

Magazine 2022/23


# Our refined network

**Interview with**  
the Executive Board

**Diversity is strength**  
The advantages of our  
smelter network

**Key figures**  
Aurubis at a glance

 **Aurubis**  
Metals for Progress



Diversity is strength — this idea has shaped us for many years. By networking our smelters, we have created advantages that clearly set us apart from the competition. Our sustainably produced metals are essential to all technologies of the future. We continue to advance and optimize our smelters to meet the growing global demand for metals. This allows us to process complex metals even more efficiently, use intermediate products, and close internal material loops. The result: higher scaling effects and more metals.

Our expertise is the foundation of our progress. Every smelter is different, and each one generates value. Only by working together, though, can we fully realize our unique strength. **Our refined network.**

We hope you enjoy this magazine.

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The fiscal year in 150 seconds  
[aurubis.cdn.picturepark.com/v/EHCgAs4J/](https://aurubis.cdn.picturepark.com/v/EHCgAs4J/)



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To enhance readability, this magazine accompanying the Annual Report is written from the perspective of the Aurubis Group.

# Our networked smelters

Aurubis is broadly positioned: We process metal concentrates, scrap metals, and metal-bearing recyclable raw materials into metals of the highest purity, which we turn into a variety of metal products. This unique model is based on our global network of sites with all their different strengths. Our six smelter sites — our metallurgical heart — play a central role. And every one of our smelters has a unique profile.


## Primary sites

Our primary smelters in Hamburg (Germany) and Pirdop (Bulgaria) process copper concentrates extracted from ores into copper cathodes. We also use copper scrap with a high copper content in process management. Recycling materials containing precious metals are also processed at our Hamburg site, making it both a primary and a secondary site.

## Secondary sites

In our secondary smelters in Lünen (Germany), Olen and Beerse (both in Belgium), and Berango (Spain), we process a wide range of metal-bearing organic and inorganic recycling raw materials, industrial residues, and purchased metallurgical intermediate products. Aurubis Richmond at our US site in Augusta, Georgia (US), will be the first secondary smelter specializing in multimetal recycling in the US.

- ▣ Primary site
- ▣ Secondary site
- ▣ Primary and secondary site



Richmond County  
Georgia, US

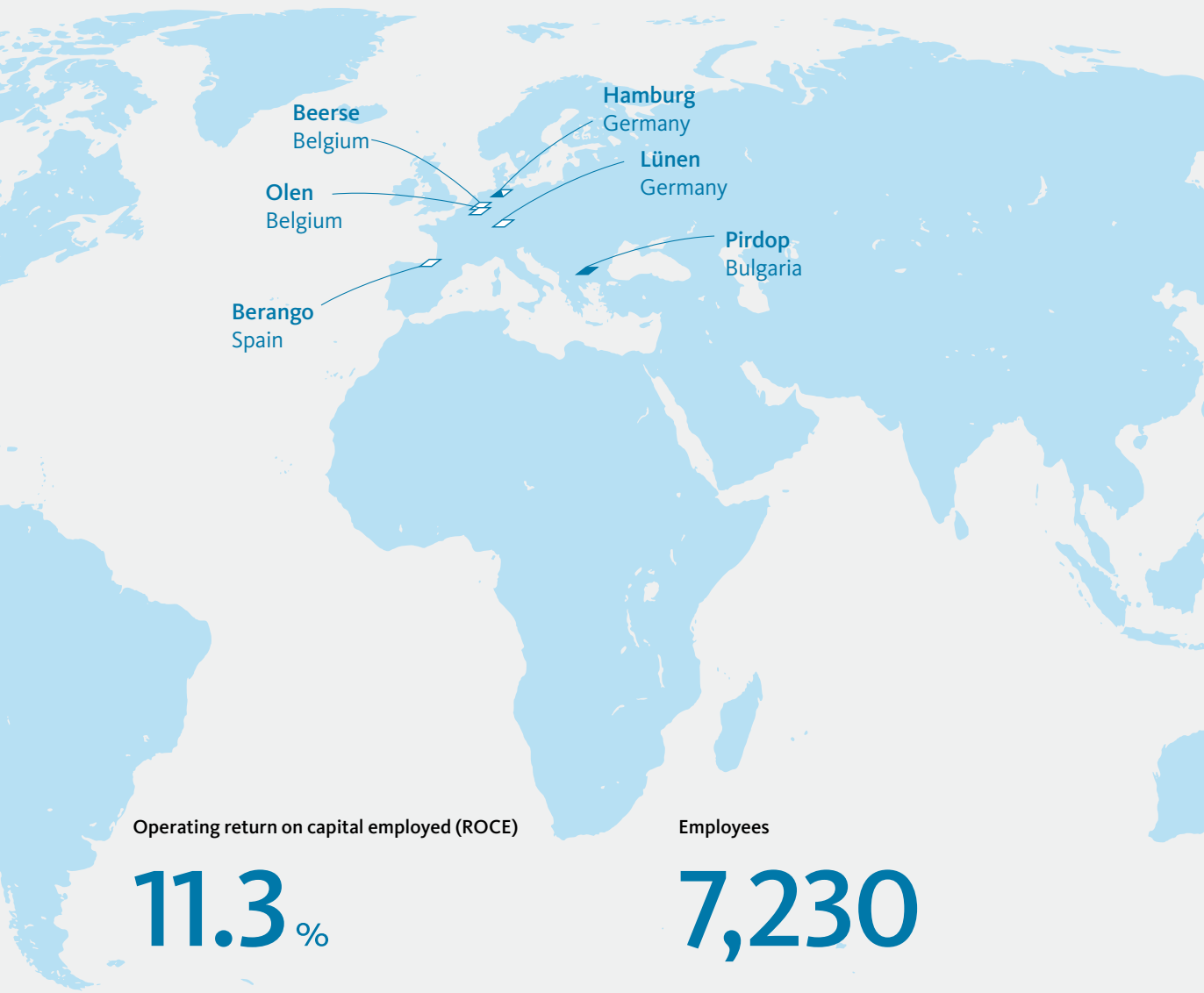
## Group figures 2022/23

Operating earnings before taxes (EBT)

€ 349 million

Concentrate throughput

2.3 million t



Operating return on capital employed (ROCE)

**11.3** %

Employees

**7,230**

Recycling material input

**1.1** million t

Cathode output

**1.1** million t



Our smelter  
network is  
our strength



Left to right: Heiko Arnold, COO,  
Roland Harings, CEO,  
Inge Hofkens, COO,  
Rainer Verhoeven, CFO

Every crisis is also an opportunity: Aurubis is facing significant challenges in occupational safety and plant security. We're staying the course, though, with our strategic investments in our core business and the growth markets of the future. Aurubis is a powerful company with products that are shaping the future, a solid financial footing, and a global smelter network that is unique, sustainable and efficient. In an interview, CEO Roland Harings, CFO Rainer Verhoeven, COO Multimetal Recycling Inge Hofkens, and COO Custom Smelting & Products Heiko Arnold look back on the eventful past fiscal year, and provide an outlook for the future.

**Roland, after Covid-19, the severe flooding in Stolberg, the energy crisis, and the cyberattack of the past year, Aurubis faced serious industrial accidents and criminal activities in 2023. How do you steer a company through such turbulent times?**

**ROLAND HARINGS** With confidence and a steady hand. We're facing significant challenges in occupational safety and plant security, and we're tackling them head on. The company is staying the course despite these incidents, and consistently realizing our ambitious growth strategy. We're strengthening our position as a sustainable smelter network, laying the groundwork for more growth in recycling, and driving the decarbonization of our company decisively forward. At € 1.7 billion, our investment plan is the largest Aurubis has seen in a long time. We are making good progress with project implementation. This communicates strength and confidence, especially in these turbulent times — and especially to the workforce.



“As a company, we’re staying the course and consistently realizing our ambitious growth strategy.”

Roland Harings, CEO

#### What are the next steps in plant security?

**ROLAND HARINGS** We'll be focusing on the legal and forensic investigations into the criminal activities until the end of the year. Beyond that, though, we're also driving lasting improvements in our process and plant security. We'll be rolling out a revamped security concept Group-wide in 2024, which will permanently raise the level of security throughout the Group. Every crisis is also an opportunity. And we're taking advantage of it!

