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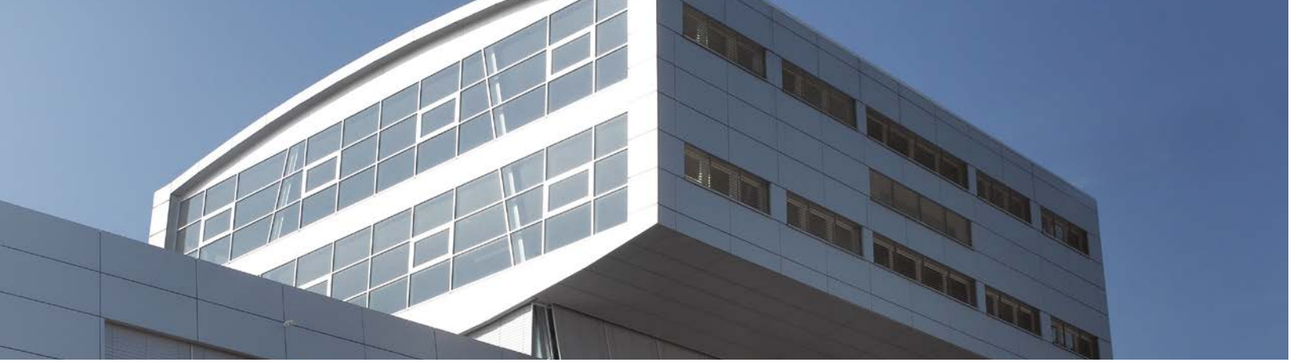
HICON®

EBNER Group Journal for Progress in Industrial Furnace Technology



EBNER

**Ladies and Gentlemen,
Esteemed readers of the
HICON® Journal,
Dear friends and colleagues.**

In accord with our vision of being **THE MOST INNOVATIVE AND COMPETITIVE FULL SOLUTION PROVIDER FOR SUSTAINABLE THERMAL PROCESSES**, we are constantly striving for ways to expand our product portfolio and strengthen our presence in the market. As 2021 came to a close it thus saw two pioneers, each rich in tradition, join forces.

America's Hazelett Strip Casting Corporation became a member of the **EBNER** Group, enriching our expertise with over a century's worth of know-how and experience in continuous casting.

Hazelett is a family-led company with 103 years of history and 160 employees.

Based in Colchester, Vermont (USA), they have recently been investing in a testing facility that employs extremely advanced technology. This is part of their effort to make the next generation of thin strip casting equipment ready for the metals market.

With this thin strip technology, the manufacture of aluminum strip with a thickness significantly below 10 mm will become far more cost-efficient and energy-efficient. In comparison, Hazelett's well-established belt caster technology allows strip with thicknesses ranging from around 15 to 38 mm and widths up to 2 m to be cast.

For the **EBNER** Group, the addition of Hazelett is another important milestone on the path toward offering complete plant solutions with state-of-the-art technology, and widens the spectrum of **EBNER** competencies with energy-efficient and eco-friendly technologies - particularly for aluminum, copper base metal and lead applications.

Gautschi Engineering GmbH, a member of the **EBNER** Group since 2010, will celebrate the 100th anniversary of its founding by holding a technical symposium and customer event this coming September. During this event, there will be an opportunity to visit the C-R-C (Casthouse Revolution Center), which opened in 2020 at the height of the coronavirus pandemic.
This is an excellent opportunity to obtain an up-close-and-personal overview of the possibilities it offers.

I look forward to personally welcoming many of our customers and business partners to this upcoming event!

Yours, Robert Ebner
CEO

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100 years of Gautschi

100 years of expertise

100 years as a full solution provider

A HISTORY OF GAUTSCHI

1920

1922 Rudolf Gautschi founds “Caloriewerke Gautschi & Brand” in Singen, Germany; the company manufactures small-scale furnaces used in a variety of applications.

1930

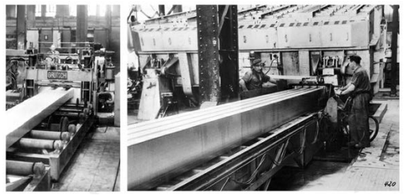
1935 The company moves to Schaffhausen, Switzerland.

1940

1948 The company moves to Taegerwilen, Switzerland and changes its name to “Gautschi Electro-Fours SA.”

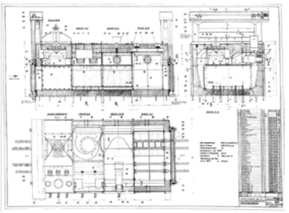
1950

1950s In cooperation with Pechiney, development of a “horizontal casting process for aluminum” (known as the “Gautschi-Ugine” process).



1960

1966 Development and delivery of the first pusher-type furnace.



1969 At the age of 80, Rudolf Gautschi retires. The company is sold to RUHRGAS AG of Germany, meaning that Gautschi Electro-Fours SA becomes a part of the LOI Group.

1970

1980

1980s & 1990s Production of highly-efficient pusher furnaces with state-of-the-art technology.

1984 Gautschi Electro-Fours SA is acquired by KHD Humboldt Wedag AG. Gautschi concentrates on the development, manufacture and installation of turn-key casting facilities for primary and secondary industries.

1990

1992 New developments for shaft furnaces.

1995 Development of a regenerative combustion system (Gautschi VAREGA®), specially designed for use in aluminum melting furnaces.

1998 Fusion with the German furnace manufacturer MAERZ; the new “Maerz-Gautschi” operates under the umbrella of the RHI Engineering Group.

maerz-gautschi
Industrieofenanlagen GmbH

2000

2002 Ingot casting machine with robotic stacking.

2005 Foundation of Gautschi Industrial Furnaces (Beijing) Ltd., a Gautschi subsidiary in the People’s Republic of China.The company is known today as Gautschi Industrial Equipment Ltd., and is located in Taicang, P.R.C.

Gautschi™
高奇工程（北京）有限公司
Branch of Gautschi Engineering GmbH
No 1905

2008 Split from MAERZ;
the new company becomes Gautschi Engineering GmbH.

2010

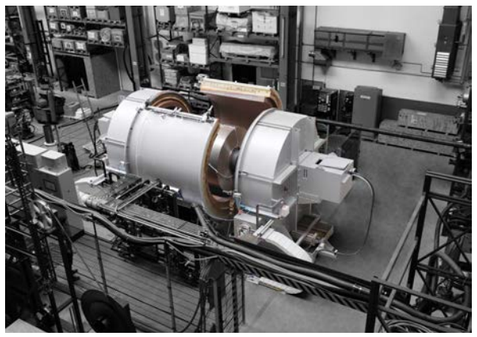
2010 Gautschi becomes a member of the EBNER Group.

This provides Gautschi with access to a global network of EBNER Group members, agents and service centers, and provides a clear emphasis on R&D.

