METALS

FURNACES, CONVERTERS, AND PROCESS TECHNOLOGY

COPPER AND NON-FERROUS METALS
ANDRITZ Maerz’ long tradition and metallurgical experience in furnace building helps to reduce operating costs, increase profit by optimizing production processes, and – at the same time – minimizes emissions to meet the most stringent environmental regulations.
Furnace systems for the copper industry

ANDRITZ Maerz supplies turn-key industrial furnace systems, including process expertise 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 expertise allows efficient manufacturing of quality products in wire, pipe, and shape production and of anodes for use in electrolytic processes. With the ANDRITZ Maerz DIRECT-TO-WIRE* method, we have additional and particularly efficient process technology available for the production of Fire Refined High Conductivity (FRHC) copper.

MAERZ* FURNACE TYPES

- Top submerged lance furnace 80-500 T/D
- Anode furnace 20-630 T
- Peirce Smith converter 100-400 T
- Top blown rotary converter up to 20 CBM
- Tilting furnace 80-500 T
- Elliptical furnace 30-100 T
- Shaft furnace 10-60 T/H
- Hearth-shaft furnace 10-60 T/H
REFINING LARGE QUANTITIES OF COPPER SCRAP IN A SINGLE UNIT
The ANDRITZ Maerz tiltable reverberatory furnaces have proven successful 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.

FIRE-REFINING OF LIQUID COPPER? NO PROBLEM
Besides copper scrap, it is possible to charge both furnace types with liquid copper for fire refining. To achieve high efficiencies, oxygen technology is applied for 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 shows optimal refining results in combination with our process knowledge. Furthermore, the use of nitrogen purging 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.
ECONOMICAL SOLUTION FOR SMALLER CAPACITIES
The ANDRITZ Maerz Elliptical Furnace completes the scope of tiltable furnaces with a new type for smaller capacities. Due to the advanced design, smaller furnace capacities starting at 30 tons can also be realized economically. Their compact dimensions allow the transport of pre-assembled elliptical furnaces to site.

YOUR BENEFITS
- 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
- Combinable with water quenching systems and waste heat boilers
- Combinable 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. The nozzle-mix burner system with single burner control and the optimized furnace geometry contribute to this high efficiency. 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 are guided upwards through the shaft to pre-heat solid scrap in the upper part. 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 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 lies on continuous operation and a high daily capacity of up to 1,000 tons.

YOUR BENEFITS
• 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
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 realized successfully.

ONE OF THE WORLD’S LARGEST ANODE FURNACES 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.

YOUR BENEFITS
• 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 Converters

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 20 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 we use makes it possible to obtain 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 pour the material 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.

YOUR BENEFITS

• Recycling of copper scrap, WEEE, dust, slag, and alloys containing precious metals
• 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
TSL – Top Submerged Lance Furnaces

The top submerged lance furnace is an advanced solution for the processing and recycling of electronic scrap and complex copper and non-ferrous metal bearing materials.

**TSL FURNACE, A UNIVERSAL INDUSTRIAL FURNACE FOR A WIDE RANGE OF METALLURGICAL APPLICATIONS**

TSL furnaces are offered as tailor-made technology and process packages for smelters, recyclers, mini-melters and niche applications. TSL furnaces are an alternative concept for TBRC technology with similar and directly comparable metallurgical capabilities at lower investment costs. TSL furnaces are equipped with burner and feeding lance technology and can be operated by direct and/or indirect combustion. Plastics and organic substances from feed materials such as PCBs or any metal-containing residues partially or completely replace the required fuel during (semi-)autothermal operation.

In addition to the furnace vessel with slag and metal tapping spouts, TSL furnace packages include the required charging systems, combustion and cooling technologies, and, depending on the application, more or less complex solutions for exhaust gas purification and environmental protection.

**YOUR BENEFITS**

- Small units for start-ups and niche applications in recycling of WEEE
- High efficiency in melting and converting of any metal bearing raw materials
- Comparable low investment costs at high metallurgical flexibility
- Different lance systems available for combustion, feeding, and steering
- Tight connection to after-burning, cooling, and gas cleaning facilities
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 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.

**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.

**PRECIOUS METALS FROM WEEE: TBRC AND TSL FURNACE TECHNOLOGY**
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. The Maerz TSL is a stationary vertical furnace that is also suitable for recycling of shredded PCB. Advanced injection lance and oxygen burner and converting lance technology makes the TSL furnace ideal for treatment of the material specified for production of blister copper rich in precious metals. This blister copper is then processed further using our elliptical and reverberatory furnace refining technologies.

**YOUR BENEFITS**
- 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
ANDRITZ copper furnaces product portfolio

PRIMARY INDUSTRY
- Drum-type anode and holding furnaces
- Peirce-Smith converters
- Top blown rotary converters (TBRC) for smelting and anode slime treatment
- Shaft furnaces for anode scrap melting

SECONDARY INDUSTRY
- Elliptical and tilting reverberatory furnaces for refining of copper scrap
- Top blown rotary converters (TBRC) for multi purpose melting and refining of copper, alloys, dust, WEEE scrap, and anode slime
- Top submerged lance furnaces (TSL) recycling technology for metal recovery from WEEE scrap
- Hearth-shaft furnaces for melting of copper scrap

PROCESSING INDUSTRY
- Shaft furnaces for melting of cathodes and high-grade scrap
- Elliptical and tilting reverberatory furnaces to produce FRHC copper in a Direct-to-Wire® process

Extract from our reference list

- Aurubis AG, Germany
- Cunext Group, Spain
- First Quantum Minerals Ltd., Zambia
- Glencore Xtrata PLC, Australia
- Kansanshi Mining, Zambia
- Kazzinc, Kazakhstan
- KGHM, Poland
- KME, Germany
- Mesco Inc., Japan
- Metallo Chimique, Belgium
- Montanwerke Brixlegg AG, Austria
- Novgorod Metallurgical Plant, Russia
- Rosskat, Russia
- Shan Poornam Metals, Malaysia
- Sofia Med, Bulgaria
- Transkat, Russia
- XSTRATA Copper, Australia
- Yanggu Xiangguang Copper, China
OUR EXPERTISE IS THE WAY TO YOUR SUCCESS

Numerous customers worldwide rely on our technology for melting and refining with low metal loss, minimal fuel consumption, and an ensured environmentally friendly process.

AUSTRALIA
ANDRITZ AG
1120 Vienna
p: +43 50805 0
metals.at@andritz.com

CHINA
ANDRITZ (China) Ltd.
200082 Shanghai
p: +86 21 3108 9388
andritz.shanghai@andritz.com

INDIA
ANDRITZ Technologies Pvt. Ltd.
700098 Calcutta
p: +91 33 46027958
atechkol@andritz.com

GERMANY
ANDRITZ Maerz GmbH
40215 Duesseldorf
p: +49 211 38425 0
welcome-maerz@andritz.com

USA
ANDRITZ Metals Inc.
Canonsburg, PA 15317-9584
p: +1 724 746 2300
furnace@andritz.com

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