

HICON®

EBNER GROUP Journal for technology and progress





EBNER GROUP

Ladies and Gentlemen,
 Esteemed readers of the
HICON® Journal,
 Dear friends and colleagues
 of the **EBNER GROUP!**

The **EBNER GROUP** is constantly evolving, and in this issue we would like to present two recent changes in upper management.

At Gaultschi Engineering GmbH, Stefan Pelech has taken charge of operations. He brings with him two decades of experience with industrial facilities for the aluminum casting industry, and for the past two years has been in charge of developing our product lines for aluminum.

Another notable development among the members of the **EBNER** family is the change in leadership at GNA alutech inc. In the competent hands of Kaleb Wright and Chantal Coupal, the company will seek to build upon the remarkable 40-year story of success begun by Ted Phenix. The new leadership will secure GNA's place as a dynamic force in the industry, with Ted, the founder of the company, supporting the new management team in an advisory role.

In these dynamic and challenging times, the synergies and strengths of the **EBNER GROUP** continue to grow in importance. Our focus on the development of technologies for sustainable solutions underscores our commitment to the responsible use of resources within the industry. Cooperation among the members of the **GROUP** enables us to take advantage of our collective expertise, and ensures that we stay at the forefront of technological progress.



This April, at the upcoming WIRE and TUBE trade fair in Düsseldorf, Germany, there will be another chance to speak with our experts in person. This is a chance to discuss the new developments and solutions that will allow us to shape the future of the metals industry together.

Over 4 800 **EBNER** bell annealers are currently in operation throughout the world, of which 500 are special designs for wire applications. These numbers highlight the wide distribution of **EBNER** technology, and are another indication of our commitment to offering state-of-the-art solutions tailored to the wide range of requirements encountered in the metals industry.

We would like to invite you to investigate the latest developments with us, to forge new partnerships and to accompany us on our path into an innovative and sustainable future.

Yours,
 Robert Ebner
 CEO **EBNER GROUP**

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ANTON OPPERMANN
EBNER Product Manager

Flexible **EBNER** facilities for every type of semi-finished product provide our customers with the highest efficiency and best possible quality.

COPPER: ENABLING TECHNOLOGICAL PROGRESS

Copper has been in use for over 10,000 years, and entire periods of human history such as the chalcolithic or the bronze age have been named after it. Today, electrification and digitalization have led it to become even more important than ever.

Copper's outstanding electrical and thermal conductivity, far superior to that of any other technologically relevant material, are the keys to its success. It also has excellent formability and corrosion resistance, and other properties such as hardness can be easily influenced with alloying elements.

The combination of these characteristics means that copper has a wide range of economical applications for every type of electrical facility, as well as in fields such as mechanical and plant engineering, power generation, telecommunications and mobility. Copper has allowed us to achieve our current level of technological progress, an age of electrification and digitalization.

COPPER: ADVANCING GREEN TECHNOLOGIES

Copper is becoming increasingly important and the demand for it is rising due to increasing global energy consumption, as well as the need to meet climate goals and successfully transition to renewable energy. Copper is thus often considered a critical resource.

Every type of renewable energy, particularly wind power and solar energy, relies on copper. For example, electric vehicles require around four times as much copper as conventional vehicles. Every prediction thus shows that the demand for copper will rise sharply in the next few years.

Copper can also be easily recycled: over half of Europe's annual requirements are already being filled by recycled material.

MINIATURIZATION: DRIVING THE GROWTH OF HIGH-STRENGTH COPPER ALLOYS

Due to the trend toward increased miniaturization, high-performance copper alloys are increasingly being developed and used. These alloys are precipitation hardened and exhibit high strengths. In many sectors of the electronics industry, for example consumer electronics



RYAN GORE
HAZELETT Sales Manager

or electric vehicles, there is an increasing demand for high-strength copper alloys. A good example of this is the USB-C plug for smartphones, tablets and other devices, which will become standard in the EU in 2024. This type of plug contains high-strength copper alloy strip and foil (less than 0.15 mm thick), which creates the electrical connection between the cable and the plug socket.

Plug connections must be as small as possible while still providing a continuous electrical connection. Along with high strength, the material that is used must also be to retain its stress relaxation properties. Put simply, this means that the contacts must retain their strength under frequent use.

The contacts are usually manufactured by stamping them, though those with particularly delicate structures are manufactured using a photochemical etching process. A metallic coating is often applied to the strip and foil that is used, e.g. using a tinplating process.



High-performance copper alloys for USB-C plugs



Copper and copper alloys in the electronics industry

COPPER: A MATERIAL WITH POTENTIAL.

Electrification and digitalization: copper is not just used to conduct electricity, it is paving the path toward renewable energy.

BRIGHT ANNEALING LINES FOR COPPER AND COPPER ALLOYS

The fact that the demand for copper is predicted to increase is also reflected in the increasing amount of interest in annealing capacity for high-performance alloys (also referred to as *high-temperature* alloys). These alloys are primarily processed in Asia, where a significant fraction of the electronics industry is based.