Gautschi®
EBNER® GROUP MEMBER

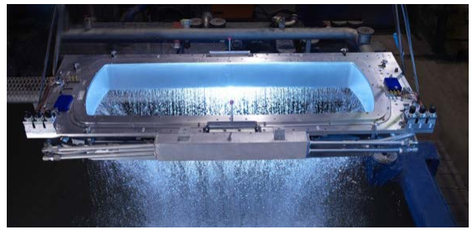
2014 Gautschi Engineering GmbH moves into its new headquarters in Berg, Switzerland.
The new offices not only provide additional space, but also provide facilities for the assembly and testing of Gautschi technologies.

2019 Gautschi introduces the new Compact Coil Furnace (CCF), which provides astonishing savings in energy consumption.



2020

2020 Gautschi introduces a new generation of slab molds.



2020 Gautschi moves to Braunau-Ranshofen, Austria.

With the opening of CASTHOUSE (R)EVOLUTION CENTER (C-R-C), Gautschi achieves one of its greatest milestones. Along with our sister company, HPI High Performance Industrietechnik GmbH, we operate one of the most modern casthouses for both vertical and horizontal casting processes in Ranshofen, Austria. At the Center, we do not just offer our customers a showroom. We provide production-related services such as technology, alloy and product development. Over and above this, active employee training is offered and future applications conceptualized.

2022

Gautschi®
celebrates 100 years 1922-2022
EBNER® GROUP MEMBER

ROBERT SCHMIDT

Gautschi news

OLIVER JANSEN

Gautschi news

The long-term experience that Gautschi Engineering GmbH of Braunau-Ranshofen, Austria has gathered in the global aluminum industry allows it to offer sophisticated products that have stood the test of time, from stand-alone facilities all the way up to complete casthouses.

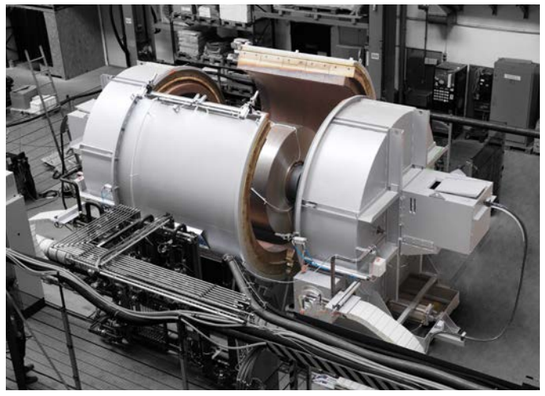
Long-term customer satisfaction is our goal in everything we do. We learn to fully understand our customer's needs, allowing us to work together with them to develop comprehensive solutions that are tailored to requirements. The products developed by Gautschi are designed to meet not only the current but also future demands of the market. Our professionalism is key to the implementation of our customers' projects.

With our worldwide professional service, we can guarantee the long-term operation of our facilities. Our customers benefit from the user-friendliness, ease of maintenance, long service life and high quality of our products, as well as technologies designed to save both energy and resources.

A recent example is the introduction of our latest generation of regenerative burners for melting furnaces. In comparison to others on the market, these burners have the best values for energy consumption and provide emission values for CO_2 and NO_x that will remain below the legally-stipulated limits over the long term.

Our newly-developed Compact Coil Furnace (CCF) for

Regenerative burner



Compact Coil Furnace (CCF)

Gautschi round melting furnaces

Gautschi soaking pit furnace

heat treating foil material should also be mentioned, as for this process this furnace provides energy savings that are unparalleled when compared to other well-known systems on the market. This has an economically advantageous effect on the user's value-added chain.

RELATIONSHIPS BASED ON PARTNERSHIP AND RESPONSIBILITY

We offer our partners honesty, fairness, and dependability, and expect the same from them in return. This is how we reliably maintain our professional and interpersonal relationships. We are also aware of our responsibility to the environment.

Our innovative technologies and professional services contribute to the conservation of resources and the protection of the environment, by ensuring the energy efficiency of Gautschi facilities.

THE EMPLOYEES ARE THE COMPANY

Our employees are dedicated and loyal. Their technical and personal competence is always available to our customers. Our employees enjoy the personal and professional opportunities that an international network offers them. In their work, they use the freedom they are given to creatively act as entrepreneurs, and to build an interdepartmental team spirit that is both objective and results-oriented.

Our management has created an atmosphere in which employees are empowered to express their own individuality and to identify with the company, its goals, and its strategies. Communication and participation are fundamental management principles.

INDIVIDUALITY, SYNERGY AND ESTEEM CHARACTERIZE THE COHESIVENESS OF THE EBNER GROUP

As a member of the **EBNER** Group, Gautschi is the market leader and expert in the field of liquid metal furnaces. In the heat treatment market, Gautschi is in direct competition with **EBNER** Industrieofenbau. Gautschi facilities offer technological solutions that make them stand out from competing products. The companies that form the **EBNER** Group mutually support and value one another. This allows Gautschi to benefit from synergies that add value, and so promote the market presence of the Group as a whole: the FULL SOLUTION PROVIDER.

A NEW FUTURE FOR CASTHOUSE TECHNOLOGY

With the opening of CASTHOUSE (R)EVOLUTION CENTER (C-R-C) in 2020, we achieved one of our greatest milestones. Along with our sister company, HPI High Performance Industrietechnik GmbH, we operate one of the most modern casthouses for both vertical and horizontal casting processes in Ranshofen, Austria.

At the Center, we do not just offer our customers a showroom. We provide production-related services such as technology, alloy and product development. Over and above this, active employee training is offered and future applications conceptualized.

TECHNICAL SYMPOSIUM AND COMPANY OPEN HOUSE

In the course of our 100th anniversary, Gautschi will be holding an open house at our Ranshofen works and would like to invite all those interested to a technical symposium on September 26, 2022. The event will also see the official opening ceremonies for the C-R-C (Casthouse Revolution Center), which was finished in 2020 at the height of the coronavirus pandemic. This is an excellent opportunity to obtain a personal impression of the opportunities for cooperation that it offers.

www.gautschi.cc
www.hpi.at
www.c-r-c.info

Robert Ebner
CEO, EBNER Group

"Twelve years ago, the acquisition of Gautschi was a significant step in the history of EBNER. For the first time, we had acquired a competitor.

At the time, Gautschi was a well-established company with a history that reached back almost 90 years. Originally family-owned, a lack of successors in the founding family meant that it had changed hands several times and the company had not been able to orient itself around any long-term strategies.

To me, it was important that we pass EBNER's recipe for success on to Gautschi: a clear commitment to R&D, in-house fabrication of key components and an active global presence.

Our effort is reflected in new developments like the CCF, state-of-the-art burner technology and the new Casthouse Revolution Center (C-R-C). The C-R-C opens up previously undreamed-of possibilities for mold development, including opportunities to test new alloys alongside our customers.

Gautschi was thus the first piece in the mosaic of EBNER's strategy for becoming a full solution provider for the aluminum industry, a strategy that we have tirelessly advanced through our acquisition of HPI in 2017, GNA in 2019 and Hazelett in 2021.

