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How to cope with bottlenecks?

Dependence on raw materials is a central problem for foundries all over the world. This concern has rapidly gained momentum in recent months. Delivery chains in many places have also been unable to function consistently due to the sometimes rigorous regimes imposed in response to the pandemic. Our industry must cope with bottlenecks affecting metals, in particular – so, among other things, our first issue of the year takes a closer look at this problematic topic.

Photo: BDG

Jan Kretzmann
Editor-in-chief
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Raw material prices have veritably exploded due to extreme demand, among other reasons, and delivery constraints pose serious problems for companies. A development whose end is not yet in sight. Companies and suppliers in the foundry sector must adapt to these new conditions as well as possible. Our article on the Hüttenes-Albertus Group shows how this can function in practice. The Group is represented in more than 30 countries, and its procurement processes must support the purchase of a wide range of chemical raw materials, minerals and sands – from small specialties to bulk commodities. Join us in an interesting look behind the scenes of this network of buyers active worldwide.

One region plays a decisive role in the procurement of graphite for the industry: China. With more than 70 % of global production, the country is by far the world's largest supplier of graphite. Users of graphite electrodes came to realize that this could become a problem in 2017 and 2018, when panic purchases broke out and the previous market price rose eightfold in one year. Our background report by Benjamin Sarkoezy shows that a similar scenario could occur again.

Let's change the subject and move on to an article of a very different complexion, in which not global dependency, but the transfer of knowledge and the division of labor has led to a win-win situation: a German start-up that produces, among other things, historical door fittings and window handles that arte true to the original. The idea came from Germany and the casting takes place in India, where an entire region lives off traditional sand casting processes, executing every customer requirement with a great deal of manual work and attention to detail.

In contrast, we look towards the future with our company report on Hetitec Oy in Tampere, Finland – one of Europe's most modern and rapid foundries, equipped with innovative technologies for additive manufacturing, simulation and metal casting.

Have a good read!

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Cover-Photo:
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Krapohl-Wirth is the leading international consulting company of the foundry sector.

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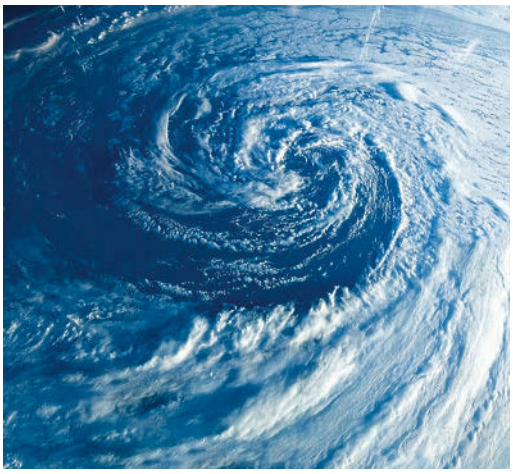

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The VX2000 is the second-largest 3D printer in voxeljet's portfolio. After a new update, the system prints a complete job box of 2 x 1 x 1 meters in about 24 hours.