The proven design of an **EBNER** vertical bright annealing line allows copper and copper alloy strip to be heat treated in atmospheres containing a large proportion of hydrogen. This type of facility is particularly suited for high-performance copper alloys, which require extremely high processing temperatures. Following cold rolling, thin strip and foil up to 0.05 mm thick is heated up to target temperature in a jet tunnel and a radiant heating zone. It is then quenched in hydrogen atmosphere, a process that is extremely uniform. **EBNER**'s integrated strip cleaning system optimally prepares the strip for heat treatment or a downstream process (e.g. passivation). Extremely high strengths can be achieved by heat treating the strip in an adjacent facility, for example by precipitation hardening it in a **HICON**® bell annealer.

Employment of a **HICON/H₂**® muffle ensures that the temperature is extremely uniform and that the material is optimally protected from oxidation. An excellent strip geometry and uniform mechanical properties are achieved. The combination of muffle and vertically-oriented design allows the strip to be heated up and cooled without coming into contact with facility components. Paired with precise regulation of the strip tension, this ensures that the surface of the strip remains bright and free of damage even as optimal strip geometry is achieved. These features allow the manufacture of components with extremely small geometries for the electronics industry.

These facilities can be heated with state-of-the-art, low-emission natural gas burners, zero-carbon hydrogen burners or zero-emission electric heating systems.

HAZELETT

The **EBNER** Group offers solutions for processing every type of semi-finished copper product. A wide variety of heat treatment facilities can be supplied, from roller-hearth furnaces for rod and bar to bell annealers for strip and wire and vertical bright annealing lines. **HAZELETT** has been a member of the **EBNER** GROUP since 2021, meaning that the Group's product line includes continuous casting equipment.

The development of **HAZELETT** technology for casting copper base materials began over 90 years ago, and it has become an extremely efficient, eco-friendly casting process. Constant improvements made to the

technologies and designs, as well as the accumulation of know-how concerning the process, have been the keys to success. **HAZELETT** copper casting facilities deliver products that are of the highest possible quality, even as they ensure that production costs are held to a minimum.

Over half of the worldwide demand for copper is for cast and rolled copper wire rod, used as a starting product in the electrical and electronics industries.

The **HAZELETT** twin-belt copper bar casting machine is unique in the industry. The straight-through mold produces bar that does not need to be straightened when it exits the machine. The semi-horizontal orientation of the long, narrow mold and the ability to taper the mold to accommodate shrinkage of the bar as it cools ensure the highest quality bar for in-line rolling. Bar with diameters ranging from 8 to 22 mm can be produced.

With 38 **HAZELETT** copper bar casting machines currently operating in 16 countries, **HAZELETT** customers are producing a significant amount of the world's copper wire.

The **HAZELETT** twin-belt copper bar casting machine is the only continuous copper casting machine in the world that can say this. For example, the casting machine installed in a European plant is producing every major type of copper base metal, and is supplying a significant amount of Europe's copper sheet and foil.

The **HAZELETT** twin-belt copper bar caster



Right-hand image: Vertical **HICON/H₂**® bright annealing line for cold-rolled copper and copper alloy strip





HEAT TREATMENT TECHNOLOGY FOR WIRE ROD AND DRAWN WIRE.

Hot-rolled and Stelmor-cooled wire rod are the starting materials for a number of processes and high-quality products.



PETER SEEMANN
EBNER
VP Research & Development



SASCHA EPPENSTEINER
EBNER
VP Product Management

The first time a coil of wire rod is heat treated it usually undergoes a spheroidization anneal, where the as-cast hot-rolled microstructure is optimized for additional cold forming. The excellent temperature uniformity that is achieved in HICON/H₂ furnaces is essential for successfully annealing wire coils heat treated above the Ac1 temperature, particularly with highly-alloyed grades.

Thanks to the high heat transfer coefficients, the necessary transformation energy is transferred all the way through to the center of a compact wire coil. Both the exterior and interior windings of the coil thus show similar temperature profiles throughout the course of the anneal, leading to extremely uniform mechanical properties - particularly when high alloy grades are annealed above the Ac1 temperature.

COLD-DRAWN WIRE

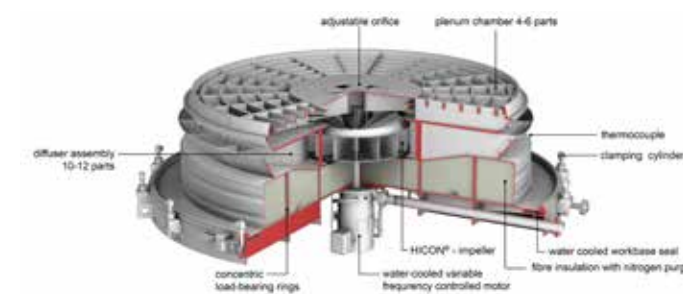
With HICON/H₂ technology, cold-drawn wire can easily be recrystallized in pure hydrogen. Depending on the grade of steel, operating temperatures may vary between 660 °C and 860 °C.

Hydrogen's ability to transfer heat, along with its cleaning properties, promotes the evaporation of lubricants. Automatic atmosphere control programs flush the evaporated drawing compounds out of the workload space during the heating-up phase. Both at the end of the heating-up phase and at the end of cooling, the temperature scatter throughout the charge stack remains minimal. The graph shown below compares heat treatment of a 44 t stack of wire in nitrogen atmosphere with heat treatment in hydrogen atmosphere. When nitrogen is used as the process atmosphere, a throughput of only 1.8 t/h can be achieved. A hydrogen process atmosphere provides 2.6 t/h. Along with

the fact that heat treatment in a hydrogen atmosphere takes less time, there is also a significant difference in the surface finish of the two compact coils: the coil annealed in hydrogen has a significantly better finish.