I would like to sincerely thank every Gautschi customer and employee for the loyalty they have shown during both the good times and the hard times, as it is they who have enabled the great successes and further development of the company over the last 12 years.

I look forward to personally welcoming many of our customers to Ranshofen in September, to celebrate the 100th anniversary of Gautschi's founding!

Casthouse (R)Evolution Center

WE ARE YOUR CASTHOUSE FOR SPECIAL ALLOYS AND INDIVIDUAL DEMANDS

The Casthouse (R)Evolution Center (C-R-C) in Ranshofen, Austria is a full-scale industrial foundry, incorporating a horizontal casting facility operated by HPI and a vertical casting facility operated by Gautschi. Both facilities are available for customer demonstrations, alloy trials, operator training, and small, quick and/or special production runs. The facilities are also used to further develop the state-of-the-art molds and casting systems.
A variety of equipment is available from HPI, including a 1.7 t electric melting furnace, a rod feeder device for grain refinement and of course the heart of the facility: a horizontal continuous casting machine (HSG) with flying saw. The entire production process, from melting the base material to production of first-class semi-finished aluminum products in both round and rectangular formats, is offered.
In addition to all this, the technology center is equipped with a 7.5 t melting furnace from Gautschi. When required, this furnace can supply the HPI casting line with liquid metal for an extended period of time. The Gautschi vertical casting machine is capable of casting slabs and billets in any alloy and up to 6.8 m in length. Material is fed in from the Gautschi melting furnace mentioned above. An inline degasser and a ceramic filter guarantee top quality.
Gautschi has been supplier of casting machines for both billets and slabs for many years, and offers several types of molds on the market. These include the well-known Gautschi billet mold, which has demonstrated its advanced quality and performance at many locations over the last 20 years, and the recently-developed and newly-introduced Gautschi slab mold.
The new Gautschi slab mold was developed by an international team comprised of casting experts and experienced Gautschi design engineers. Making use of their extensive experience in casting difficult and highly-demanding alloys, including slabs used in aircraft and automotive body applications, the experts focused on providing real 100 % hands-free casting, significantly less scalping scrap and significantly less butt curl for all alloys, even as they ensured that the strictest safety standards were maintained in the manufacturing process.
In light of their experience, the team of experts expects that the new Gautschi slab mold will have a definite impact on, as well as meet, the high demands currently placed by the market - as well as those expected in the future. The Gautschi billet mold is based on the Air Glide technology developed by VAW. An excellent surface, a low segregation zone, high pit recovery and easy maintenance have made this mold a huge success. The full range of alloys has been cast successfully with Gautschi billet molds, including the most demanding aircraft alloys. This billet mold has been continuously improved over the last few years, and will be optimized further at the C-R-C by making use of the pilot caster.
The complete process is connected to a data logging and analysis system, enabling continuous data recording and process evaluation throughout the entire plant. By recording and analyzing the properties of the semi-finished product, such as the microstructure, surface quality, tensile strength and hardness, parameter effects can be derived and precise prediction models generated. These models allow a direct derivation of the effects of process conditions on the quality and properties of the end product. The prerequisites for qualitative and quantitative optimization of the customer's production are thus given.
The affiliated laboratory enables detailed evaluation and analysis of the metallurgical properties of a product. In addition to a spectrometer for measuring the chemical composition, the lab also includes a thermal analysis facility to determine the solidification behavior of the alloy and a device to record the hydrogen content in the melt. Small crucible and heat treatment furnaces round out the available equipment in order to, for example, reproduce small melts (a few kilograms), homogenization tests and aging tests.
The unique features of the technology center promote and support creative processes in the field of mechanical engineering. In cooperation with foundry specialists, new geometries and casting systems can be built in the affiliated mold workshop and tested directly at the lines. The knowledge gained flows directly back into the design.

TOLL CASTS AT THE C-R-C

Knowledge gathered at the C-R-C finds direct application in production runs for customers. Due to the optimal sizes of the available facilities, special alloys can be easily cast in a wide range of batch sizes, cost-effectively and with excellent quality. This is true for both slabs and billets. This capability is another important factor that contributed significantly to the foundation of the C-R-C technology center. With its concentration of possibilities under one roof, the C-R-C is unique in the field of toll casting. Customers are provided with an enormous potential for obtaining high-quality production material on short notice. The material can be ordered with either horizontal or vertical casting specified.

PLEASE FEEL FREE TO CONTACT US!

info@gautschi.cc

Hazelett

The EBNER Group expands its expertise with the addition of a century of experience in the field of continuous casting.

DAVID HAZELETT

Hazelett Strip Casting Corporation

In December 2021, Hazelett Strip-Casting Corporation of Colchester, Vermont (USA) became a member of the EBNER Group.

Hazelett has been a family-owned company for three generations, and enriches the expertise of the **EBNER** group with over 100 years of experience in continuous casting. Taking a look back in history, the Hazelett story begins in 1919.

C.W. HAZELETT, CONTINUOUS CASTING PIONEER

Clarence William (C.W.) Hazelett, an engineer, economist, and accomplished musician, began developing continuous casting machines in 1919. First working with single-roll (later twin-roll) casters, he was the first to commercialize continuous casting, manufacturing lead strip for automobile battery grids. The company he founded, the Hazelett Storage Battery Company of Cleveland, Ohio, made batteries for Ford in the 1920s. C.W. Hazelett continued to work with various continuous casting designs throughout the 1930s and 1940s. He relocated to Connecticut, which at the time was a center for non-ferrous metals processing. He designed, tested and sold various twin-roll and ring mill machines and machine designs for casting copper alloys, aluminum, nickel, and steel strip.

FROM ROLLS TO BELTS

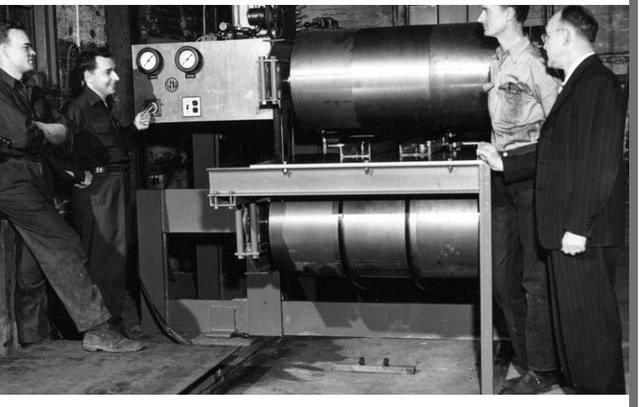
Frustrated with his attempts to cast aluminum strip on his twin-roll caster designs, Hazelett conceived the idea of casting between belts. He went on to design and build the first twin-belt casting machine in 1947-1948. He supplied prototypes to Olin Brass, Waterbury Rolling Mills and Dow Chemical (among others) for the production of copper alloys, aluminum and magnesium. The first commercial operation using Hazelett's twin-belt casting technology is believed to be at Kaiser Aluminum, when in 1956 Kaiser began to use a Hazelett casting machine to cast aluminum busbars up to 26" wide. During these years, Hazelett maintained a workshop in Greenwich, Connecticut, where he cast different metals and alloys on his casting machines and improved his designs. The casting machines were built by W.S. Rockwell Company in Fairfield, Connecticut.