#### What role does occupational safety play in the company?

**ROLAND HARINGS** We have always placed the highest priority on safety in the workplace. And the central importance of occupational safety has only become more apparent in recent months. Building on the work invested in and findings from the immediate measures taken in Hamburg right after the accidents, we started an in-depth, multi-step analysis at the plant and Group levels with external support. Our aim is to systematically tap our improvement potential and develop a long-term strategy and vision for occupational safety going forward. Safety is a promise throughout the Group — which is why we're assessing and enhancing occupational safety levels at all sites. We're cultivating a safety culture that includes occupational safety and plant security in equal measure.

#### What do you think the future holds?

**ROLAND HARINGS** I'm optimistic about the future. We're a global supplier of metals that are essential for the transition to a more sustainable global economy. We have very good future prospects because we continue to strengthen our business model through organic growth projects and steadily expand our unique smelter network by adding processes and increasing processing capabilities, increasing our productivity, and raising efficiency. At the same time, we're driving the digitalization of our production forward, getting our plants ready for new fuels, and pursuing our goal of sustainable, carbon-neutral production by 2050.

#### Rainer, how do you view the fiscal year results and the negative impact of the criminal activities?

**RAINER VERHOEVEN** The criminal activities directed against Aurubis resulted in a high shortfall in metals, which significantly hampered the past 2022/23 fiscal year result. At € 349 million, operating earnings before taxes were at the upper end of the adjusted forecast of € 310 to 350 million. So we were again able to close the fiscal year with a satisfactory annual result despite the significant financial impact of the criminal activities.

#### What contribution are the growth projects making, and what requirements do they need to fulfill to fit into the financing strategy?

**RAINER VERHOEVEN** Cumulative EBITDA from the growth projects is projected to surpass investment volume by 2030. We're leveraging the potential of all sites with targeted investments in our processes and facilities for profitable growth. The parameters



are clearly defined: The investment projects have to make a significant and sustainable contribution to the strategic targets and improve our processing ability and capacities, while creating valuable synergies with our existing processes. The value added by each individual growth investment has to positively impact our most important Group KPI, operating return on capital employed (ROCE), and simultaneously comply with our sustainability targets. Our solid financial position and a good earnings situation coupled with strong cash flow create a robust foundation for funding our attractive growth projects. This is primarily taking place from our own resources and existing credit lines, some of which we have linked to our sustainability performance through the EcoVadis rating agency. We further improved our EcoVadis CSR ranking (corporate social responsibility) this year and number among the top 1% of companies in the non-ferrous metals industry worldwide when it comes to responsible corporate governance.

#### How do you ensure that the strategic projects are realized with discipline and consistency?

**RAINER VERHOEVEN** We have set clear financial criteria and adopted a transparent, vibrant governance structure and proactive risk management. From the initial idea through to completion, we continuously develop and monitor our projects based on defined parameters and decision-making criteria.

#### How do you meet the expectations of shareholders and investors?

**RAINER VERHOEVEN** Our share price went through significant fluctuations due to the criminal activities directed against Aurubis and geopolitical factors as well. But we're confident that our investment in the future will pay off in the long run. By the end of the 2025/26 fiscal year, Aurubis will have invested around € 1.7 billion in strategic investment projects. These will start delivering positive earnings contributions by fiscal year 2024/25. We intend to continue financing the present, and any future projects, from current cash flow. Back in December 2022, we announced that the accelerated

growth trajectory would be supported by a more flexible dividend payout in the future. And that shareholders would continue to participate accordingly in company profits. Which is why we will be recommending a dividend of € 1.40 for the 2022/23 fiscal year at the Annual General Meeting. This shows that we're striving for a balanced capital allocation that enables self-financed growth and an appropriate dividend, thus creating value over the long term — for our shareholders and investors, too.

**“A robust balance sheet, a good earnings situation, and strong cash flow create the foundation for our strategic growth.”**

Rainer Verhoeven, CFO



### Inge, what impact will the new plant being built in the US state of Georgia have on Aurubis?

**INGE HOFKENS** The plant has far-reaching implications — both inside the company and for the outside world, as a visit from First Lady Dr. Jill Biden clearly showed. We're holding fast to our growth strategy and showing that we can successfully realize a major project like Aurubis Richmond. The plant and the team are growing rapidly. We now have 100 employees on-site who are very excited and enthusiastic about helping shape our vision. We'll be pioneers in the country for the recycling of reusable materials and recovering valuable metals like copper, nickel and tin.

### Where does Aurubis Richmond stand in fall 2023?

**INGE HOFKENS** The project is progressing well. The US market is growing very quickly and holds a lot of excellent opportunities for us. So the decision to move up the original start date for the second module was absolutely right, as was mapping out the value chain from blister copper to wire rod now. We're in the US to stay — and to grow there, too.

### What kind of growth expertise does Aurubis have?

**INGE HOFKENS** We not only have the right strategy; we also have the know-how from well-educated, talented experts. Aurubis is achieving profitable growth in areas the company has been active in for over 150 years. We'll use the knowledge from the newer Group sites to continue to advance them, whether in concentrate processing, recycling or product business. We're continually optimizing our material flows in our smelter network so we can extract more marketable metals and transform all input materials into valuable products. We're reducing waste streams, taking a zero-waste approach, and have already established ourselves as a cornerstone of the European circular economy.

### How is Aurubis' pioneering role in sustainability being measured?

**INGE HOFKENS** We're an industry leader in sustainability, as our KPIs clearly show: Our production has lower carbon footprints than the industry average. The Copper Mark certifications of our production sites confirm that we produce sustainably, enabled by our processes. Following the plants in Pirdop, Hamburg and Lünen in 2023, Aurubis Olen became the fourth site in the smelter network to be awarded the quality seal. Aurubis Stolberg and Aurubis Beerse are currently in the process of certification. The great interest the US market has shown in Aurubis is another indication of how attractive we are with our sustainable approach.

**“We're reducing waste streams, taking a zero-waste approach, and establishing our role as a cornerstone of Europe's circular economy.”**

Inge Hofkens, COO



## Heiko, what makes the Aurubis smelter network so special?

**HEIKO ARNOLD** The Aurubis smelter network is unique worldwide and is the powerhouse behind our company. Every plant in the Group runs independently and autonomously. Together, we leverage potential to benefit the entire company by optimizing material flows and supporting each other. We're investing locally in developing new technologies that are transferable. We're exploring and promoting the use of alternative, carbon-neutral energy sources to make environmentally sound cost benefits available to the entire company. This is visible in the testing of ammonia as a low-carbon fuel in wire rod production in Hamburg (→ see page 20), the lowering of costs and fuel consumption with the UHTH project in Lünen (→ see page 21), and the Industrial Heat 2.0 project (→ see page 29), which will prevent up to an additional 100,000 t of CO<sub>2</sub> emissions in Hamburg by feeding our production heat into a district heat network.

## What's next for our smelter network?

**HEIKO ARNOLD** Every site in every country has its own specific strengths, challenges and overall conditions — whether in Germany, Bulgaria or Belgium. Aurubis' expertise, productivity and efficiency has grown with every expansion of the smelter network. The smelters work in tandem, helping each other, but they also follow their own individual development plans, such as for digitalization. Our technology leadership in metallurgy is helping us decarbonize metal production at all our sites, and develop additional metal processing steps that will allow us to process and extract valuable intermediate products we've had to sell to competitors up to now.




“The Aurubis smelter network is unique worldwide and is the powerhouse behind our company.”

Heiko Arnold, COO

## How are the growth projects contributing to the smelter network?

**HEIKO ARNOLD** The many projects at all our sites are helping us optimize material flows and continually improve on the strengths of the individual sites — and with them our unique, global, integrated smelter network. Projects like ASPA and BOB are custom-tailored for the sites in Olen and Beerse, while Hamburg is the best place to develop a project like CRH. There are no rankings among the plants, but there is no one-size-fits-all solution, either. Together, all the sites form a working structure that will take us into the future, is cost-efficient, and sustainably generates more metals for the transformation tasks ahead.

# Our smelter network — an overview

A large industrial smelter facility with molten metal being processed. The scene is dark with bright orange and red highlights from the molten metal. A thick orange horizontal bar is positioned across the middle of the image. In the foreground, there is a large, dark, textured object, possibly a piece of machinery or a container, with a circular opening. The background shows complex industrial structures and pipes.

Our unique, efficient smelter network enables us to capitalize on our value chain more fully than ever before and sustainably increase our productivity.