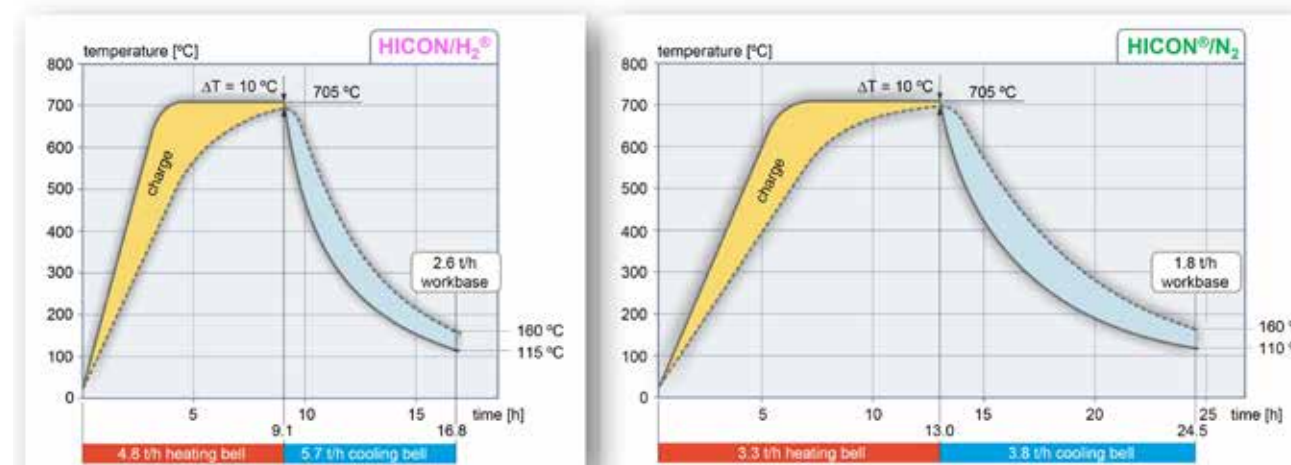
LIGHTWEIGHT CONSTRUCTION AND ATMOSPHERE FLOW

Workbases designed to heat treat steel wire (see image below) are distinguished not only by their lightweight construction, which they combine with excellent load support, but also by optimized gas flow throughout the entire volume containing the charge - which they combine with extremely high speeds of gas flow. Concentric support rings and segmented plates are used to reduce the weight of the diffuser/load plate assembly. The light weight of this assembly provides an improved and more even flow of gas across the entire surface bearing the charge.



Cross-section of a workbase designed to heat treat steel wire

Comparison between anneals in nitrogen and hydrogen atmospheres



Special fan impellers, developed by **EBNER**, have intakes with an increased cross-sections. This allows extremely high speeds and recirculation of extremely high volumes of gas: up to 50 m³/s. The combination of lightweight construction, optimized gas flow and high gas speeds enables the shortest possible annealing times.

ATMOSPHEREperfect

The **ATMOSPHEREperfect** software module is an automatically-controlled purging program. It is easily activated by checking a box in the visualization system (see image below). An automatically-calculated purging segment is located in segment 1 of the atmosphere track, so that the atmosphere can be replaced with 100 % H₂ as quickly as possible. Automatic H₂ control is found in segment 2. The preset flowrate of 15 m³/h is the minimum purge flowrate. This is maintained until the minimum purging time has expired, unless control by the **ATMOSPHEREperfect** module is required. The purge flowrate is automatically regulated in response to evaporating drawing compounds and lubricants. Evaporation is detected by noting an increase in the power draw of the workbase fan while the speed has remained constant. That is, the module calculates the optimal current draw with a 100 % H₂ atmosphere at a given temperature.

Example of an annealing program with **ATMOSPHEREperfect**

Temperature track				Atmosphere track													
Seg.	Temp. [°C]	Zeit [h]	Zeit [min]	Temp. [°C]	Zeit [h]	Zeit [min]	Best.	Schutzgasart	Durchfluss [m³/h]	H ₂ in H ₂ [%]	Temp. [°C]	Zeit [h]	AG [h/m]	HG [h/m]			
1	695	7.0	0	695	7.0	0	>	0	2.8	5	H ₂ spülen	10.0	100	323	2.2	0	188
2	695	0.3	0	695	0.3	0	>	0	8.1	5	H ₂ spülen	15.0	100	194	12.4	0	400
3	705	0.5	0	705	0.5	0	>	0	0.0	4	H ₂	0.0	100	0	0.0	0	0
4	705	4.8	0	704	4.8	0	>	0	0.0	4	H ₂	0.0	100	0	0.0	0	0
5	0	0.0	0	0	0.0	0	>	0	0.0	4	H ₂	0.0	100	0	0.0	0	0
6	0	0.0	0	0	0.0	0	>	0	0.0	4	H ₂	0.0	100	0	0.0	0	0
7	0	0.0	0	0	0.0	0	>	0	0.0	4	H ₂	0.0	100	0	0.0	0	0
8	0	0.0	0	0	0.0	0	>	0	0.0	4	H ₂	0.0	100	0	0.0	0	0
9	0	0.0	0	103	0.0	0	<	192	8.1	4	H ₂	0.0	100	98	9.1	233	31