New Finnish foundry

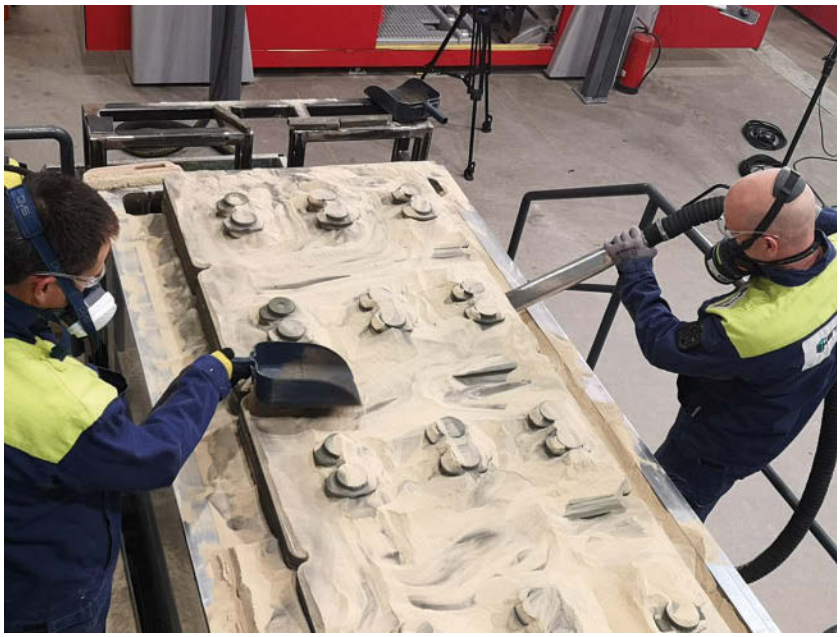
Rapid and flexible 3D printing

This article portrays a foundry in Finland. Hetitec Oy specializes in the rapid processing of orders, with the aim of finishing production of an ordered part within one week. Whereby 'printed casting' plays a decisive role.

By Frederik von Saldern

Eight years ago, Ville Moilanen probably wouldn't have dreamt that in 2021 he would be operating Scandinavia's largest 3D printer for on-demand production of sand molds and cores. But what was once his vision is now his reality. He now runs Hetitec Oy, one of the most modern and fastest foundries in Europe, equipped with state-of-the-art technology for additive manufacturing, simulation and metal casting. With in-house foundry capabilities in steel, iron and aluminum alloys, Hetitec can produce castings within a week thanks to printed casting technology. Post-processing and quality assurance included.

Printed casting describes the process of 3D printing and the casting of highly complex molds. This hybrid approach makes it possible to combine the advantages of 3D printing (i.e. geometric freedom) with the cost benefits of conventional production.



What makes Hetitec's business model special is that a foundry was built around 3D printing instead of integrating 3D printing in an existing foundry. This enables Hetitec to deliver finished castings within a week.

Photos: Hetitec

Metal casting can exploit a considerably greater variety of materials than direct metal-processing additive technologies. In addition to iron alloys, Hetitec can also cast various special steel and aluminum alloys.

The path to independence and a new era in metal casting

Ville Moilanen joined the former voxeljet technology GmbH in Augsburg as a mechanical engineer in 2008. As a sales manager, among other things he helped set up voxeljet's On-Demand Center and was responsible for sales on the Scandinavian market.

In discussions with customers he found out that the average delivery time for castings in Finland was more than three months. And this despite the fact that Finland is home to many large industrial companies active in sectors such as machine construction, energy supply, shipbuilding, etc. Sectors that generally have a high demand for castings, and particularly for prototype parts.

The reason for these long lead times was that the Finnish foundry industry was mainly set up for serial production using conventional casting methods. There was also an acute shortage of skilled foundry engineers. In many foundries, the engineers are so busy meeting serial orders that they simply have no time to work on small to medium batch sizes.

Ville Moilanen took on these market deficits in 2012, when he decided to move back to Finland and found his own company, Hetitec Oy, in the Pirkanmaa region near Tampere. He finally opened his center for the 3D printing of sand molds and cores in 2013. At the time, he invested in a VX1000 from voxeljet and printed 3D furan molds and cores for customers on demand.

Hetitec continued this business model for several years until, in 2018, the company decided to scale up, to expand and to transform its 3D Printing Service Center into a highly specialized foundry. Hetitec's unique idea? Building a foundry around the 3D printer and not just integrating a 3D printer into a foundry. And all with the aim of achieving a clear objective: the rapid production of castings.

The new VX2000 – 40% more powerful

The first casting plants were installed at Hetitec in early 2020. These included four melting furnaces for various alloys. Hetitec can melt steel (including Duplex), gray cast iron, spheroidal graphite iron (including ADI and SiMo) and aluminum. Hetitec also invested in CAD software for mold construction and casting simulation to prevent casting defects and keep the reject rate as low as possible. In addition to the VX1000, Hetitec enhanced its additive manufacturing capacity with a VX2000 from voxeljet in 2021. The large-format 3D printing system has a construction volume of 2 x 1 x 1 meters and is ideal for the production of large individual molds or a variety of smaller components.