# Maximum metal extraction

We produce a variety of metals of the highest quality with our integrated smelter network — efficiently and sustainably. Our metal processing comprises three major processing steps in the value chain:

## Smelting

At our smelter sites, we process concentrates that contain copper and precious metals along with a wide range of organic and inorganic recycling raw materials. This generates the first intermediate product, copper anodes of differing metal compositions, which are the basis for downstream processing steps.

## Refining

In our tankhouses, we refine the anodes into high-purity copper cathodes — according to their composition. Industrial and precious metals are separated out, along with a number of other metals. In this processing step, metals like nickel, lead, tin, gold and silver collect in intermediate products like anode slimes and electrolyte, which serve as starting materials for the extraction of multiple metals.

## Multimetal

We use additional, bought-in intermediate products to process our starting materials into marketable metals and products in this step. Our metallurgical expertise allows us to extract a number of metals from raw materials efficiently and responsibly. They create the foundation for the green transformation, technologies of the future like electric cars, and many industrial applications.

- Concentrates that contain copper
- Concentrates that contain precious metals/nickel
- Alloy scrap
- Scrap metal
- Electronic scrap
- Industrial residues
- Slimes and dusts

- Gold
- Silver
- Seleniun
- Zinc
- Sulfuric acid
- Tellurium
- Nickel
- Antimony
- Platinum metals
- Lead
- Bismuth
- Copper
- Tin
- Iron silicate

## Multimetal

- Additional, non-precious metal processing
- Intermediate product processing
- Precious metal refining
- Copper processing

## Refining

- Copper and copper-nickel electrolysis

## Smelting

# Strength lies in diversity

Collaboration and experience transfer, synergies and innovations — the central elements of the modern working world are nothing new for Aurubis. Quite the opposite, in fact. We have always practiced them. Our core strength lies in our unique structure: a globally integrated network of copper smelters, recycling sites, and highly specialized metal processing plants. A network backed by the expertise of more than 7,200 employees worldwide. Thanks to the unique structure and enormous pool of knowledge, we can process a range of very different materials efficiently and profitably — from copper concentrates and complex recycling materials to production scrap and customer waste.





## The foundation of success

We turn all these materials into metals that can be directly used in new products. Solar panels, wind turbines, electric cars, energy storage plants, power lines, data networks: Aurubis metals are in almost everything that makes our lives sustainable and digital — tomorrow and today. Our metals serve as the foundation for an innovative, environmentally friendly world. Just like our powerful smelter network is the foundation of our success. But we're not resting on our laurels. We continue to optimize and expand our network with projects that target long-term growth. With one clear objective: to consolidate and continually expand our powerful position as one of the most efficient and sustainable multimetal producers in the world.

## Specific strengths

Aurubis has six copper smelter sites: **Hamburg** and **Lünen** in Germany, **Pirdop** in Bulgaria, **Olen** and **Beerse** in Belgium, and **Berango** in Spain. All these smelters process copper-rich raw materials into high-purity copper cathodes. They are not identical, though — each site works with individual processes and has specific strengths. Pirdop is purely a primary smelter and processes the most copper concentrates in the largest smelter furnace in the Aurubis Group. Along with concentrates, the Hamburg plant also uses recycling materials. Lünen, on the other hand, is a pure recycling specialist and employs a range of materials — including intermediate products from other sites. The same is true for Olen. In recent years, the plant has continually upped the proportion of recycling materials and works very agilely to cast the right anodes for other Aurubis plants. The Berango plant processes less high-grade recycling materials and feeds what the other Aurubis plants can't use into its production, including metal-bearing slags. Beerse rounds out the network with a number of special processes, including a vacuum technique for extracting tin and lead from all kinds of recycling materials. A perfect combination for Aurubis, since lead is an important component in copper production.



## 3 questions for

### Christian Plitzko

Supply Chain Management,  
Group Metallurgy

#### What makes the Aurubis network so special?

**CHRISTIAN PLITZKO** Only a few metal companies in the world have our degree of vertical integration, from the raw material to the copper product, plus our broad spectrum of value generation. We extract 20 elements in addition to copper! Our great strength is our ability to process a mix of so many different, complex raw materials and extract and recover so many metals at the same time.

#### How do the individual sites profit from the network?

Every site has its own specific strengths and unique qualities, and no one site has to try and cover everything. Each leverages its expertise to achieve the highest metal yield or recovery. This includes passing intermediate products, like anode slime, on in the network to be processed by the plant with the highest efficiency.

#### What do you think the future holds?

We want to meet the rising demand for metals as sustainably as possible by increasing recycling. So we have to adjust and advance our processes again and again as raw materials change. We are also pushing the electrification of our processes and using alternative fuels. All this gets Aurubis even closer to our goal: carbon-neutral metal production.



## 3 questions for

**Dirk Vandenberghe**

Managing Director Olen, Beerse,  
and Berango

### What makes the Aurubis network special?

**DIRK VANDENBERGHE** Adaptability is one of its strengths. Over the past decades, the network was systematically adapted with each growth stage. And we bring loose ends in the smelter network closer together with every strategic project. We methodically integrate specific strengths and technologies to broaden our position. That's how we're moving forward!

### How has the network changed?

Now that the Beerse and Berango sites, which I'm responsible for along with Olen, have been integrated, we can cover the entire portfolio of recycling materials available on the market. And these sites have brought another key skill into the network: the refining of pure tin. Material flows in the Group were optimized accordingly to maximize tin production.

### What do you think the future holds?

We'll continue to systematically expand and improve the network and build our capacities for specific metals — like nickel with the BOB project in Olen. And we'll also be able to process those intermediate products we now sell internally, thanks to projects like ASPA in Beerse. This adds more value for Aurubis as a whole — and preserves our independence.

### Using everything

All the smelters in the network deliver their anode slime, a valuable copper production waste product, to Hamburg. The metals and precious metals contained in the slime are extracted there, and the precious metal smelter processes the latter to silver, gold and other metals. Hamburg is also where intermediate products that cannot be sold are turned into products that can go back into internal manufacturing processes or sold on as new products. Sulfuric acid, a by-product generated when copper concentrates are processed and crucial for the fertilizer and chemical industries, is produced in our Hamburg and Pirdop plants. There is even a plant for processing selenium, a semi-metal contained in concentrates: Aurubis subsidiary RETORTE transforms the waste material into highly valuable compounds for a range of applications. An impressive number of Aurubis sites, seven all told, turn our main product, the copper cathode, into products like wire rod and continuous cast shapes.

Metals recovered in FY 2022/23

~920 t silver

~7,850 t tin

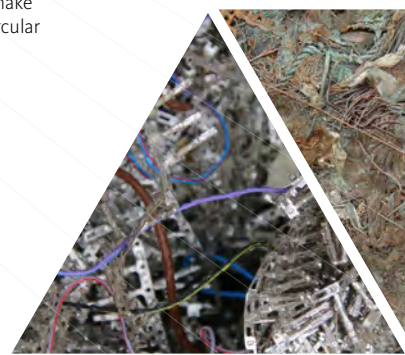
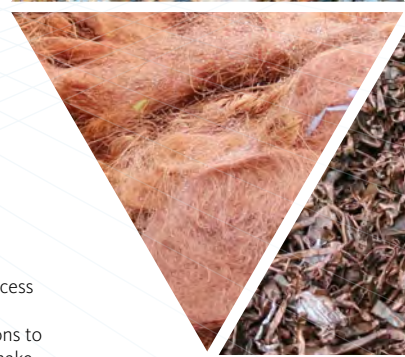
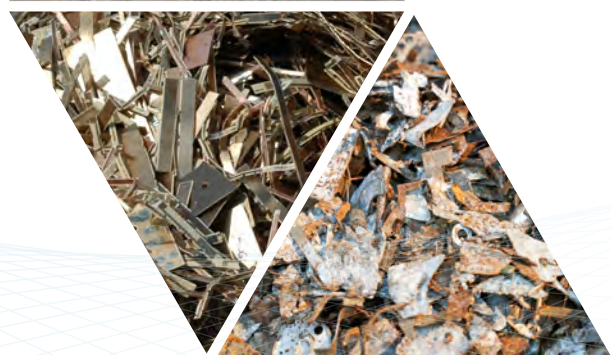
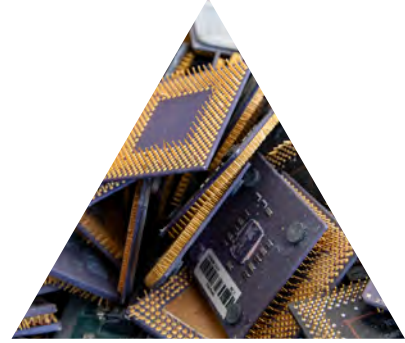
~50 t selenium

## True innovations

No one site does it all, and each capitalizes on its specific expertise, while working together to form a cohesive whole. The result: the utmost in synergies and efficiency. This approach allows us to close material loops and recover many new substances from a range of different raw materials. And the network model ensures consistently stable material flows. The sites help each other out with raw materials and final products, and in unusual situations, making sure no bottlenecks occur. The differences work together to drive our innovative power: New ideas and true innovations emerge from the interplay of a variety of perspectives, and wide range of expertise.