Automatically controlled H₂ source

ENCAPSULATION OF THE PROCESS CHAMBER

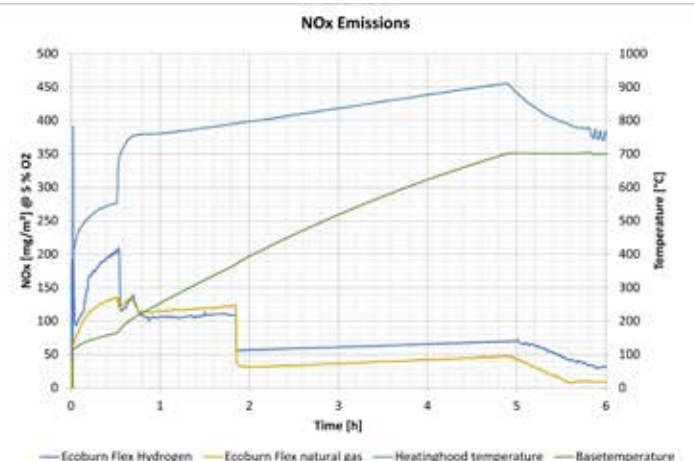
The inner cover provides all-metal encapsulation of the process chamber and allows special atmospheres to be used in the workload space, without the admixture of exhaust gases or ambient air. The inner cover is exposed to temperatures over 1000 °C, as well as a high number of temperature cycles and thermal shocks. To prevent distortion, **EBNER** inner covers are always corrugated. It is also crucial to select the right material, as the combination of oxidizing exhaust gas on the outside of the cover and the reducing atmosphere on the inside can thin the material. A baffle system is located inside the inner cover to direct the flow of gas inside the workload space. This prevents the gas flow from short-circuiting or moving in irregular patterns, optimizing heat transfer.

ECOBURN FLEX: SPECIAL BURNERS FOR OPERATION WITH NATURAL GAS AND HYDROGEN

To reduce the emission of pollutants such as NO_x and CO₂, **EBNER** is constantly advancing its proprietary burner technology. Our goal is to provide extremely low

NO_x emission values (< 100 mg/m³ @ 3% O₂, figure 4), even as H₂ combustion offers a carbon-neutral (at least on a local level) method of heating. **ECOBURN FLEX** burners can operate with either type of fuel gas (natural gas or hydrogen), and automatically switch to flameless operation as soon as a certain heating bell temperature is exceeded. During flameless operation, using natural gas as a fuel at max. heating power results in NO_x values below 50 mg/m³. When using H₂, they are below 70 mg/m³.

When **ECOBURN FLEX** burners are compared with the models of burner currently standard in the industry, NO_x values can be reduced by about 30 % when in flame mode. The first production anneals using H₂ as a fuel gas have already been successfully completed.



NO_x emissions of an **ECOBURN FLEX** burner when operating with hydrogen and natural gas

PUTTING IT ALL TOGETHER

EBNER bell annealers are distinguished by cutting-edge technology that is constantly being improved. Ground-breaking innovations have already been made to reduce atmosphere consumption (**ATMOSPHEREperfect**) and to improve burner technology (**ECOBURN FLEX**). Our furnaces feature the lowest energy consumption, the lowest emissions, the highest throughput and are extremely flexible. When annealed in an **EBNER** bell annealer, steel wire is of a quality that ensures the reliability of downstream processes: it has a homogeneous microstructure, uniform mechanical properties, no additional decarburization, no additional grain boundary oxidation and an ultra-clean surface finish thanks to optimized atmosphere flow and sophisticated process control. Over 4.800 **HICON** bell annealers - of which around 500 are for wire - are in service throughout the world.



**FABRIZIO MILANO****EBNER Thermal Solutions**
Managing Director

In October 2022, Acciaierie Valbruna S.p.A. placed an order with **EBNER Thermal Solutions S.r.l.** for delivery of a new heat treatment facility for their **Vicenza works**. Only eleven months later, the facility went into operation.

Acciaierie Valbruna S.p.A. is one of the largest producers of stainless steels, nickel alloys and titanium long products in Italy. The company's 2500 employees produce around 250,000 metric tons of specialty steels per year, operating from two production plants in Italy (Vicenza and Bolzano), one in the United States (Fort Wayne, IN) and one in Canada (Welland, Ontario).

Valbruna's products find application in a wide variety of industrial sectors such as the food and pharmaceutical industries, aerospace industry, automotive industry, chemical and petrochemical industries, construction, energy, machine manufacturing, medical technology and shipbuilding.

Valbruna's primary goal has always been to increase its production capacity in industrial sectors that demand high quality standards.

SUCCESSFUL IMPLEMENTATION ON A TIGHT SCHEDULE

To achieve its goal, Valbruna made a decision in 2022 to invest in a new heat treatment facility for the solubilization of long products. This new facility would replace an existing one operating at their Vicenza plant, and would be capable of complying with the extremely stringent AMS 2750G aerospace standard.

The turnkey contract that was awarded included two strict milestones. First, the existing furnace had to be dismantled by the last week of July, 2023. Second, the new furnace had to be installed and ready to start production by the middle of September, 2023.

As it turned out, the old furnace was completely dismantled by August 1 and on September 15, 2023 the new furnace produced its first heat treated coils. These coils were heated up to 1180 °C, following which they underwent solubilization in the quench tank.