The printer recently underwent a process update that has increased productivity by almost 40%. "If it were up

ON VOXELJET:

voxeljet is a leading supplier of large-format high-speed 3D printers and on-demand services for industrial and trade customers. The company's 3D printers use a powder-based additive manufacturing technology that enables the production of highly complex components made of a variety of materials. The material sets used are based on particle material and proprietary chemical binders. The company offers its 3D printers and on-demand components for industrial and trade customers in the automotive, aerospace, film & entertainment, art & architecture, machine construction, and consumer goods industries. Further information is available at **www.voxeljet.com.**

Hetitec's specialty includes spare parts and prototypes, in particular. As the Finnish industry mainly focuses on serial production it benefits, above all, from the fast delivery times and reduced costs.

ON HETITEC:

Hetitec Oy is a foundry located in Tampere, Finland. Founded in 2012, Hetitec started with an on-demand printing service for sand molds and cores for metal casting. Hetitec is now a fully equipped foundry with comprehensive additive manufacturing capacities, and it specializes in the production of highly complex castings made of steel, iron and aluminum. With in-house simulation software and quality assurance, as well as collaborations with nearby companies, Hetitec is one of the fastest foundries in Scandinavia and can produce complete finished castings within a week. For further information visit www.hetitec.com.

to our customers, they would prefer to have the castings yesterday – a service that, unfortunately, we cannot offer yet. But we can readily print a job box in less than a day, which makes the VX2000 the most productive 3D printer in the whole of Finland," says Managing Director Moilanen. "With our equipment we can produce castings weighing from 1 to 600 kg in just a few days, with a unique portfolio in terms of material diversity."

But that is not all. Hetitec collaborates with neighboring companies for machining and quality assurance. This allows the freshly cast parts to be processed immediately and inspected before shipment. This workflow enables Hetitec to dispatch finished parts within just one week. Or, in the words of Ville Moilanen: "This makes us the fastest freaking foundry in the whole of Scandinavia."

The Finnish market at a glance

Scandinavia's industrial landscape is particularly characterized by shipbuilding, automotive, energy, forestry machinery and offshore industries. All these markets can benefit greatly from Hetitec's services, printing technology, casting technology and its specialist range of materials.

Core shooting system with integrated manufacturing unit.

Process Analytics

Improvement of core making equipment through analysis of the core making process

By Jia Li, Xue Niu, Linlong Yang, Gaochun Lu, He Qiu, Jiangsu

The conventional core-making technology utilizing core machines has disadvantages, which include: fixed volume in single batch sand mixing, large fluctuation of storage time, and uncontrolled storage environment. These factors cause the sand core quality to fluctuate and therefore lower the efficiency and effectiveness of production.

In previous analysis of the resin material characteristics, it is found that primarily the viscosity coefficient of liquid resin and the degree of spontaneous reaction affect the quality. Furthermore, as the sand shooting nature and law of resin hardening indicate, a good fluidity of core sand guarantees a high quality.

Further process research is required to analyse the factors and laws that affect core sand fluidity and core curing, in order to optimize core-making equipment, improve core-making quality, and enhance efficiency.

Cold box core-making process

The equipment used in this paper include a sand mixer, the proprietary MLWA1 sample machine from Suzhou Mingzhi Technology, SAC hammer sampler, strength tester, and electronic balance. The materials used include a

Photos: SUZHOU MINGZHI TECHNOLOGY

cold box resin (phenolic resin and poly-isocyanate), triethylamine and 50/100 recycled silica sand.

The cold box resin with the addition set at 0.6 % for both components and recycled silica sand are first mixed. The influence of environment temperature and standby time on the fluidity of the core sand is studied. The method refers to the 'side-hole quality test' in Casting Manual Volume 4: Modelling Materials (Huang, 2002).

The initial strength is tested on the 8-shape sample made by the MLWA1 sample machine. After that, how the core sand temperature and catalytic gas temperature affect the initial strength is analysed.

Standby time and room temperature

As shown in Figure 1, the fluidity of the core sand shows a downward trend as the standby time increases. When the standby time remains constant, the higher the room temperature is, the more rapidly the fluidity of core sand decreases.

Sand temperature

How the sand temperature affects the reaction speed of resin has a '10 °C' rule (Qu & Ji, 2007). That is, with every temperature increase of 10 °C, the reaction speed doubles. As illustrated in Figure 2, in the range of 5 - 40 °C, when the sand temperature is lower than 15 °C, the initial tensile strength is less than 0.35 MPa; when the sand temperature is higher than 20 °C, the initial tensile strength is greater than 0.47 MPa.