FORMATION OF THE HAZELETT CORPORATION

C.W. Hazelett died in 1956, and soon after his sons, R.W. (Bill) and S. Richard (Dick) Hazelett, formed the Hazelett Strip-Casting Corporation (HSCC), with its original location being in an office building in Burling-

HAZELETT

EBNER® GROUP MEMBER



ton, Vermont. Bill Hazelett was named President and would guide and grow the company for the next five decades.

Just a few weeks before his death, C.W. Hazelett had closed a deal with Bridgeport Rolling Mills to supply his final design twin-belt casting machine, the Model 9. This machine, as well as the next three sold by Hazelett, were designed at HSCC's Vermont engineering office, but were built W.S. Rockwell in Connecticut. The Bridgeport Rolling Mills casting machine is still in service, producing zinc strip at Platt Brothers in Waterbury, Connecticut.

HAZELETT COLCHESTER SITE ESTABLISHED

Hazelett purchased its present 160-acre Colchester site and built the first of its buildings in 1958-1959, including a machine shop, assembly and testing, office and engineering. All future casting machines would be designed and manufactured in Colchester, Vermont.
The development of the Colchester site was aided by an agreement negotiated by Bill Hazelett with the Aluminum Company of Canada (Alcan) that provided financial support in exchange for licensing rights in aluminum.

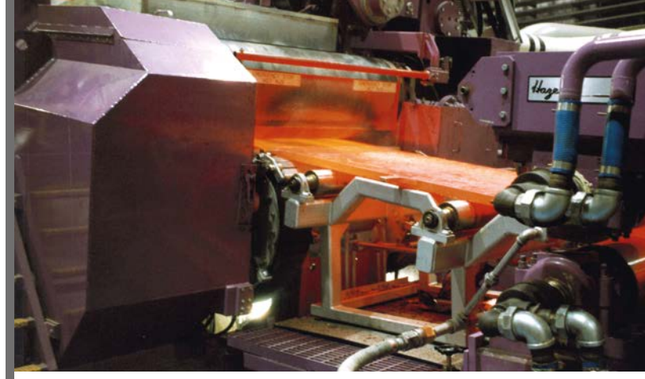
ALUMINUM INTEREST BY ALCAN AND ALCOA

In February 1957, Alcan placed an order with Hazelett for a Model 9 (the fourth machine built by Hazelett), which was designed to cast 36" wide aluminum strip. Alcan installed this machine in their Kingston laboratory, and began to develop a casting process for aluminum strip. This would be the start of a long and complex relationship with Alcan, that included Hazelett's supply of Model 11, Model 14 and Model 15 casting machines. In 1955, Alcoa visited C.W. Hazelett in Connecticut to observe a cast on his pilot caster. Shortly thereafter, C.W. and Alcoa began negotiations for the purchase of Alcoa's first caster.

Negotiations were not concluded until after C.W.'s death, but Alcoa placed an order on June 11, 1956 for a 26" wide Model 9 caster. Alcoa would, decades later, purchase two more Hazelett casting machines.

CASTING COPPER AND COPPER ALLOYS

In September of 1956, Scovill Manufacturing of Waterbury, Connecticut, placed an order with Hazelett for a Model 9 casting machine. It would be the third machine sold by Hazelett, and Scovill would go on to further develop the Hazelett casting process to produce copper alloys. They cast on the Model 9 until it was sold to British Insulated Callendar Cables (BICC) in 1963 and they purchased a Model 14. For nearly two decades, Scovill worked to develop the Hazelett casting process into a viable method for profitably producing copper alloys.



Their work led to other copper developments including the casting of copper anode plate and copper strip. BICC used their Model 9 to conduct research on copper strip and copper anode plate. In 1966, British Copper Refiners (a subsidiary of BICC) purchased a more robust Model 14 which was installed in Prescott, England as part of the first commercial line to produce copper anode plate using a Hazelett caster.

Copper anode plate casting was further developed by Onahama Smelting and Refining (a Mitsubishi Materials company) and Metallurgy Hoboken Overpelt (MHO). The latter development, named the Contilanod Process, is used by Mitsubishi in Gresik, Indonesia to produce copper anode at a rate of over 100 tonnes/hour.
In the late 1990s, Mansfelfer Kupfer und Messing installed in Hettstedt, Germany what today is the world's most efficient line for the production of copper strip, based in part on this work done in the 1960s and 1970s.

An incredibly successful development in the late 1960s to produce copper bar on a Hazelett caster led to the installation in 1972 of the first Contirod® line at MHO, using a Hazelett caster in line with a Krupp rod rolling mill. (Contirod is a registered trademark of Aurubis Belgium.) Today, 38 Contirod lines operate in 20 different countries.

THE HAZELETT PROCESS FOR CASTING ZINC

In 1958, Scovill was contracted by Vielle-Montagne (VM) of Belgium regarding the casting of zinc strip with their Hazelett Model 9. VM purchased a 45" wide Model 14 in 1962 and continued its development. In a parallel development, Grillo AG fur Zinc of Duisburg, Germany purchased a Model 11 in 1961. By the mid-1960s both groups were commercially producing zinc strip on Model 14 casters, primarily for the European roofing market.

THE HAZELETT PROCESS FOR CASTING STEEL

While the 1960s marked a period of intensive research and development in the continuous casting of non-ferrous metals, trials were also conducted in steel on Hazelett casters by Oregon Steel, Bethlehem Steel and U.S. Steel. The 1980s saw a renewed interest in casting steel on Hazelett twin-belt casters. From 1983 to 1987, extensive casting trials were conducted by Krupp Stahl, Nucor, Sumitomo Metals and US Steel/ Bethlehem Steel. Unfortunately, none of the trials led to commercial operations.

MODERN ALUMINUM CASTING

A resurgence in the development of Hazelett aluminum strip casting began with the sale of a revamped Model 20.75 in 1979, to Alflex Corporation in Los Angeles,

Hazelett Kingston

California. This line, which was 28" wide, was used to produce strip for flexible aluminum conduit. Hazelett followed the Alflex project with delivery, in 1983, of a narrower Model 20.75 to Barmet Aluminum in Livia, Kentucky. This machine was used for the production of building and construction sheet.

The Alflex and Barmet projects were challenging, but provided Hazelett with its first opportunities to develop its own aluminum casting and rolling know-how. This came in handy in the 1980s and 1990s, when Hazelett supplied 52" wide Model 32 casters to scrap-based Barmet and Nichols Aluminum (both now owned by Novelis), which, along with Jupiter Aluminum, produce a majority of the aluminum building sheet in the US. With opportunities for casting even wider, Hazelett would also design its two-meter wide Model AS2000 casters, three of which are installed adjacent to aluminum smelters in China and Oman. A fourth scrap-based line is operated by JW Aluminum in the US. These casters are capable of producing aluminum strip at 50 tonnes/hour.