SATISFACTORY QUALITY AND REDUCED NATURAL GAS CONSUMPTION

During the first week of October, the furnace was adapted to be capable of solubilizing bar using a specially-designed water spray system. This system was installed immediately downstream of the furnace outlet, in front of the coil quench tank. The first tests of the metallurgical quality were positive. Thanks to the flameless combustion system equipped with self-recuperative burners, natural gas consumption has been lowered even as optimal temperature uniformity is achieved inside the furnace chamber. The customer has been extremely satisfied with the low emission levels that have been achieved.

CONTINUING THE SUCCESSFUL PARTNERSHIP

Thanks to the highly successful collaboration during this project for the Vicenza works, Acciaierie Valbruna placed a new order with **EBNER Thermal Solutions** to rebuild an existing heat treatment facility at their Bolzano works. This facility is also used for solubilization, producing stainless steel bar and coils at throughputs up to 10 t/h.

We are looking forward to continuing our partnership, and to a successful completion of this next challenging project.

CONTINUING A SUCCESSFUL PARTNERSHIP.

EBNER supplies a roller-hearth furnace facility, complete with quenching system, to solubilize stainless steel ingots and coils.



NEW MANAGEMENT AT GAUTSCHI



STEFAN PELECH
Gautschi
Managing Director

In February of this year, Stefan Pelech took over operational management of Gautschi Engineering GmbH. Together with Udo Weilerscheidt, who is responsible for the financial side of the business, he is leading the company into the future.

Stefan Pelech has over 20 years of experience in the manufacture of industrial facilities for the aluminum casting industry. For the last two years he has been responsible for developing and coordinating the EBNER GROUP's product lines for aluminum melting and casting, with a primary focus on sustainability and recycling.

During this time, Gautschi developed a design for a multi-chamber melting furnace - complete with the components and upstream facilities required to prepare, sort and preheat scrap. Right after taking on his new management role, Stefan Pelech took the time to answer our questions.

Do you have any current goals? What would you like to achieve with Gautschi in 2024?

We would like to further strengthen our global position and continue to be a reliable partner for our customers. Positively processing every one of our customer's orders and ensuring their full satisfaction is, of course, a prerequisite.

Can we expect any changes in Gautschi's product line?

Yes, several. For example, there is the Varega Envicom burner. This burner was developed to reduce pollutant emissions, which are regulated more and more tightly. It is a regenerative burner that is distinguished by its high efficiency, paired with extremely low CO₂ emissions and an equally low level of NO_x emissions. We expect that this new type of burner will be advantageous when installed in new facilities, as we will be able to set new standards for emission levels. It will also be advantageous when installed as part of a modernization package - we expect that over the next few years our customers will invest in improvements to the efficiency and eco-friendliness of their facilities.

Isn't TPS (Thermal Processing Solutions GmbH) also working on new burner technology?

Yes. TPS is a start-up that split off from Gautschi and is also based in Ranshofen. Werner Wigger and his team at TPS are developing a method for carbon-free heating, which will be particularly suitable for aluminum melting furnaces. This method is known as a plasma

jet. The patented technology is distinguished by the fact that, when inert gases such as nitrogen are used, the temperature of the plasma jet is lowered from several thousand degrees to a level comparable to that of natural gas burners. Both the amount of dross that forms and the hydrogen content of the molten metal are reduced. This is revolutionary, as all the effort that is currently required to keep the melt clean can be significantly reduced. For the multi-chamber furnaces that we are currently developing, plasma technology will be a game changer.

What are multi-chamber furnaces and what are they used for?

Multi-chamber furnaces are currently used in the secondary aluminum industry to remelt aluminum scrap that has been contaminated with organic materials. This can be painted sheet and profiles, window frames with synthetic seals or foam insulation, or simply the oily chips left over after aluminum parts are machined. When the aluminum scrap averages up to around 5 % combustible components, it can be preheated in a multi-chamber furnace. The pyrolysis gases that are generated during the process can then be used as an energy source instead of natural gas. The preheated scrap, free of organic components, is then melted using an immersion melting process. This method uses the least amount of natural gas, and also provides the greatest metal yield.

Is there a process for scrap that is highly contaminated?

For scrap containing up to 10 % organic contaminants, we offer the MASTERmax rotary tilting furnace. In this type of furnace, both the scrap and dross melt under a protective layer of salt flux. Over a year ago, we entered into a sales partnership with KMF to provide this technology.

What happens with clean scrap?

If you need to melt clean scrap, a Gautschi round top melting furnace is the furnace of choice. Those provide unbelievably high melting rates - two years ago, I could hardly believe it myself. But it really is true that the round shape and the high output of the Varega burners allow heat to be transferred at an extremely high rate, making use of both thermal radiation and convection. In the biggest round top furnace built to date, 165 metric tons of aluminum can be melted in about 5 hours!

Apart from your products for the aluminum melting sector, does Gautschi work with other metals?

We focus exclusively on aluminum. However, we do not confine ourselves to melting; we also manufacture vertical casting lines and heat treatment facilities.

Do those have any special features?

In casting, our primary goal is to provide a "100 % hands-free" process. This enormously increases both the safety of workers in the casthouse and the security of the facility. During "hands-free" casting, no members of the casting crew are needed near the facility - from the start of the process, when the casting furnace begins to fill the launder with liquid metal, all the way up to the end when the launder is completely empty and the continuously-cast product has both solidified and cooled. Employees supervise the fully automated components remotely, from a safe control station.