In the process of shooting, the initial tensile strength must be in a range that the sand core can be completely ejected and at the same time void of excessive deformation. Therefore, the sand temperature is best controlled at 20 - 30 °C for sand cores with complex shapes and thin wall structure, while 15 - 30 °C for those with simple shape and thick wall.

ABSTRACT

Research of the process for making cores was carried out and concludes that shortening the standby time of the core sand (referred to as uncured mixture of sand and binder) can reduce fluctuation in the quality of the sand core. Controlling sand temperature in a reasonable range and raising the temperature at which the catalytic gas is cured can maintain a good initial strength of the sand core at a high speed, which therefore improves the efficiency, in terms of quantity and quality. Based on these conclusions, the layout and functions of the production equipment have been rearranged by developing an integrated core-making unit, known as MICC (Mingzhi Technology Integration Core Centre). Verification within a production setting shows that the new layout effectively improves the measurement controls of standby time, core sand temperature, and catalytic gas temperature. This helps improve the production efficiency and quality substantially.

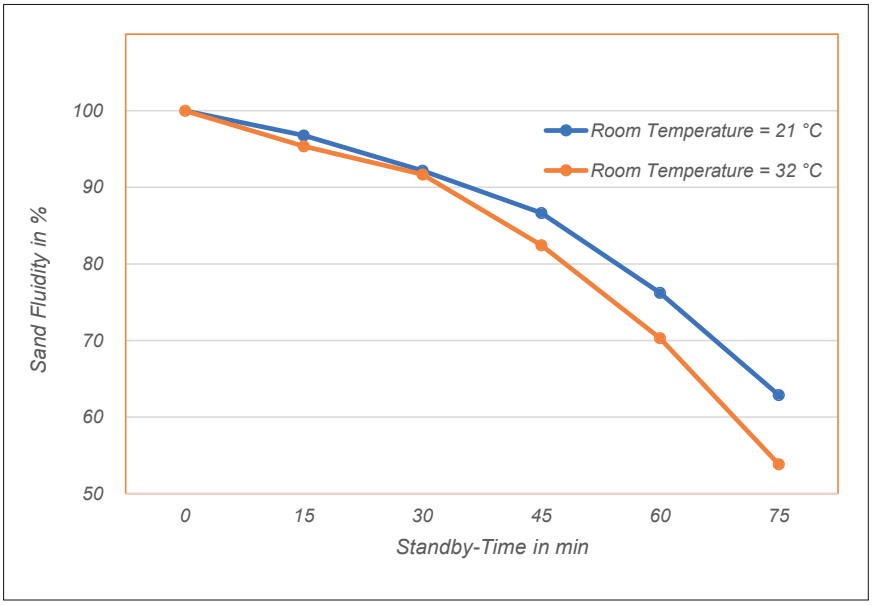


Figure 1: **Trend of sand fluidity at different room temperatures in cold box process.**

Catalytic gas temperature and blowing time

The initial strength of sand core is influenced by catalytic gas temperature and blowing time, as can be seen in Figure 3. Compared to 110°C, a catalytic gas temperature of 150°C requires a lower blowing time for achieving a desired initial strength.

The conclusions of this section are:

> Shortening the core sand standby time after mixing can reduce the fluctuation of the quality. The time should not exceed 15 min for sand cores of complex shapes or thin walls, and 30 min for cores of simple shape or thick walls.

> Controlling the sand temperature in a reasonable range and increasing the

Table 1: Quality comparison between traditional and integrated core making unit (5,000 product units).