MODERN LEAD CASTING

Five decades after the Hazelett Storage Battery Company used a twin-roll caster to produce lead strip for automotive battery grids, Delco-Remy division of General Motors approached Hazelett about using its twin-belt caster to produce lead alloy strip that would be expanded to form the grids for their new maintenance-free auto batteries. Hazelett supplied two Model 21 casters, self-contained units designed to cast narrow strip widths, to Delco-Remy in 1975 and 1976.

Twenty years later, Hazelett was approached by one of the world's largest automotive battery manufacturers: they had an interest in producing punched grids, as opposed to expanded metal grids, out of lead alloy strip cast on a Hazelett caster. After a successful testing program on a Model 21 at their R&D facility, Hazelett designed its Model LS1800 specifically for this application. Today, forty-four LS1800 casters have been sold and are operating around the world, producing positive battery grids for approximately 80% of the world's lead-acid battery market.

THE RISE OF CHINA AND GLOBAL PRESENCE

Bill Hazelett's son, David, succeeded him as President in 2009 and focused on increasing HSCC's global presence. In 2011, with seven copper bar casters operating in China and its first wide aluminum strip caster being commissioned, Hazelett recognized the need to provide better service to the Chinese market. Hazelett Trading (Shanghai), a subsidiary of Hazelett, was thus formed in 2013 and provides local customer sales, service support and logistical services to its Chinese customer base.

Today, there are thirty-two active casters operating in China. These include twenty-three copper bar casters, seven lead strip casters and two wide aluminum strip casters.

WHAT DOES THE FUTURE HOLD?

Today, Hazelett has 102 active casting machines operating in 24 countries around the globe. Several more have been shipped over the years, but some have been retired or are no longer in service. Hazelett has 160 full-time employees and a global presence in the non-ferrous metals industries.

With the acquisition by the **EBNER** Group, a new and exciting journey has started. As a member of the Group, Hazelett will be more capable of meeting the challenges of constantly improving and remaining innovative.

Together with Mino S.p.A., the **EBNER** Group will be able to offer complete process lines to the aluminum flat rolled products industry that feature Hazelett twin-belt continuous casting technology. Hazelett technology is used in metal manufacturing processes across the world to cast aluminum, copper, zinc, and lead into metal strip and bar used to create countless products. **EBNER** and Hazelett are industry leaders and technology pioneers, and both have been family-owned throughout their histories. This merger preserves that legacy. As David Hazelett has said: "As family-owned businesses, Hazelett and **EBNER** have the freedom to take a longer view: one that encourages investment in research and development, building long-term relationships, and preserving our environment."

Robert Ebner, **EBNER** Group CEO, commented: "From the first time I met David Hazelett, it was clear to me that we share many of the same values. To invest in research and development, to always be one step ahead of your competition, to build the equipment in-house, to serve your customers first class worldwide and to have a dedicated team of experts around you who believe in the same values."

Together, the companies will strengthen and complete their offerings. It will be possible, by combining their respective technologies, to cover complete projects from melting to casting and (together with partner Mino S.p.A.) rolling, as well as heat treatment provided by **EBNER** . The shared experience and expertise of **EBNER** and Hazelett will continue their stories of success.

www.hazelett.com

High customer satisfaction due to superior quality.

İÇDAŞ Çelik expands their EBNER bell annealer facility for steel wire.

ERWIN UMGEHER

EBNER news
from Turkey

In 2017, İÇDAŞ ÇELIK placed an order for an EBNER bell annealer facility for steel wire that was comprised of 2 workbases, 1 heating bell, 1 cooling bell and the associated equipment. İÇDAŞ ÇELIK was the first customer in Turkey to purchase EBNER equipment to heat treat wire rod in nitrogen atmosphere.

CONTINUOUS DEMAND AND CUSTOMER SATISFACTION

Due to continuous growth in the demand for steel wire, İÇDAŞ ÇELIK made the decision to invest in a new wire rod mill. This investment marked the point where there was a need to consider expanding their **EBNER** bell annealer facility, installed at their plant in the Biga district of Çanakkale province.

A second and even more important reason for considering an expansion was the high level of satisfaction customers expressed with the material heat treated by İÇDAŞ ÇELIK.

In 2021, these factors led to a decision to place an additional order with **EBNER** for expansion of the existing bell annealer facility for steel wire rod. The new investment covered 2 workbases, 1 heating bell and 1 cooling bell. The equipment will be integrated into the general facilities of the existing facility.

Early in 2022, İÇDAŞ ÇELIK placed an order for a third expansion phase, which will consist of 2 workbases, 2 heating bells and 1 cooling bell. As future expansion had always been a focus of investment, the foundation for the first expansion phase had been designed for 6 workbases right from the start – a feature that underlines the farsightedness of the company.

İÇDAŞ ÇELIK's vision is to be a leader in the iron and steel sector by offering products and services at a universally high quality and meeting universally high standards. This vision is to be fulfilled by high efficiency and continuous investment.

Exporting most of its production to foreign countries, İÇDAŞ ÇELIK assumed an important role in Turkey's steel industry with this advanced technology and the superior quality it delivers. It will help them pursue their goal, as one of Turkey's major steel producers, of ensuring a high level of customer satisfaction in every aspect of their services.

www.icdas.com

TECHNICAL DATA	
max. workload space diameter:	4050 mm
max. stack height:	4600 mm
max. net charge:	51 t

A green future with Gautschi technology.

Gautschi supplies new furnaces for Novelis Pindamonhangaba, Brazil, supporting the path toward a more sustainable and recycling-oriented future.

PETR KRAJCA

Gautschi news
from Brazil

Gautschi recently participated in one of the most important expansion projects in South America, adding new furnaces to the recycling facility operated by Novelis Inc. in Pindamonhangaba, Brazil.

Novelis has completed 150 Million USD investment to expand both rolling and recycling capacity at its Pindamonhangaba, Brazil plant by 100,000 t each.

Annual capacity at this rolling and recycling complex, the largest in South America, is expected to increase to around 680,000 t for aluminum sheet and 490,000 t for recycling.

The additional recycling capacity helps to support the Novelis sustainability goals to reduce its carbon footprint by 30 % by 2026 and to be net carbon neutral by 2050.

The additional capacity at the South American plant will allow Novelis to continue growing alongside its beverage packaging and specialty customers in the region.

This is the second major investment within a decade in the Pindamonhangaba plant. Ninety new permanent jobs have been added as a result of the expansion, which was completed on time and within budget. (Source: Light Metal Age, August, 2021.)

During the project, Gautschi supplied two round top charged melting furnaces, each with a capacity of 155 tons, and one rectangular melting and holding furnace with a capacity of 105 tons. The scope of supply and services included design, engineering, manufacturing, supply CIF, installation supervision, commissioning, testing and training.

The plant and equipment were selected and designed for excellent operability, quality and reliability (efficiency, speed, quality & cost). All requirements for casthouse safety and explosion risk management were incorporated.