Aurubis' unique strength lies in our great diversity. A strength we will continue to build on with our investment projects and clear course set for carbon-neutral production. Generating more metals together, responsibly, to increase the sustainability of life on our planet. This mission unites us all.

In our smelter network, we process a broad variety of multimetal recycling materials, find solutions to metallurgical challenges, and make a crucial contribution to the circular economy.





# Expertise

Our unique metallurgical expertise is the result of many decades of experience processing metals. This knowledge builds the foundation of the innovative power we use to fully leverage market potential. Comprehensive training and education help us secure the expertise of tomorrow.



# New solutions, new markets

Our network serves as the foundation for innovations, and new technologies and markets. We use our metallurgical expertise to forge new paths: This is how we are shaping the future.



Starting point: battery recycling pilot plant at the Hamburg site.

## Innovative proprietary process

Black mass, green potential. These four words indicate a future growth area for Aurubis. Handling resources responsibly is central to our activities, and we pledge to keep valuable metals in the material loop. This is also true for electric cars. Demand for batteries for electric

cars is on the rise — and with it the demand for valuable materials. This is where our recycling expertise comes into play: We have developed an innovative process to recover the maximum from old lithium-ion batteries so new products can be made.

“Thanks to our metallurgical know-how and extensive operative experience, process development didn’t have to start from scratch.”

Ken Nagayama, Head of Business Development for Battery Materials



Black mass is what is left over when end-of-life batteries are crushed, shredded and treated. The powdery substance contains valuable elements from the battery, including lithium, nickel, cobalt and manganese. In a relatively short period of time, we successfully developed a special technology at our battery recycling pilot plant at the Hamburg site that has since been patented. An innovative and exceptionally effective process: In our smelter network, we recovered around 95% of the metals contained in batteries — including the light metal lithium, economically extremely important and limited to just a few mining regions worldwide. Scaling up the pilot plant to a demonstration plant for the first commercial activities is the next step at the Hamburg site.

A success based on our core expertise: the unique metallurgical skill of the Aurubis network, built on decades of extracting and recovering metals. Cables and connectors, cell modules, battery management systems — batteries are complex recycling materials. The mix of different materials is what makes battery recycling so challenging: The black mass is a complex amalgam. The battery cells contain a variety of chemical compounds, and a lithium-ion battery’s construction varies widely from manufacturer to manufacturer.



It might not look like much, but it’s worth a lot: black mass from old batteries.

### Market ready

These are not new challenges for Aurubis. This is our everyday. And our core expertise in metallurgy fosters another success factor: speed. “Thanks to our metallurgical know-how and extensive operative experience, process development didn’t have to start from scratch,” Ken Nagayama, Head of Business Development for Battery Materials, says. “Quite the opposite. Based on Aurubis’ exceptional level of key expertise, technology development went quite fast, even with all the testing. The result: We’ll be ready to enter the market just when the market needs sophisticated solutions.”



Aurubis battery recycling:  
[www.youtube.com/watch?v=YKFQBnZYHtI](https://www.youtube.com/watch?v=YKFQBnZYHtI)

Aurubis has all the prerequisites and skills needed to successfully recycle batteries: technology leadership in metallurgy, an integrated smelter network, and existing materials streams for most non-ferrous metals. In battery recycling, we are not only profiting from our integrated smelter network — we are also strengthening our network and optimizing our core business. What we have serves as a foundation for the new, and the new strengthens what we have — we're closing loops here, too.

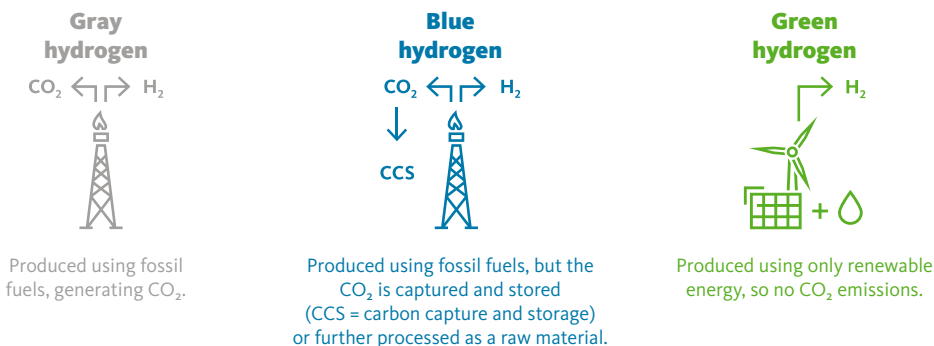
### Decarbonizing our processes

To us, expertise means questioning the status quo and forging new paths — in energy, too. Transitioning to carbon-neutral production is a real challenge for an energy-intensive company. And we're tackling it. We're testing new, low-emission energy sources and constantly enhancing our facilities to drive the decarbonization of our processes forward.

In the future, our Hamburg plant will be one of the first copper smelters worldwide ready to use hydrogen instead of natural gas in anode furnaces. A technology with the potential to prevent many thousands of tons of CO<sub>2</sub>. In addition to the impact on the climate, upgrading the furnace area will boost the efficiency of our processes. The new equipment will be able to process larger amounts of metal concentrates and recycling materials — and extract more metals even more efficiently.

We have already proven that hydrogen can successfully be used in production: In a pilot project at the Hamburg plant, we were able to produce copper anodes using hydrogen (H<sub>2</sub>) instead of natural gas — the first use of hydrogen on an industrial scale — in 2021. At the moment, there isn't enough green hydrogen to cover German industry's huge demand at competitive prices. But we're still driving research and expanding our H<sub>2</sub> readiness. Aurubis is gearing up and will be ready to go when the energy market catches up.

A willingness to explore technology and invest in innovation — we see these as critical answers to the rising demand for raw materials resulting from the green transformation. So we are consistently improving on our state-of-the-art recycling technology. Our new pilot plant at our conventional recycling plant in Lünen is just the latest example; it allows us to recover metals essential to the energy and infrastructure shift even more efficiently. The number of different layers in the computers and other electronic waste processed there is growing — as is plastic content. This presents a problem for efficient, sustainable recycling. It isn't always possible to separate plastics and metals economically. The heat value of plastic is too high for it to go into our furnaces, though, and, even more importantly, burning it generates CO<sub>2</sub>. So the high percentage of plastic results in a limitation of our production volume.







Pilot plant in Lünen: a pioneering role for new technologies.

We're turning this problem into a solution with our new pilot plant: It uses ultra-high-temperature-hydrolysis technology (UHTH) to convert plastics into a gas that can be used as a fuel. Solid carbon is produced in the process, which offers potential for new products — and with it a way to close more material loops. And finally, more recycling materials will ideally be processed efficiently in Lünen — generating more new raw materials for our smelter network.

We see an openness to know-how from other fields as an element of expertise. We are the first in the metal extraction industry to use innovative UHTH technology. “This investment in a technology from outside our industry is another example of our pioneering role in efficient and sustainable industrial production,” Verena von Weiss, Aurubis Lünen Plant Manager, says. “The new pilot plant isn't just a chance to raise our site's environmental performance to new heights and decarbonize our processes even further. It's also a testament to our identity as a driver of innovation.” Lateral thinking, exploring the unknown — important building blocks at Aurubis.



“This investment in a technology from outside our industry is another example of our pioneering role in efficient and sustainable industrial production.”

Verena von Weiss, Aurubis Lünen Plant Manager



The future starts here: welcoming the new apprentices to Aurbis Lünen.