Process	Category of sand core	Rate of defect (traditional core making unit)		Rate of defect (integrated core making unit)		Quality improvement	
		Fracture in %	*Mis-shoot in %*	*Fracture in %*	*Mis-shoot in %*	*Fracture in %*	*Mis-shoot in %*
Cold box	Water jacket	3.62	1.46	0.43	0.25	3.2	1.2
	Casting head	0.4	1.50	0.1	0.32	0.3	1.2
Inorganic	Water jacket	9.06	5	1.05	0.83	8.0	4.2
	Casting head	2	2.55	0.5	0.46	1.5	2.1

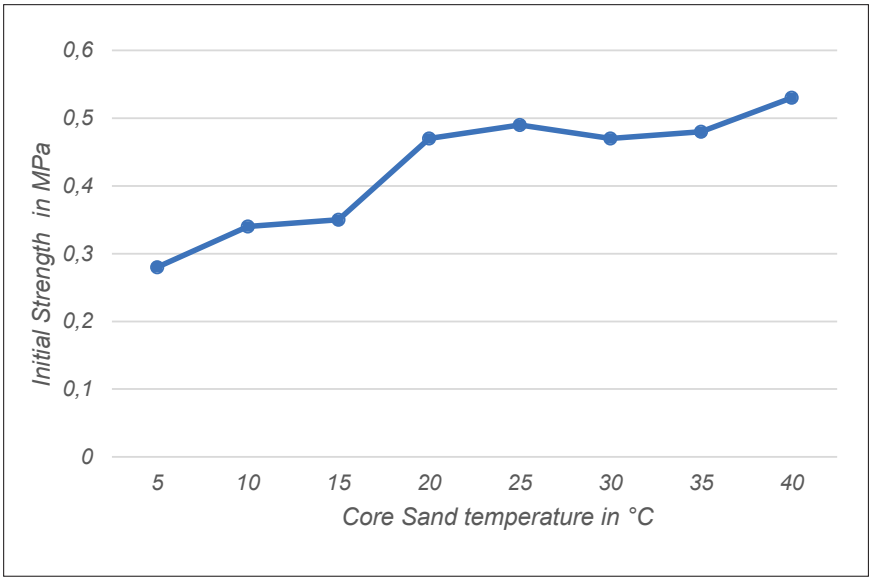


Figure 2: Effect of sand temperature on initial strength.

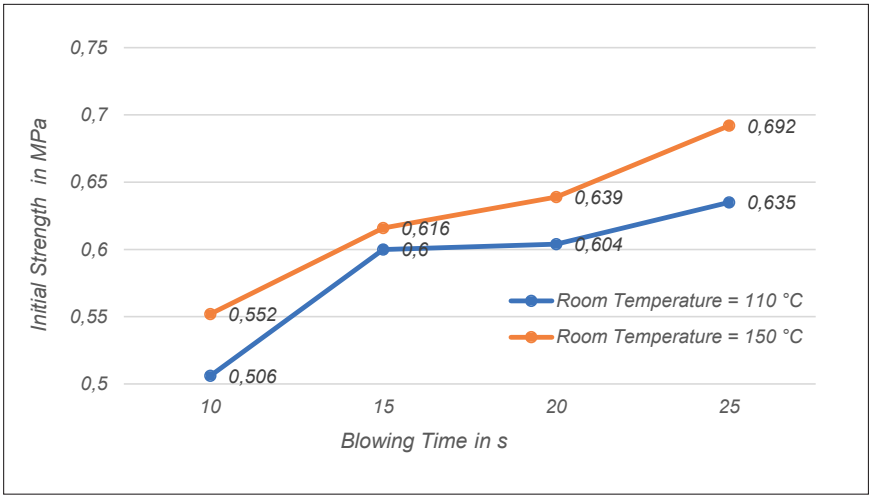


Figure 3: Effect of catalytic gas temperature and blowing time on initial strength of sand core.