We are also continuously developing mold technologies. It should be possible to cast notoriously difficult hard alloys just as easily and at the same high quality as simple "garden-variety" alloys. That should also hold true whether you are casting ingots with the Gautschi ingot mold or casting billets with the Gautschi Air Glide mold.

How and where does Gautschi develop molds?

We develop molds at our Casthouse (R)Evolution Center, known as the **C-R-C**. We share this casthouse with HPI, and it is equipped with both horizontal (HDC) and vertical (VDC) casters. HPI uses the HDC to develop its mold technology, while Gautschi uses the VDC for its casting trials.

You also mentioned heat treatment facilities, which are one of EBNER's core competencies. What does Gautschi do in this field?

In this area, we have very different product lines.

First, we offer batch-type homogenizing furnaces. These are used in casthouses to metallurgically prepare semi-finished cast products for further processing (pressing or rolling). Our furnaces stand out from the competition due to their extremely short heating-up times, the extremely uniform temperature distribution within the furnace and their coolers, with which cooling rates can be flexibly adjusted to suit the alloy being processed.

Second, several years ago we developed the Compact Coil Furnace (CCF) - the most efficient and most flexible facility for heat treating sheet coils. Individual coils are heat treated in inert gas, with a minimal amount of atmosphere and energy required.

Third, we offer pusher-type and soaking pit furnaces. These are also extremely efficient and have excellent temperature regulation, and are used to bring ingots up to temperature before they are hot rolled. This is the only area in which our product range overlaps with **EBNER's**.

That brings us to our last question. Gautschi is a 100 percent subsidiary of the EBNER GROUP, which means that EBNER Industrieofenbau in Leonding (Austria) is a sister company. There are a number of others, such as GNA in Canada, HPI, which is also based in Ranshofen, HAZELETT, and so on. All of these companies are active in the aluminum industry. How do they interact with one another?

The product lines of all of the sister companies you named complement one another. There is very little overlap, meaning that we do not compete with one another in the marketplace. This is a huge advantage for us, because we have access to projects and markets that we might not be able to bid for if we were operating alone. For example, we can work together with HAZELETT on a strip casting line where we supply the melting furnaces, or with HPI on a batch homogenizing facility where HPI supplies the handling and sawing equipment. For overall automation of the facilities, we can use the **VISUALFURNACES 8** software suite developed by **EBNER Industrieofenbau**.

We can also rely on the support of **EBNER Industrieofenbau** when we would like to simulate atmosphere flow or during product development projects. In China, for example, the market is supported by Gautschi China. When they need to, they can fall back on the manufacturing capacity at **EBNER's** workshop in Taicaing. There are many more such examples, and one of our goals is to find and exploit more of these synergies.

Thank you for taking the time to talk to us and your interesting answers, and we wish you the best of luck in the future!

Thank you too!



Since it was founded in 1922, Gautschi Engineering GmbH has numbered among the most innovative and competitive full-solution providers for aluminum melting and casting processes.



NEW DIMENSIONS.

HPI supplies a new casting line to HYDRO Rackwitz. This will help satisfy the increasing demand for green aluminum.



GREGOR KÜCHER

HPI

**Senior Metallurgical and
Sales Engineer**

With the opening of the new HyForge casting facility at their aluminum recycling plant in Rackwitz, Germany, Hydro Aluminium has passed another milestone. This forty million Euro investment is in response to the automotive industry's effort to decarbonize, and increases Hydro's capacity for recycled aluminum scrap.

On September 14, 2023, opening ceremonies marked the end of a 14-month construction project and introduced Hydro's innovative HyForge forging stock at its Rackwitz works. Technology supplied by HPI was incorporated into the new casting line, making it possible to supply customers with billets with small diameters and superior surface finishes. HyForge billets can be forged directly into high-quality automotive components and other products, without additional processing steps such as extrusion or homogenization. This is a tremendous advantage, as lightweighting with aluminum is one of the most effective methods to improve the energy efficiency of motor vehicles without sacrificing safety.

CONTRIBUTING TO THE "GREEN TRANSFORMATION" IN GERMANY

For Hydro, the expansion of the Rackwitz plant is an important step towards fulfilling its ambitious goals in the recycling sector. Among other targets, the company plans to double the amount of aluminum scrap it processes by 2025. The expansion also allows more regionally-sourced scrap to be recycled, ensuring that Hydro remains a market leader in sustainability.

DECARBONIZING INDUSTRY

The recycling of scrap such as beverage cans, window frames, automotive parts and other objects that have reached the end of their service lives is one of the many strands in Hydro's strategy to reduce emissions. It is also the fastest way to supply carbon-neutral aluminum. The expansion of the Rackwitz plant is only one of several investments the company has made into first-class recycling technologies intended to satisfy both the growing demand for and the regulatory push toward aluminum with a small carbon footprint.

The new HyForge line has capacity of 25,000 metric tons per year, which is in addition to current annual production (95,000 metric tons of extrusion billets). The expansion also led to the creation of 20 new jobs, increasing the number of employees at the Rackwitz plant to 90.



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With HyForge, Hydro is literally forging the future of the automotive industry and is responding to the increasing demand for lightweight aluminum components with small carbon footprints.