### We offer training: our experts of the future

Educating our own experts is part of our company strategy. Our attractive range wins people over, despite the current shortage of qualified workers: In September 2023, 78 young people started their education in 13 professions and dual work/study programs at our Hamburg site, and 14 new employees started their

training in seven specialized areas at the Lünen site. We are proud of the fact that over 85% of apprentices have chosen to join the Aurbis workforce after training (in Hamburg) over the past ten years. We also promote professional exchange through networking — like our international network for students, student workers, and university interns — and offer young people struggling to find a foothold in life the opportunity to prepare for an apprenticeship in our industry.



Lifelong learning: the foundation of any career.

### We offer a lifetime of learning: employee qualification

Lifelong learning is more than just a catchphrase at Aurbis. Our Learning Academy offers every employee throughout the Group a wide range of continuing education options and information: comprehensive training sessions on fundamental topics in the company, like “The Copper Story”, or about our strategy, and method tutorials and learning units on more specialized topics, like project communication and time management. Every employee can also take advantage of an allotment of 18 hours for continuing education per year.

### We foster diversity: the foundation for good teamwork

A diverse workforce is the foundation for good teamwork, so we ensure everyone in the company is treated with fairness and respect. This mindset is laid out in our Code of Conduct, the Aurubis Human Rights Commitment, and the Aurubis Diversity Commitment. We see diversity as an opportunity to leverage a wide range of perspectives and viewpoints, cultural backgrounds, international experience, individual skills, and a diverse demographic mix to promote our corporate success.



Diversity in the company: fostering the company's success.



Expert knowledge: driving innovation for the circular economy.

### We work together: using multidisciplinary knowledge

We are improving every day to make sure we reach our goals. We take advantage of all the interdisciplinary expert knowledge from all divisions to arrive at the best results for Aurubis — and for the environment. One project in the secondary smelter Plant North (RWN) at our Hamburg site is a shining example of this. An expert team made up of colleagues from the plant, Environmental Protection, Controlling, and Production Planning is working on a new process for the electric furnace: The limestone input material currently used will be replaced by less expensive, carbon-free converter slag. This will cut costs, increase efficiency, and prevent CO<sub>2</sub> emissions. This is just one example of how we are using our in-house expert knowledge to generate innovative power and to foster the circular economy.

# Optimization

The background of the page is a workshop or factory setting. It features blue metal shelving units. On a blue pegboard, various tools are organized, including wrenches with yellow handles, pliers, and screwdrivers. A workbench is visible in the foreground with a dark metal component. The lighting is bright, and the overall scene is clean and organized.

Through new investment projects and facility maintenance and modernization, we're optimizing our smelter network and focusing on efficiency and sustainability to continue responsibly producing metals in the future.



# Better, more sustainable, more efficient. Our focus: optimization

Aurubis already produces a number of its metals with less than half the CO<sub>2</sub> emissions of its global competitors. But we won't stop there. We want to continue improving to make our production carbon-neutral well before 2050. We're investing not only in the growing recycling markets of the future, but also in energy efficiency, decarbonizing and maintaining our facilities, developing modern technologies, and digitalizing and automating our plants.

With a number of measures and projects, we're continuously working on getting better in all aspects of sustainability at our smelter network sites. This has been verified by the CSR (corporate social responsibility) ranking issued by the EcoVadis rating agency: In 2023, we once again numbered among the best 1% of companies in the non-ferrous metals industry worldwide. Aurubis improved by five points, particularly in the "Sustainable Procurement" category, and was classified a "leader" in carbon management. We have linked most of our financing instruments to the development of the EcoVadis rating, an indication of just how seriously we take our sustainability targets.



A logistical and technical feat: the successful maintenance shutdown in Pirdop.



“With investments in new techniques, we’re improving the energy efficiency of Aurubis Bulgaria’s production and reducing the plant’s CO<sub>2</sub> emissions by another 2,100 t per year at the same time.”

Tim Kurth, Managing Director of Aurubis Bulgaria



### **An emphasis on sustainability: maintenance shutdown in Pirdop**

During the more than 40-day routine maintenance shutdown in early summer 2023, about € 60 million was invested in more than 130 maintenance and repair jobs conducted in all of the key production areas of the plant. One clear focus was sustainability and the Group’s target of reducing CO<sub>2</sub> emissions from production by 50% by 2030, such as by optimizing energy efficiency in production. To continue increasing plant availability, a second anode casting wheel was installed to accompany the existing anode furnaces. In addition to Aurubis employees, at times there were more than 900 employees of contractors on-site during this large-scale logistical and technical project, which had been planned since 2021. The project concluded successfully within the timeframe and budget, and in compliance with the highest occupational safety and health standards.



“With the new hydrogen-ready anode furnaces, we’re taking a step into the future and demonstrating: We’re ready!”

Thies Fingerhut, Project Manager for Anode Furnace 2.0, Aurubis Hamburg



Technically feasible: using hydrogen instead of natural gas for carbon-neutral anode production.

**H<sub>2</sub>-ready as of 2024: anode furnaces capable of using hydrogen in Hamburg**

As a company with a nearly 160-year history, we are always facing new challenges and investing in carbon-neutral copper production. In the coming year, the Aurubis plant in Hamburg will be one of the first copper smelters in the world to use hydrogen instead of natural gas in its anode furnaces, which could lead to an annual savings of 5,000 t of CO<sub>2</sub>. While the available quantity of green hydrogen at competitive prices can't yet cover industry's huge demand, this step marks another milestone in our decarbonization strategy. The facility will already reduce natural gas consumption by 15% thanks to the integration of new, more efficient components, which will lead to an additional savings of 1,200 t of CO<sub>2</sub> annually.

**Solar energy: additional facilities in Pirdop**

Aurubis Bulgaria's solar park is an important factor in decarbonizing production in Pirdop, and is already the largest in-house solar park in Bulgaria. We're now increasing the output of the current facility and the 3rd stage already under construction by an additional 18 MWp (megawatt peak) for a total of around 42 MWp. Once all expansion stages are complete in roughly mid-2025, the total electricity generated will be equivalent to the annual needs of a small town of 15,000 households. Aurubis will thus be avoiding around 28,000 t of CO<sub>2</sub> emissions a year.



Aurubis Bulgaria's solar park: unique in the entire country.



### Industrial Heat 2.0: waste heat from Hamburg

Since 2018, we've been supplying Hamburg households with CO<sub>2</sub>-free waste heat that we extract from a chemical sub-process of copper production and deliver to the neighboring Hafencity East and Rothenburgsort quarters via a roughly 3.7 km long pipeline. In addition to this heat supply, we will be providing up to an additional 20,000 households with heating energy starting in the

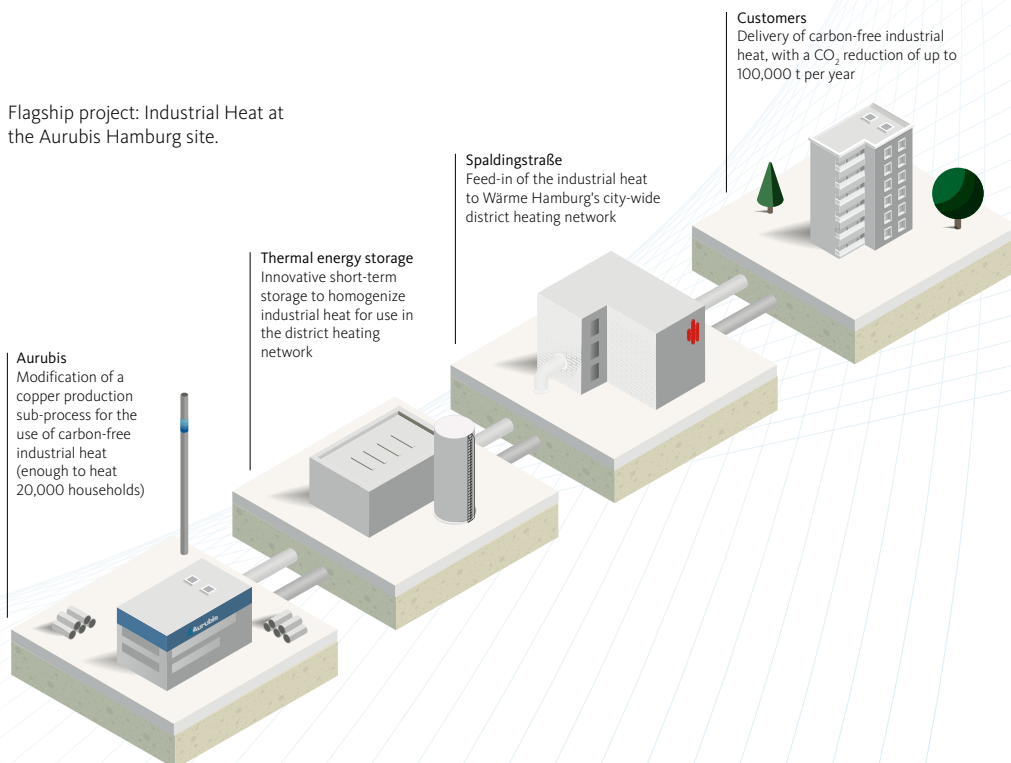
2024/25 heating period, saving another 100,000 t of CO<sub>2</sub> per year for the city of Hamburg. The Industrial Heat flagship project at the Aurubis Hamburg site drew strong national and international attention. The second stage of this highly complex project will be executed in spring 2024 during the routine scheduled maintenance shutdown in the Hamburg plant, and is the biggest project of its kind in Germany.