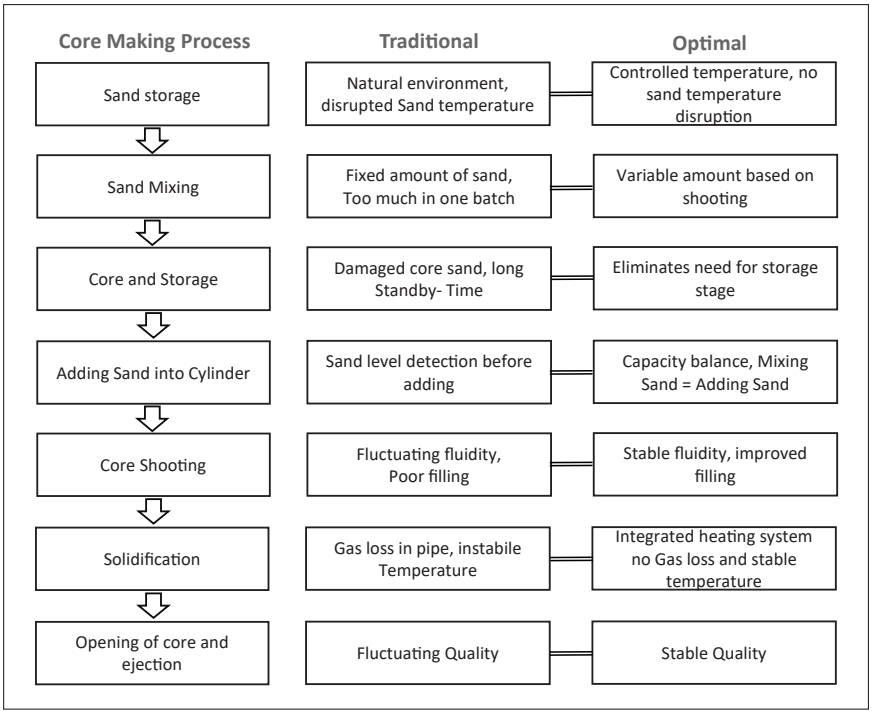


Figure 4: Comparison between traditional and optimised core making process.

catalytic gas temperature allows the sand core to achieve the desired initial strength in a short timeframe. Therefore, the efficiency, as relates to lower defective core rates (see Table 1), can be improved.

Inorganic core making process

As per empirical evidence in application, as well as testimony from technicians of inorganic material suppliers, it is believed that reaction to air and dehydration leads to crusting of the mixed core sand (Wei, Liu, Pi, & Qin, 2013). When room and sand temperatures rise, the speed of crusting will increase, which lowers the quality. To reduce encrustation, the temperature of the inorganic sand should be no more than 35 °C at a standby time ideally that is lower than 10 minutes.

In the inorganic core making process, the core sand is first injected into the heated core box. Then, a quick curing and encrustation on the outer contour occurs, while the interior core sand is not yet entirely cured. Finally, hot catalytic gas is injected to increase the interior sand temperature and as curing occurs, drain water is released.

In the core making process of a high temperature heater product, verification of one type of cylinder block shows that increasing the catalytic gas temperature can reduce the blowing time as the mould temperature remains unchanged.

To summarize, during the inorganic sand core making process, it is found that:

1. To reduce quality fluctuations, sand temperature should be lower than 35 °C and the standby time must be less than 10 min.
2. A higher catalytic gas temperature can increase efficiency.

Results

The research results in section 2 show that, irrespective of process employed (cold box or inorganic process), sand temperature, core sand standby time, and catalytic gas temperature are always important parameters to control.

Analysis and improvement of core making process and equipment

Comparison of core making processes

Focussing on three key parameters – sand temperature, core sand standby time and catalytic gas temperature – weaknesses in the relative stages of the

traditional core making process are optimised, as is shown in Figure 4. The optimised version avoids the storage of core sand and improves or simplifies the other stages. It results in improved control of the three parameters noted.

Layout and optimization

In accordance with the proposed changes in the core making process, the layout of the traditional core making unit, as shown in Figure 5, is modified to improve control of the three variables. Applying an integrated design concept, a new type of core making unit MiCC (Mingzhi Technology Integration Core Centre) is developed, which is illustrated in Figure 6. Additionally, an intelligent control system MiCL (Mingzhi Technology Intelligence Core Control) is developed for this unit, enabling closed loop control of these variables in the core-making process.

Improved temperature control of sand

Since silica sand has poor thermal conductivity, a sand temperature control device in the form of an air heat exchanger is developed. It is designed as a compact structure, easily integrated with the sand storage structure. Aided by MiCL's calculation of the monitoring core sand temperature, the temperature range of input sand can be broadened from 5 - 35 °C to 0 - 50 °C. That is to say, the addition of the temperature controller offers more effective and precise control of the input temperature than without it.

Table 2: Core sand standby time of traditional unit.