This expansion enables us to strengthen our strategic partnerships with customers in the automotive sector, meeting their high quality standards and supporting their growing focus on sustainability.

Eivind Kallevik
Executive Vice President, Hydro Aluminium Metal

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**TED PHENIX****GNA**
President

As the founder and president of GNA I am delighted to reflect on the remarkable journey of our company, founded and headquartered in Montreal, Quebec.

From our humble beginnings to becoming a cornerstone in the industry, **GNA's** success is a testament to the collective efforts and resilience of our dedicated team over the years.

In the past four decades, we've witnessed and experienced the highs and lows of the aluminum market, consistently adapting to changing dynamics and emerging as a leader in our field. From pioneering industry-leading technologies to establishing strong relationships with clients and partners around the globe, our journey has been marked by milestones that have shaped **GNA** into the powerhouse it is today.

As I prepare to pass my hopes and plans for the company on to the next generation, I am pleased to introduce the leadership duo set to steer **GNA** into the future. Chantal Coupal, a seasoned professional, knows our industry extremely well. She brings a wealth of experience and a deep understanding of our customers' needs to her new role. Joining Chantal is Kaleb Wright from the United States, an expert whose extensive hands-on experience in aluminum casthouses promises to open new horizons for **GNA**.

Their combined expertise represents a fusion of local insight with a continued understanding of global industry needs and objectives, ensuring that **GNA** alutech continues to thrive and evolve. As we welcome this new chapter, the legacy of the past 40 years will serve as a foundation for innovation, sustainability, and our continued focus on customer satisfaction.

To our cherished clients, partners, and dedicated employees, I extend my heartfelt gratitude for being integral to our journey. Your support has been the driving force behind **GNA's** success. As I step back from day-to-day operations, I am pleased to share that I will remain actively involved through continued support and special project work, ensuring a seamless transition and

contributing to the ongoing success of the company. Looking ahead, our future holds limitless possibilities. With Chantal and Kaleb providing the leadership and supported by our growing team, we are poised for more great achievements in the next 40 years and beyond. Let us continue working together, crafting a future where **GNA** stands synonymous with excellence, innovation, and enduring success in the aluminum industry.

**KALEB WRIGHT****GNA**
President of Business
Development

Kaleb Wright joined **GNA** in 2019 as CTO. Before joining **GNA**, he spent over two decades supervising aluminum operations at one of **GNA's** customers. Over the last few years, Kaleb has established **GNA** as a strong service partner for the North American aluminum industry.

**CHANTAL COUPAL****GNA**
President of Operations

Chantal Coupal has been a member of the **GNA** team since 1995, initially joining as a junior project engineer. She has successfully managed numerous projects for **GNA**, working closely with Ted Phenix, the company's founder. Over the years, Chantal has assumed diverse roles within the company and has been involved in the operation of every department.

NEW GNA MANAGEMENT.

GNA alutech inc.: celebrating 40 years of excellence in the aluminum industry as a supplier of equipment and technology.



Since its founding in 1983, GNA has established itself as a leading provider of equipment and services, including melting and holding furnaces, for the aluminum industry.

A GREAT HONOR.

David Hazelett receives the Boultinghouse award.



DAVID HAZELETT
HAZELETT Managing Director

HAZELETT joined the **EBNER** GROUP IN 2021, enriching the Group with their expertise and experience in continuous casting. Today, HAZELETT is one of the world's leaders in continuous casting technology.

The Boultinghouse award is the highest award given by the North American aluminum industry.

It honors those who have not only had distinguished careers within the aluminum industry but also have provided their talents to improve the industry itself.

The award is presented in memory of the late ARCO Aluminum, Inc., president Marlan T. Boultinghouse. Boultinghouse brought energy and enthusiasm to the industry through his advocacy of aluminum marketing and the many technical programs he helped to advance. Winners of this award are wide ranging, from those who make the aluminum industry safer to those who have advanced major aluminum markets.

David Hazelett is the 24th recipient of this award, adding to the breadth of expertise represented by this group - with a common theme that each one of these winners has advanced, and in some cases transformed, the aluminum industry.

HAZELETT'S GAME-CHANGING TECHNOLOGY

The technology for fabricating flat-rolled aluminum products has changed dramatically over time. Many products that were once rolled in large scale conventional rolling mills can now be made in smaller and more efficient facilities.

The advent of continuous casting opened the flat-rolled product world for manufacturers. Several companies have been pivotal in developing this technology, but none more so than HAZELETT Strip-Casting Corporation.

David Hazelett was a founding member of the Associate Member Class of the Aluminum Association, and has been a tireless voice for the suppliers to the industry.

HAZELETT's history dates back more than 100 years. Throughout that time, the company has continued to quietly evolve and innovate with a heavy focus on research and development, gaining them a reputation for excellence.



Since 1919, Hazelett has been a word leader in the development and manufacture of continuous casting machines for the metals industry.



LIU NING
EED
Managing Director

A protective atmosphere roller type short cycle annealing furnace, generally referred to as an STC furnace, is primarily used to bright anneal products such as bar, wire, and copper pipe, improving the uniformity of their structures and enhancing their ability to undergo mechanical processing.