Equipment was carefully selected for optimum performance, based on Gautschi's decades of experience, the customer's business needs and performance evaluations. Every aspect of process control and the process variables were accounted for in the design of the equipment and automation system.

The complete project was a logistical challenge, as the furnace shell was manufactured in China, the electrical equipment, refractory linings and cover handling machine for the round top furnaces came from Europe, the burner system was shipped from the USA and installation services were performed in Brazil.

In the end, as the customer can confirm, everything worked out perfectly, on time and within budget. The equipment is now in operation and exceeding the customer's expectations.

www.novelis.com

ECOBURN H_2

A new EBNER burner technology pairs sustainability with increased efficiency.

Price of emissions certificates

MICHAEL SCHIESSER

E³ - EBNER Energy Efficiency

MARKUS MAYRHOFER

EBNER Product Development

With the development of the ECOBURN H_2 175 kW burner, EBNER has achieved an additional breakthrough in the journey towards carbon-neutral heat treatment facilities.

A combustion system fired by sustainably-produced hydrogen provides an additional alternative to customers seeking low-carbon solutions, alongside our electric heating systems. The use of these eco-friendly technologies has been driven by the rising price of emission certificates, as well as by the strategic goals established by our customers.

With the development of the ECOBURN H_2 burner, we are taking a stand for a sustainable and carbon-neutral society. The use of hydrogen as a carbon-free fuel is only one of the pillars of our E³ strategy for sustainability, with which we - as a supplier of heat treatment facilities - are making a significant contribution.

An additional and significant advantage of this burner technology is the high energy density that it offers, when compared to electric heating systems. Extensive trials in EBNER's in-house technology center showed that heat transfer was improved, leading to an overall increase in the efficiency of the furnace facility.

EXTENSIVE TRIALS SHOW EXTREMELY LOW LEVELS OF NITROGEN OXIDE (NO_x) EMISSIONS

The H_2 burner design developed by EBNER provides the lowest possible NO_x emission levels, well below the limits established by many national and international regulations (TA-Luft, MCP, etc.). Supplementary exhaust gas scrubbing systems, which require additional investment and create additional operating costs, are thus made unnecessary. ECOBURN H_2 burners can be installed in every new EBNER facility.

EASY INTEGRATION INTO EXISTING FACILITY DESIGNS

Another significant advantage provided by the H_2 burner system is that the combustion air and exhaust gas infrastructures installed at existing facilities require no adaptation to continue in use.

For any potential upgrade or rebuild, only alterations in the fuel gas supply system are required. Furthermore, depending on the type of facility, it may be possible to recycle the hydrogen used in the heat treatment process and use it as fuel gas.

Using state-of-the-art simulation software, EBNER has developed a CFD (Computational Fluid Dynamics) model that enables furnace designs to be optimized for hydrogen-fired burners. Sample simulations of the temperature fields emitted by a burner fired with natural gas and a burner fired with hydrogen can be seen in the figure below.

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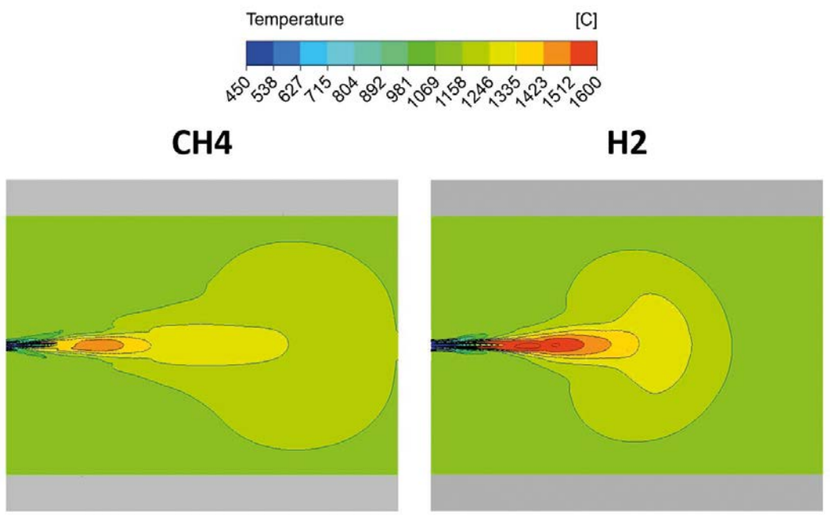
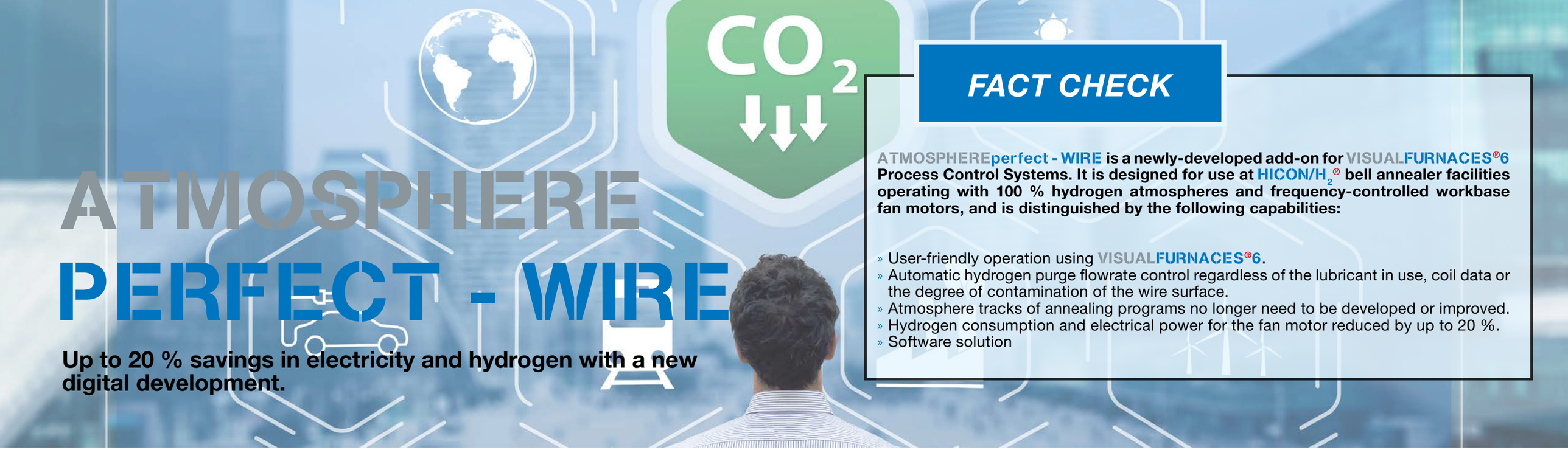




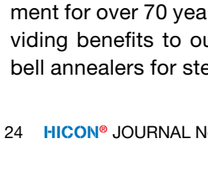
ATMOSPHERE PERFECT - WIRE

Up to 20 % savings in electricity and hydrogen with a new digital development.