Category	Process	Number of cores made per hour	Standby time in min
Inner core (complex, thin wall)	Cold box	60	> 30
	Inorganic	40	> 45
Outer mould (simple, thick wall)	Cold box	45	> 15
	Inorganic	30	> 20

Table 3: Core sand standby time of optimized unit.

Category	Process	Number of cores made per hour	Maximum standby time in min
Inner core	Cold box	60	2
	Inorganic	40	3
Outer mould	Cold box	45	1.5
	Inorganic	30	2

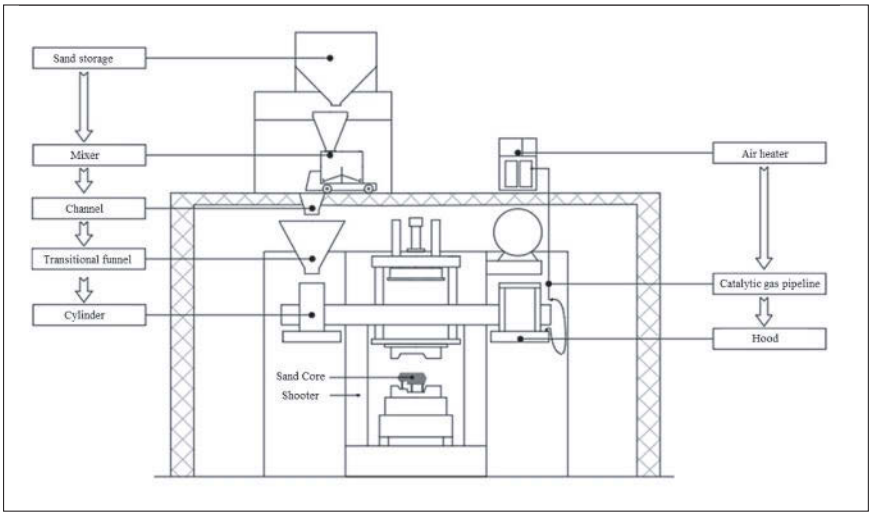


Figure 5: **Layout of a conventional core-making unit.**

Core sand standby time

The integrated core making unit simplifies the cycle of the core sand transportation. The channel and transitional funnel (shown in Figure 5) are cancelled. The sand mixer defines the sand addition through the conversion of MiCL calculation results based on the amount of mixed sand, the volume of shot sand, and time of one patch. Then, it adds the core sand to cylinder directly, which means instant use of core sand and a shorter standby time

The measured standby time of the traditional unit is listed in Table 2, whilst that of the integrated core making unit is in Table 3. After optimization, the core sand standby time becomes 10 % versus the traditional time.

Catalytic gas temperature

In the traditional core making unit layout, the catalytic gas heater is generally set on the steel platform, which means the pipe connecting it to the hood is 3 - 8 m. As a result, there is approximately 50 % loss of gas temperature before gas is transferred into the hood, due to the length of pipeline, which is a more notable phenomenon in cold environments and seasons, such as wintertime.

The integrated core making unit applies the high-efficiency curing technology. It accomplishes a '0 distance' (<0.5 m) catalytic gas transfer into the hood by nature of the integrated design of the heater and hood. The heat loss and catalyst used are both reduced, so the efficiency increases. The comparison data is in Table 4 (Yang & Xu, 2021).

Production verification

The integrated core-making unit enables the control and improvement of sand temperature, core sand standby time, and catalytic gas temperature, of which the effects of core sand standby time and catalytic gas temperature are the most obvious.

The quality comparison between the traditional core making unit and the optimised unit, when manufacturing 5,000 pieces of product, is illustrated in Table 1.

Results and discussion

1. Through analysis of the core-making process, it is found that the sand temperature, core sand standby time, and catalytic gas temperature are the significant factors that affect the fluidity of the core sand and the initial strength of the sand core.
2. Focusing on improving these key factors, the traditional core-making unit is optimized and improved by development of the integrated core-making

Table 4: Comparison of heater performance.