“Aurubis is a forerunner in decarbonization. Our Industrial Heat flagship project is the biggest undertaking of its kind in Germany.”

Michael Jordan, Aurubis Hamburg Plant Manager

Flagship project: Industrial Heat at the Aurubis Hamburg site.



**Sustainable processes: additional Copper Mark certifications**

Following the plants in Pirdop, Hamburg and Lünen, this year Aurubis Olen became the fourth site in the smelter network to be awarded the internationally recognized Copper Mark quality seal. In addition, our site in Stolberg received the Copper Mark in the “Fabricator” category in June 2023, the first processor of rolled copper products to do so, and Aurubis Beerse also started the extensive process this year. We actively pursue the development of sustainable and responsible supply and value chains in the raw materials industry. We revised our Business Partner Screening process for this purpose as well. It now also fulfills the requirements of the Copper Mark regarding responsible sourcing as a criterion for responsible mineral supply chains. In February 2023, we were also one of the first companies in the world to commit to the new Copper Mark Chain of Custody Standard, the first standard that will cover the entire copper supply chain.



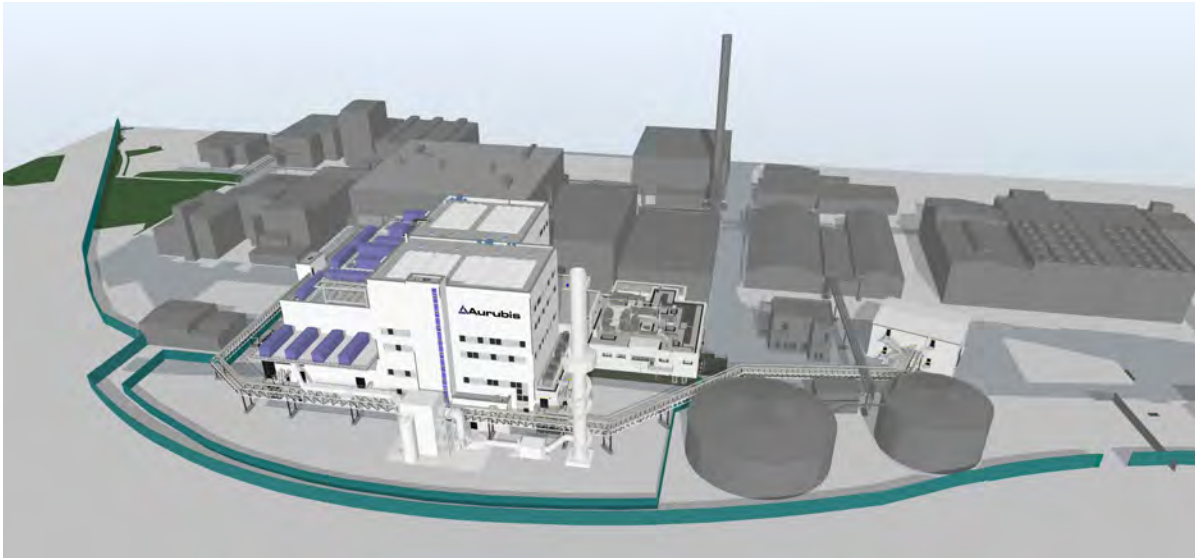
**Responsible: partnerships for sustainable copper sourcing**

To develop sustainable copper production from primary materials, the actors across the entire value chain have to work together and adhere to shared standards. In early 2023, as part of the German-Chilean Raw Materials Partnership, we signed a memorandum of understanding with the Chilean company Codelco, the largest copper producer in the world. The shared target: promoting collaboration and communication to develop a responsible copper value chain. In November 2022, a similar memorandum of understanding was signed with the multinational mining company Anglo American based in London (UK). There, too, we’re pursuing the goals of fulfilling the growing demand for metals of the future through sustainable copper mining and sourcing, utilizing shared expertise for new technological solutions, and making the entire copper production process more transparent.



The Copper Mark verifies sustainable copper production.





The new precious metal processing plant will fulfill the highest security standards.

### Security: innovative precious metals processing in Hamburg

A new facility for processing precious metals, the Precious Metals Refinery (PMR), will be constructed by the end of 2026. With this investment, we are raising the bar with innovative process technology and systems engineering and the highest standards for plant and precious metals security and occupational safety.

Precious Metals Hamburg comprises the entire precious metals processing chain in one closed security area. Newly developed metallurgical processes will boost efficiency, reduce throughput times, and lower operating costs by around 15%. The expanded production capacity in precious metals will enable us to lay the groundwork for implementing additional projects from our growth strategy.



### Environmental protection: improved slag processing in Pirdop

At its site in Bulgaria, Aurubis is investing in the improved treatment of slag from copper refining. The new process involves cooling the slag in pots, as opposed to pits as it is now. As of commissioning in 2026, Aurubis will significantly exceed the industry standard in environmental protection and will have achieved dual goals: a considerable reduction in diffuse emissions and increased work safety for this process. Metal recovery will also increase by about 500 t of copper each year. Overall, it's a project that once again demonstrates how responsibly and efficiently we transform raw materials into value while conserving resources.

# More metals

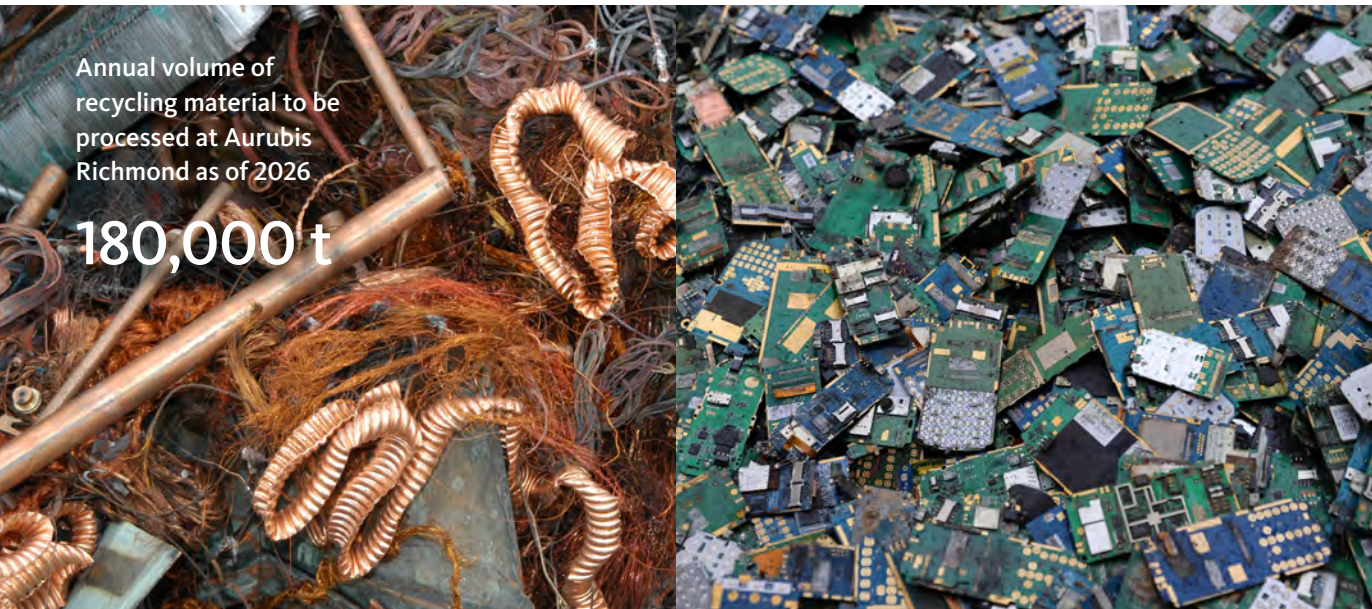
We're improving our material flows, optimizing our processing methods, and boosting our capacities with new, state-of-the-art technologies. The result: a diversified portfolio with maximum use of our resources. A sustainable approach is our answer to the rising demand for raw materials.