FACT CHECK

ATMOSPHEREperfect - WIRE is a newly-developed add-on for VISUALFURNACES®6 Process Control Systems. It is designed for use at HICON/H$_2$® bell annealer facilities operating with 100 % hydrogen atmospheres and frequency-controlled workbase fan motors, and is distinguished by the following capabilities:

- User-friendly operation using VISUALFURNACES®6.
- Automatic hydrogen purge flowrate control regardless of the lubricant in use, coil data or the degree of contamination of the wire surface.
- Atmosphere tracks of annealing programs no longer need to be developed or improved.
- Hydrogen consumption and electrical power for the fan motor reduced by up to 20 %.
- Software solution



MICHAEL SCHIESSER

E³ - EBNER ENERGY
Efficiency

Steep price increases on international energy exchanges have placed great challenges before consumers, companies and energy suppliers. With the start of the conflict in the Ukraine, energy became an even more influential instrument of geopolitical power: energy policy has been transformed, just as international policy has.

Improving quality and increasing energy efficiency are two goals that lie at the heart of many EBNER innovations. With the new ATMOSPHEREperfect - WIRE software - module for bell annealer facilities for steel wire, EBNER is introducing a new product with a very attractive ROI. ATMOSPHEREperfect - WIRE is a new software solution that provided savings of up to 20 % in electrical and hydrogen consumption during long-term testing at an Austrian customer's works, and is one of the latest achievements of EBNER's in-house product development team. The EBNER team worked intensively in production conditions for an entire year, with the goal of saving energy and increasing efficiency at bell annealers for steel wire.

A FOCUS ON HYDROGEN

EBNER has been emphasizing research and development for over 70 years, and has always focused on providing benefits to our customers. EBNER HICON/H$_2$® bell annealers for steel wire have been leading the market for years, but now - with the successful introduction of the ATMOSPHEREperfect - WIRE software solution - the energy efficiency of this type of facility has been digitally increased. The name "HICON/H$_2$® bell annealer" already betrays its "secret". Along with high convection, the hydrogen atmosphere is what makes it possible to provide the shortest annealing times, the shortest cooling times and excellent surfaces on the finished product. Our experience with hydrogen has been a great advantage of late, as due to developments in energy prices the measures taken to reduce energy consumption have increasingly focused on the use of hydrogen.

CHALLENGES IN CLEANING

To keep the atmosphere in the workload space as pure as possible and make full use of the advantages of processing in hydrogen, hydrogen is used as a purge gas during heat treatment. Lubricants, which are applied to the surface of the wire during the drawing process to reduce the forces exerted on it, evaporate when the wire is heated up in an EBNER bell annealer. Hydrogen purging transports the products of evaporation (CO, CO_2 and CH_4) out of the workload space. Until now, facility settings for atmosphere purging were based on the experience gathered by EBNER commissioning engineers and our customers, and then refined over time. Problems with soot, caused by highly-contaminated starting material, would require manual adjustment of the atmosphere track to ensure that the surface of the wire became clean. It was time to take a new approach and find a way to provide precise settings.

THE SOLUTION: ATMOSPHEREperfect - WIRE

By measuring the current draw of the workbase fan motor, conclusions can be drawn regarding the density - and, in consequence, the purity - of the atmosphere in the workload space. Based on this insight, the EBNER research team developed a mathematical model that uses the value for motor current draw to calculate the minimum necessary atmosphere purge flowrate.

PROVEN UNDER OPERATING CONDITIONS

To test the newly-developed model, one of our customers installed it at one of their workbases. The results were positive, so a second phase of testing saw the entire anneal shop (10 workbases) equipped with the software module. After a year-long test under production conditions also showed positive results, automatic purge flowrate control was integrated into the software. Continuous optimization work was required during the testing phase, for which reason a team from the EBNER Product Development Department was at the customer's works to supervise the annealing process.

UP TO 20 % SAVINGS IN POWER AND HYDROGEN

When the long-term testing phase had been completed, the results showed that hydrogen was not the only utility for which consumption had been reduced. The power consumption of the workbase fan motor had also decreased by up to 20 % - all without any change to the quality of the wire surface or the material quality of the annealed wire. In an era of increasing energy costs, the ability to recognize and use potential savings is a must. It is thus forms a significant element of the EBNER E³ sustainability strategy: looking beyond the development of the new ATMOSPHEREperfect - WIRE module, every other energy consumer and the carbon footprint of the heat treatment industry require optimization, i.e. through increased digitalization.

We would be happy to discuss the possibility of installing ATMOSPHEREperfect - WIRE at your facility.

PLEASE FEEL FREE TO CONTACT US!

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A HICON® success story

Extremely thin aluminum foils, annealed in extremely pure atmospheres: products for special applications in the electronics industry.

LEOPOLD FELLINGER
EBNER Senior Sales Manager

MANOJ KUMAR
EBNER Product Development

The worldwide success story of EBNER high-convection bell annealer technology has been extended with the addition of yet another application. Over the last few years, EBNER has successfully installed several facilities designed to produce aluminum foil for the electronics industry.

For this special application, many well-known manufacturers supplying the electronics industry can be counted among **EBNER**'s customers. The end products find many uses, for example in capacitors, microelectronics and (more recently) battery technologies for electric vehicle applications.

HIGH REQUIREMENTS

The requirements placed on the aluminum foil, for example high-capacitance foil, are extremely high. Significant aspects include electrical conductivity, quality of surface finish and resistance to oxidation, all of which must be combined with excellent mechanical properties.

To manufacture capacitors, extremely thin aluminum foil is used as both anode and cathode. The surface of the anode is coated with a "thick" layer of oxide, which acts as a dielectric. The oxide layer is created in a downstream process, referred to as *anodizing*. This requires the natural oxide layer to be both thin and evenly distributed, which in turn requires a very precise and evenly-distributed heat treatment process in an extremely pure atmosphere.

Along with the purity of the atmosphere, precise temperature control is a fundamental requirement. Both of these requirements can be fulfilled by **EBNER**'s proven **HICON®** annealing technology. The heart of every bell annealer facility is the **EBNER HICON®** workbase, with its high-convection recirculation fan. The fully gas-tight design of the workbase enables a "high" vacuum to be achieved, which is essential for certain process steps. The extremely pure atmosphere is supported by the use of argon as a process gas.

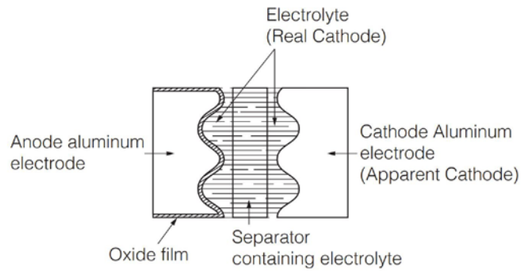
Typical capacitors

Through the use of a 3-stage vacuum pump, a vacuum of 2 x 10^{-3} Torr can be achieved. This is only made possible by the extreme precision with which workbases are manufactured in our in-house workshop. Before it is shipped, every workbase undergoes extensive quality testing - including vacuum testing in our lab.