High quality products such as standard high-grade, high-strength parts, cold formed automotive parts, and bearing steels often require steel wire to be annealed during the refining process (before production) to reduce tool wear and improve product yields. Heat treatment also facilitates cold heading forming, reduces hardness, improves the structure and ensures good mechanical properties are obtained.

An STC furnace is an essential piece of equipment for completing this process.

Jiangsu Tiangong Tools Co., Ltd. is a supplier of comprehensive solutions for the cutting tool manufacturing industry, primarily focused on the production and sale of carbide steel and high-speed steel cutting tools.

In February 2022, Jiangsu Tiangong Tools Co., Ltd. signed a contract with **EED** Company, a member of **EBNER** GROUP, for the purchase of gas-fired roller type short cycle annealing furnaces using RX gas as a shielding gas. These furnaces would improve the mechanical properties of Jiangsu Tiangong Tools' alloy and high-speed tool steels, enhancing the market competitiveness of its cutting tool product line.

A gas-fired RX atmosphere roller type short cycle annealing furnace is a typical STC furnace. Such a STC furnace prepares an endothermic reaction atmosphere by cracking natural gas for use as a shielding gas during heat treatment in the furnace, which can effectively limit the occurrence of additional decarbonization.

Cracking is carried out using an endothermic gas generator, a device that mixes natural gas with a corresponding amount of air. When subjected to the action of high temperature and catalyst, this mixture undergoes incomplete combustion to produce a special atmosphere commonly referred to as RX gas.

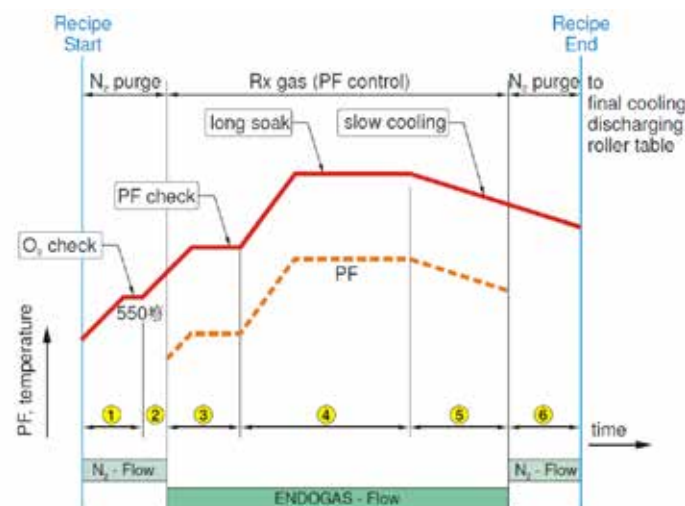
The process for preparing an endothermic atmosphere using natural gas follows the formula $\text{CH}_4 + 2.38 \text{ air} \rightarrow \text{CO} + 2\text{H}_2 + 1.88\text{N}_2$, and when natural gas is used as the cracking gas the final composition of the RX gas includes about 20 % CO and about 40 % H₂.



The atmosphere inside the STC furnace is a mixture of CO, N₂, H₂, and CO₂. To control the atmosphere in the furnace and maintain the pressure inside it, the workload space inside the furnace must always be isolated from the air outside to prevent both the admixture and leakage of air. To maintain a particular carbon potential in the furnace, as well as to control the stability of atmosphere composition, it is also necessary to automatically control the atmosphere in the furnace in response to different processes. A variety of monitoring instruments and devices such as CO and CO₂ analyzers, O₂ analyzers, etc., are therefore essential. These regularly or continuously measure the atmosphere in the furnace to adjust the gas supply.

STC HEAT TREATMENT FURNACES.

Protective atmosphere roller type short cycle annealing furnaces.



Principles of atmosphere control in an STC furnace

The material is initially purged with nitrogen gas while heating up. When the furnace temperature reaches 550 °C, the oxygen content in the furnace is measured. If less than 1 %, the temperature continues to increase. Once the temperature exceeds 630 °C, RX gas is fed in and the material undergoes the annealing process in process atmosphere.

Once the material temperature is below 650 °C, the entry of RX gas is stopped and nitrogen is forced in until the CO content is below 4 %. The furnace door at the outlet of the heating chamber can then be opened and the heating process is finished.

Using a given material as an example, the material is heated up to 20 - 30 °C above its Ac1 temperature

(which is 770 °C in this example) and held there for a certain period of time. Controlled cooling is then carried out: the material is slowly cooled down to 670 °C before being discharged from the furnace and entering the cooling chamber for cooling.



Archived curve of a spheroidization anneal recorded on site

The curves in the upper part of the image are the trend curves for the setpoint and current value of the temperature, while the curves in the lower part of the image are the trend curves for the setpoint and current value of the atmosphere.

The contract with Jiangsu Tiangong Tools will be executed in two phases, with two annealing furnaces installed in each phase. Currently, delivery and commissioning of the first phase have been completed and we are looking forward to the start of the next phase of the contract.



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MAY 6 - 9, 2024	AISTECH	Columbus	USA	Booth no.	1846
JUNE 11 - 12, 2024	WIRE EXPO 2024	Uncasville	USA	Booth no.	302
JULY 3 - 5, 2024	ALUMINIUM CHINA	Shanghai	CHINA	Booth no.	TBA
SEPT. 03 - 05, 2024	METALLURGY CHINA	Shanghai	CHINA	Booth no.	TBA
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We look forward to seeing you there!



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