# More metals for a sustainable world

With large-scale investments in the US and Europe, we're promoting the development of the circular economy.



A variety of recycling material input: shredder materials, copper wire, and printed circuit boards (PCBs).

## Circular economy

For Aurubis, growth primarily means producing more metals. More metals for a green and digital future. More metals for a sustainable world. Recycling and the circular economy play a central role here — as a response to rising future demand for raw materials. After all, metals are at the core of the circular economy. Our main product, copper, can be processed over and over without a loss of quality, for example. Using existing resources on-site also saves huge quantities of energy and greenhouse gas emissions.

We already process more than a million tons of complex recycling materials, and we want to continue growing in the area of recycling. As one of the world's biggest copper recyclers, we are using our extensive expertise to develop our capacities and our efficiency in metal recycling even further. The objective of our strategy is for Aurubis to offer the entire value chain real solutions for the circular economy.

## Valuable raw materials

One of the central projects: Aurubis Richmond. With the construction of the first US recycling smelter specialized in multimetal recycling, we are opening up a highly attractive new market with an annual recycling material volume of more than 6 million t. Until now, most US electrical and electronic scrap has been exported, landfilled or remained uncollected, and local industry has lost valuable critical and strategic raw materials. The supply of complex recycling materials has gotten a boost due to a growing awareness for sustainability in the US, and declining export rates. In our new facility in the state of Georgia, we can annually process 180,000 t of recycling materials, like e-scrap, into new raw materials. The heart of the process is a state-of-the-art procedure for processing complex recycling materials in order to recover copper, nickel, tin, zinc, precious metals, and platinum group metals in additional stages.

Aurubis Richmond is breaking new ground — and making a significant contribution to more sustainability and supply chain security in the US economy. “Our ambition is to make additional investments in the value chain in the US in the future,” David Schultheis, Managing Director of Aurubis Richmond, says. “Our sites in Europe will also benefit from the new plant’s output: There will be even more co-products and intermediates from copper production that have to be

specially processed and refined. To sum it up, the plant in Georgia will complement and broaden our integrated international smelter network with an attractive new site — and diversify our business and project portfolio beyond Europe.”

Our objective for the US: Aurubis plans to become the largest fully integrated producer of copper from recycling materials in North America. In doing so, we will gradually expand our capacities along the entire value chain. Aurubis Richmond is the foundation for this, and not only from a timing perspective. The uniqueness of the project lies in its construction concept: Aurubis Richmond is the first plant that we’re realizing using a modular principle. The modular recycling system we’ve developed allows us to add further facilities and components tailored to the future demands of the new market. An innovative concept that provides a high degree of plannability and maximum flexibility in a booming segment. Nevertheless, in the future we want to use the modular system in established markets, too: as a model for additional growth projects at other Aurubis sites.



Aurubis Richmond video  
[aurubis.cdn.picturepark.com/v/laAgvSXQ/](https://aurubis.cdn.picturepark.com/v/laAgvSXQ/)

“To sum it up, the plant in Georgia will complement and broaden our integrated international smelter network with an attractive new site — and diversify our business and project portfolio beyond Europe.”

David Schultheis, Managing Director of Aurubis Richmond





### Putting all materials to use

First and foremost, more metals means making our material flows and processing methods even better. With our metallurgical expertise, we keep pushing forward to use resources fully, and in a way that creates value. We believe sustainability and economic efficiency go hand in hand. We want to generate marketable products from all input materials, profitably leverage intermediates and co-products, and avoid residues and waste.

Complex Recycling Hamburg (CRH) at the Aurubis headquarters will set an example starting in 2025. The project centers around an exceptional facility that will allow us to considerably strengthen our capacities for recovering metals from intermediates from copper production. One of these intermediates is copper-lead matte consisting of copper, lead, sulfur and precious metals. Until now, this complex material has been sold to other companies because it can't be fully processed using conventional metal industry facilities.



“No other growth project optimizes as many valuable material streams and is as strongly integrated into our smelter network as CRH.”

Jürgen Jestrabek,  
Project Manager of Complex Recycling Hamburg



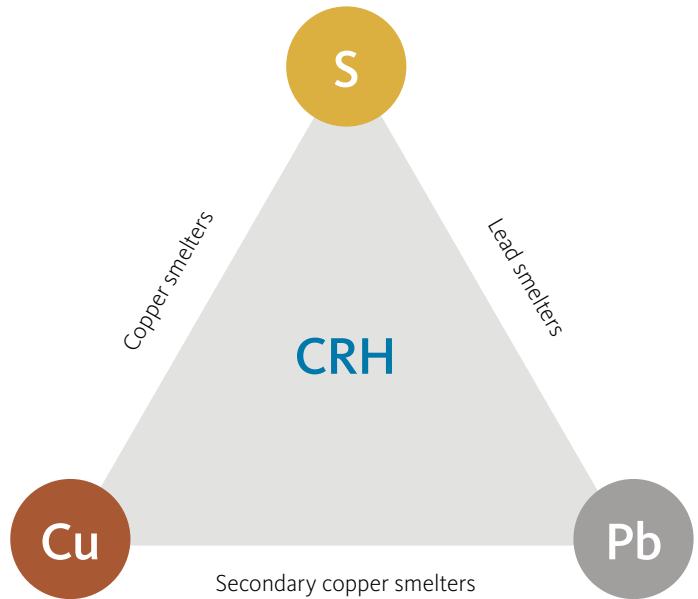
External input materials for CRH

~ 32,000 t p.a.

Production start

2nd half of 2025

CRH leverages our unique strengths and creates options for the complex processing of copper (Cu), lead (Pb), and sulfur (S).



With CRH, however, we'll be able to process copper-lead matte ourselves in the future, and recover valuable new raw materials from it: blister copper, sulfur dioxide, and lead oxide. We can then feed the blister copper into our copper cathode production, process the sulfur dioxide into saleable sulfuric acid in our sulfuric acid facility, and use the lead oxide in our production processes, as lead is a carrier material for many precious metals and a key factor in recovering and recycling valuable raw materials.

Using everything, and turning it into the best — Aurubis' metallurgical expertise makes this sustainable approach possible. "The extraordinary thing about Complex Recycling Hamburg is that the technology unites the separation and processing of valuable raw materials in one facility," Project Manager Jürgen Jestrabek explains. "CRH takes the circular economy to a new level: We're creating an ecosystem that employs the zero-waste approach, even within the company's own processes. In the future, we'll be able to process all intermediates

ourselves, leaving nothing behind. With CRH, we're strengthening our core business with particular intensity. No other growth project optimizes as many valuable material streams and is as strongly integrated into our smelter network as CRH."

The processes get an efficiency boost at the same time: The new technology makes intermediate steps between separation and processing unnecessary, as everything goes directly into one facility. This means shorter processing times — together with higher capacities. By expanding the portfolio, Aurubis can continue profiting from its own intermediates, and even process material from other companies with CRH in the future. CRH has good competitive prospects. And not just because Aurubis is one of the few metal producers worldwide with this type of technology, but also because the enormous growth in demand for industrial metals guarantees the project a solid foundation for growth.



Pirdop tankhouse: expanding capacities for more output.

## Three advantages at once: tankhouse expansion in Pirdop

A bigger supply for a booming market, leaner processes within the Group, a better environmental footprint — our Pirdop tankhouse investment project checks three important boxes at once. The tankhouse is the final refining stage in copper production. By expanding the facility at the Bulgarian site, we're strengthening our core business first and foremost: Copper cathode output in Pirdop will increase to 340,000 t per year.

