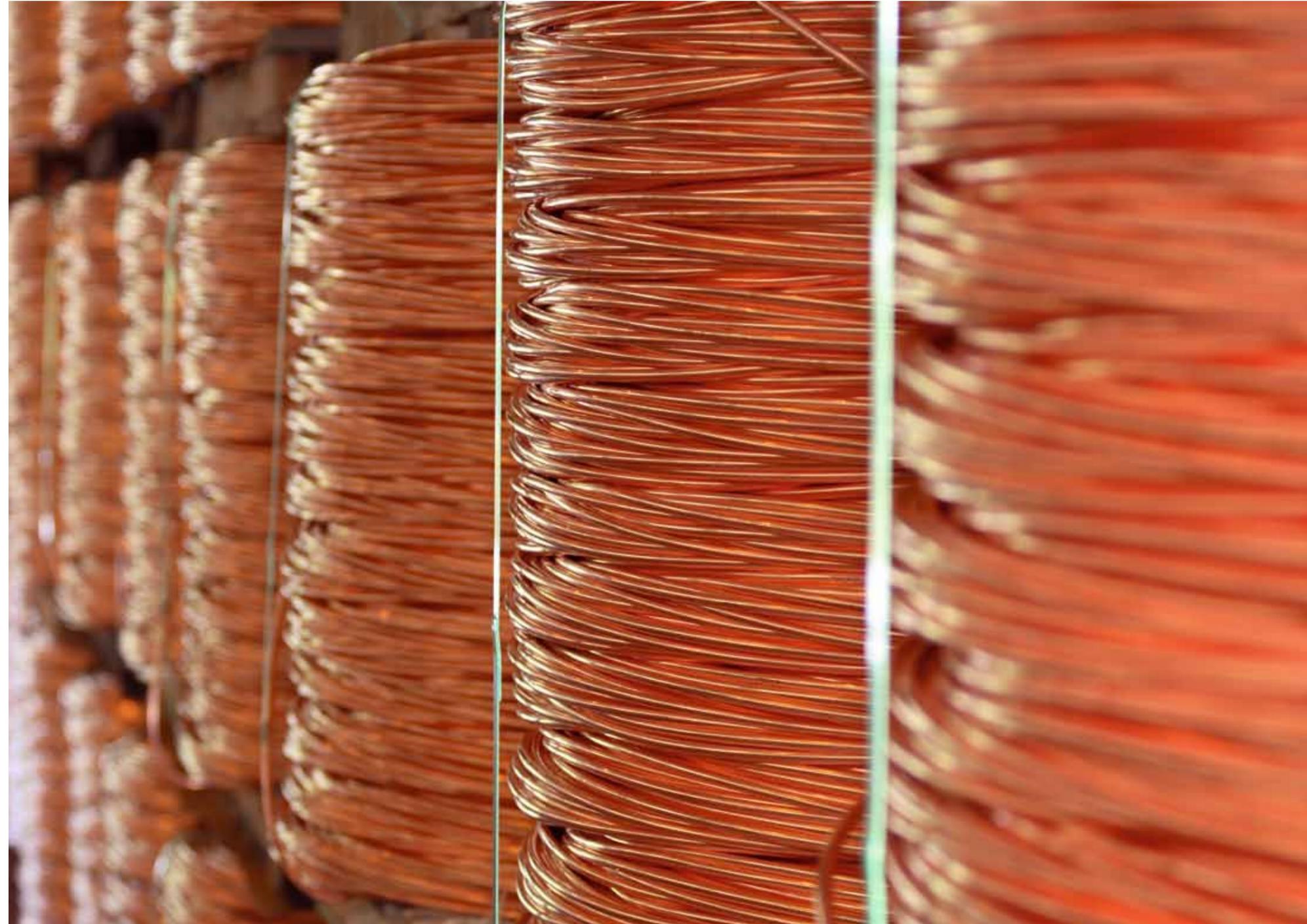
Engineering and equipment packages are available for modernization projects and increasing the efficiency of existing plants. The aim is to increase the metal yield and the metallurgical efficiency, and to optimize energy utilization by improving the process technology.



▲ Printed circuit boards, PCB

Main features

- Direct-to-Wire technology for FRHC copper production
- WEEE recycling technology for metal recovery
- Mass and metal balances
- Process scheduling and process cost calculations
- Slag processing design
- Refining and nitrogen purging systems
- Burner systems with and without use of oxygen



▲ Copper rod, photo courtesy of Southwire Company, LLC

Our expertise is the way to your success

Numerous customers worldwide rely on our technology to melt and refine with low metal loss, minimal gas consumption, and ensure an environmentally-friendly process.

The product portfolio

Primary industry	Secondary industry	Processing industry
Drum-type anode and holding furnaces	Drum-type anode and holding furnaces	Shaft furnaces for melting of cathodes and high grade scrap
Peirce Smith converters	Hearth-shaft furnaces for melting of copper scrap	Tilting reverberatory and elliptical furnaces for refining of copper scrap to produce FRHC copper
Top blown rotary converters (TBRC) for smelting and anode slime treatment	Top blown rotary converters (TBRC) for multi purpose melting and refining of copper, alloys, slags, dust, WEEE scrap, and anode slime	Direct-to-Wire technology for FHRC copper production
Shaft furnaces for anode scrap melting	Tilting reverberatory and elliptical furnaces for refining of copper scrap	
	Shaft furnaces for anode scrap melting	
	WEEE recycling technology for metal recovery	

Combustion systems
 Refractory lining Refining systems
 Automation
Nitrogen purging
 Visualization Turnkey Off-gas measurement
 Plant modernization

Extract from our reference list

- Aurubis AG, Germany
- Cunext Group, Spain
- First Quantum Minerals Ltd., Zambia
- Glencore Xtrata plc, Australia
- Kansanshi Mining, Zambia
- Kazzinc, Kazakstan
- La Farga Lacambra, Spain
- Mesco Inc., Japan
- Metallo Chimique, Belgium
- Montanwerke Brixlegg AG, Austria
- Novogorod Metallurgical Plant, Russia
- XSTRATA Copper, Australia
- Yanggu Xiangguang Copper, China



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