The precisely-distributed flow of atmosphere through the charge ensures that even the most severe requirements placed on the temperature uniformity within the aluminum coils can be achieved.

Throughout the world, a wide variety of customers rely on proven **EBNER** technologies to heat treat aluminum foil for the electronics industry. **EBNER** is proud to be the global leader in this special market segment.

Design of an aluminum electrolytic capacitor



ECHT 2022

Heat treatment in steel processing.

PETER SEEMANN

EBNER news
from Austria

At this year's European Conference on Heat Treatment (ECHT), EBNER has been honored with the opportunity to be a member of the organizational committee - alongside other well-known companies such as voestalpine, ASMET, Aichelin, Rübig and the Upper Austrian University of Applied Sciences (Wels campus).

The 27th ECHT will be held from September 5 - 8, 2022 in Salzburg, Austria, and a wide range of comprehensive and interesting topics will be addressed. The primary emphasis will be on heat treatment in steel processing, in particular on the following themes:

- Furnace technology (batch-type furnaces, chamber furnaces, walking beam pusher-type furnaces, etc.)
- Continuous heat treatment and processing lines
- Heat treatment of Advanced High Strength Steels (AHSS)
- New steels and the relationships between their microstructures and properties
- Annealing, Q&T and Q&P at various stages of steel processing
- Thermomechanical treatment

Alongside the many other fascinating presentations, **EBNER** will introduce an R&D project started up in cooperation with ENRAG.

This project involves the implementation and calibration of digital twins for continuous annealing facilities.

ENRAG is a company that specializes in processing technology, simulation and software development, and in partnership with them **EBNER** is developing a fully transient facility model for continuous annealing facilities.

The model is linked directly to the facility automation system. Taking information such as fuel flowrate and blower speeds, it calculates the distribution of temperature within the annealing line - including the temperature of the steel strip at every point along the line.

This information is then returned to the automation system, and forwarded to the operator's workstation.

Based on newly-developed algorithms, the digital twin optimizes the transition phase between different strips and, should there be a partial shutdown of the facility (e.g. should a heating zone go off line), provides the operator with immediate instructions to optimize the quality of the strip during every phase of operation.

We are looking forward to many fascinating presentations and stimulating exchanges of ideas at ECHT 2022, and hope that we will also have the opportunity to meet many of **EBNER**'s customers there.

Perfectly-tailored services.

GNA ensures high-quality services by continuously growing its range of competencies.

KALEB WRIGHT

GNA news
from Canada

GNA joined the EBNER Group in 2019. Since then, the combination of competencies provided by Group membership has already led to the completion of several successful projects.

Over the last two years, GNA has helped market a complete casthouse solution to North American customers. We have now quoted three complete casthouses at which the partnership between GNA, Gautschi, and HPI allows us to provide every piece of equipment in the plant.

Currently, GNA is developing a project to restart a casthouse that has not been in operation for several years. This plant currently has an HPI horizontal casting system installed, and HPI and GNA are working closely together with our client to find options, solutions and improvements to the existing plant.

HIGH ENERGY SAVINGS

Our most recent large-scale project, for Nanshan Aluminum in Lafayette, Indiana (USA), was just recently completed. Existing furnaces at the Lafayette plant had been requiring rebuilds for some time, as the reliability of the equipment had fallen and energy usage had increased.

GNA completely rebuilt and re-insulated two of the client's four furnaces, and implemented a number of modifications to increase efficiency and reliability. Our client was very happy with the end result, and stated that they could not believe the amount of work GNA completed in just two weeks. The orderliness of the job site and the high degree of safety with which work was carried out also exceeded their expectations.

After only one week of operation, the client expressed their satisfaction with the high energy savings that were achieved. The ability of the furnaces to retain heat has been greatly improved, reducing the demands placed on the burners. A rebuild of the remaining furnaces by GNA is now under discussion.

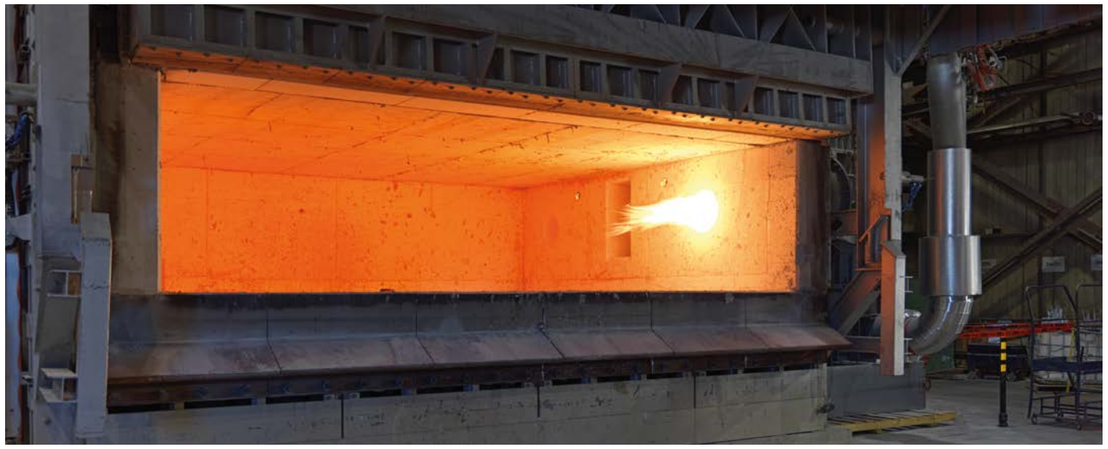
IMPORTANCE OF SERVICE

For many years, customers relied on their own in-house maintenance teams to maintain and repair equipment in their production lines. Companies would have their own engineering, electrical, mechanical and hydraulic specialists, and in many cases would have their own fabrication resources to fill their needs. Today, however, companies face challenges such as technological advancement and personnel shortages – leading to more and more services being bought in.

This trend means that the importance of the customized services offered by GNA will only increase. In the future, our focus will thus be on growing the GNA service team with specialized technical personnel from the aluminum industry. We are also developing a special training plan to ensure both that our competence continues to grow and that our service is of the highest quality.

Alongside our partners in the EBNER Group, we look forward to continuing to provide the highest quality products and services to our customers.

www.gna.ca



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NEWS

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Trade fairs. Conventions. 2022

MAY 16 - 19, 2022	**AISTECH 2022**	Pittsburgh	**USA**	Booth No.	**734**
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JUNE 20 - 24, 2022	**WIRE 2022**	Düsseldorf	**DE**	Booth No.	**10C42-07**
SEPT. 5 - 8, 2022	**ECHT 2022**	Salzburg	**AUT**	----------	
SEPT. 27 - 29, 2022	**ALUMINIUM 2022**	Düsseldorf	**DE**	Booth No.	**TBA**

We look forward to seeing you there!

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