More refined copper from European production helps cover burgeoning demand in the region's industry. Furthermore, regional production contributes to the European Union's goal of reducing its dependence when it comes to crucial raw materials. And not least, metals "made in Europe" are produced in accordance with the highest environmental standards. Our own environmental footprint is also shrinking: In the future, we will be able to process all locally produced copper anodes directly in Pirdop instead of transporting some of them to other Aurubis sites as we currently do. This optimizes material flows in the Group, reduces logistics costs — and lowers our CO<sub>2</sub> footprint.

## Using all our potential: BOB and ASPA in Belgium

Potential for new raw materials is everywhere. In the future, our plant in Olen, Belgium, will be recovering important new resources from the electrolyte used in metal production. BOB makes it possible: Bleed Treatment Olen Beerse, a new, state-of-the-art facility that draws out valuable raw materials such as nickel and copper from the electrolyte that accumulates in metal production in Olen and Beerse (both in Belgium). With BOB, Aurubis is taking on another part of the multimetal value chain and optimizing the Group-wide material flow. Another benefit: The new facility makes production faster and more efficient. But BOB contributes to our sustainability targets first and foremost: We will recover valuable metals and reinforce our responsible approach to resources.



BOB: new facility, more efficiency.



ASPA: closing loops, avoiding transports.

At the Beerse site, too, we'll soon be utilizing raw material potential even more intensively: With a process developed in-house, we're improving anode slime processing with a few key steps. This intermediate from copper production contains precious metals, such as gold and silver, as well as tin. With our new Advanced Sludge Processing by Aurubis (ASPA) hydrometallurgical procedure, raw materials can be recovered from anode slime in an even shorter time. The new facility takes metal recycling to the next level: It draws out as many components as possible, as quickly and efficiently as possible — directly on site in the plant. Another important contribution to closing waste cycles and avoiding transports — key elements for us in developing a sustainable circular economy.

# Scalability



Aurubis' business model is extremely capable of expansion and growth. Because we are developing a modular approach to new processes, allowing us to transfer and implement them independently of location. Because one of our smelter network's strengths is how we can flexibly react to internal and external demands. Because we think locally and act as a network.



# “Our successes are scalable!”

In an interview, Thomas Sturm, Senior Vice President Corporate Development, explains scalability based on examples from daily business, and how Aurubis is successfully using the strategically smart tactic of thinking and acting with a modular approach.



Thomas Sturm sees growth opportunities through scaling effects.

**Thomas, scalability refers to the ability to expand and grow. What does that mean when we're talking about Aurubis?**

**THOMAS STURM** We have a modular mindset. Our projects aren't designed as one-offs; they are fundamentally transferable, taking the respective local circumstances into account. That means they're not just successful once — they're, well, scalable. Quick execution, higher efficiency, synergies and learning effects in construction and operation are key. And shaping and driving the transformation of our industry towards sustainable metal production in everything we do.

**How does a company like Aurubis manage to scale its successes?**

**THOMAS STURM** Our new recycling plant in Georgia is a good example of this. Aurubis Richmond is developing as a module structure that we planned with an eye to the future and are now realizing step by step: Following the commissioning of the first module in the second half



High-level visitor: Dr. Jill Biden, First Lady of the United States, at the new Aurubis plant.



Proud team: Aurubis Richmond celebrates its topping-out in November 2023.

of 2024, we plan to start Module 2 in early 2026. Thanks to the very good market conditions in the US, we’ve sped up the implementation of the second stage and doubled processing capacities. Our ambition at Aurubis Richmond is to continue expanding our value chain beyond blister copper, all the way to wire production. We will grow in line with the possibilities presented by the markets. And we have additional plans for future investments up our sleeve. Aurubis Richmond can serve as a blueprint for other possible sites in the US and beyond.

**Metal production is a complex business with long lead times. How agile can growth actually be for a company like Aurubis?**

**THOMAS STURM** Growth requires planning ahead and a sound foundation rooted in facts — as well as maximum flexibility and adaptability. We are closely reviewing and monitoring where today’s markets are developing, and our project pipeline contains many more ideas and plans that we haven’t made public yet. When opportunities

arise and we identify a growth investment that makes sense — large or small — we’ll take it on, confident in the results of our analyses, though it takes bit of courage too, of course. That’s essential. And it goes faster if we can reuse existing technologies, because we don’t have to start all over with our planning.



**What are scaling effects?**

Scalability refers to the ability of a system, network or process to change in size. Usually, it means a system’s ability to grow.

(Source: Wikipedia)

Another example of agility is the investment in expanding selenium production at our RETORTE subsidiary, a local top-tier company in a niche global market → [see box](#) that is extending its access to promising, specialized food and pharmaceutical markets with a new facility in line with Good Manufacturing Practice. Although this represents a smaller project compared to others, the investment decision was made with a sense of purpose. After all, it doesn't just mean securing the site's future, but also acknowledging RETORTE as a key component of our smelter network. Because a by-product of copper production in Hamburg, raw selenium, is processed into valuable products here.

## i

#### Expanding selenium production at RETORTE

As the global market leader, RETORTE GmbH produces about 50 different selenium products for around 500 customers in 15 industries worldwide. The Aurubis subsidiary is further expanding its selenium production for the high-margin growth markets of the food and pharmaceutical sectors. The groundbreaking ceremony for a new production facility in accordance with Good Manufacturing Practice took place in June 2023. With this investment, Aurubis is strengthening the company located in Röthenbach a. d. Pegnitz with approximately 40 employees as a key component of the valuable multimetal material cycle. All of the raw selenium from smelting operations in Hamburg is refined and processed into products of value here (→ see photo at right).

#### Where can we see the flexibility of Aurubis' smelter network?

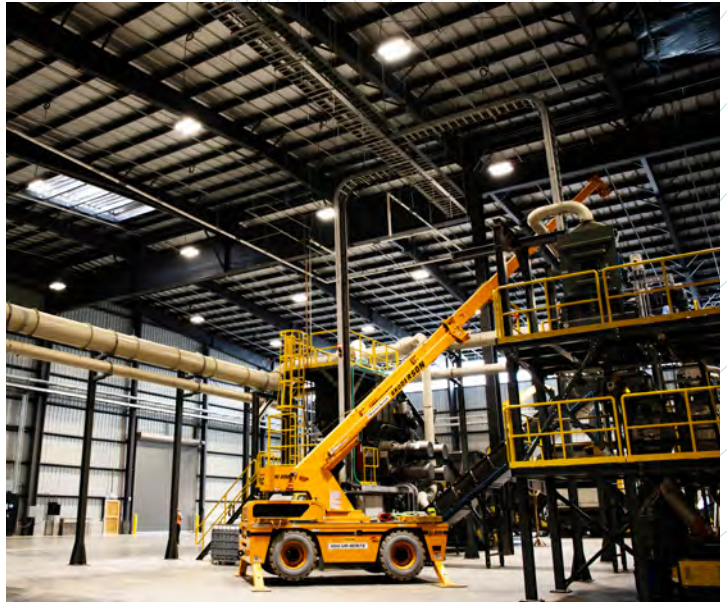
**THOMAS STURM** Each one of our smelters has its own specific strengths. It is crucial to optimally connect them for the best overall result. That's something we're good at. The strength of our supply chain is especially evident, even during shutdown periods. Our sites leverage the high degree of flexibility in our smelter network to secure the supply for production. Our most important objectives in the Group are to utilize all our facilities, to recover our metals efficiently, and to maximize productivity. For instance, the anode slimes for our new ASPA recycling facility in Beerse, Belgium, will come from multiple sites in the company, and the blister copper that we'll produce at Aurubis Richmond in the US will initially be processed in Europe for the most part. Another example shows how we take sustainability aspects such as reducing CO<sub>2</sub> emissions into consideration in our investment projects: Expanding our tankhouse in Pirdop will allow us to process all the anodes produced at the site in Bulgaria, too, instead of transporting them to other sites. This opens up new capacities and saves CO<sub>2</sub> in the Group thanks to the elimination of the transports. → [See the](#)

"More metals" section, p. 32





Progress in Aurubis Richmond construction: the interior work is moving forward.



The plant is growing: the first multimetal recycling plant in the US is being built on an area of just under 150 acres.

# Aurubis at a glance

Group figures 2022/23

Operating earnings before taxes

**€ 349** million

Net cash flow

**€ 573** million

Equity ratio

**56.6**%

Return on capital employed (ROCE)

11.3%

Capital expenditure

€ 633 million

Recommended dividend

€ 1.40

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