Category	Traditional	Optimized	Trend	Extent in %
Heat loss in %	50 - 60	10 - 20	Descend	30 - 50
Curing energy (only cold box) in kWh/kg	0.009	0.0045	Descend	50
Catalyst consumption (only cold box) Catalyst used/ weight of core in ml/kg	1 – 1.5	0.5 – 0.7	Descend	30 - 50
Curing efficiency (time in s)	20 - 30 (Cold box)	10 - 20 (Cold box)	Descend	30 - 50
	30 - 50 (inorganic)	15 - 25 (inorganic)	Descend	50

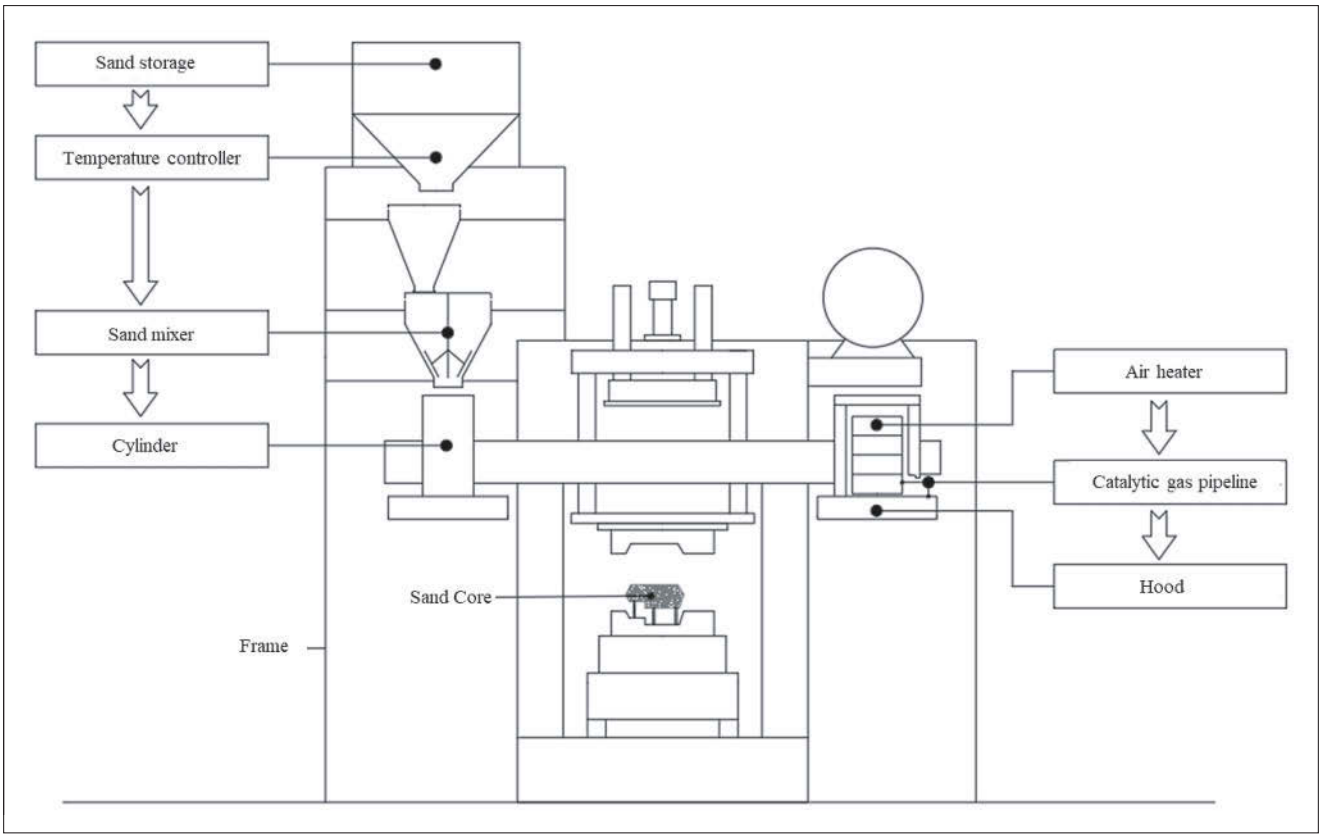


Figure 6: Layout of the integrated core-making unit

unit, MiCC. Quality and efficiency have been greatly improved, while material energy savings is achieved. It can reduce customer operating costs and offer an improved manufacturing environment.

In the future, the unit will provide core-making producers with a reasonable solution for upgrading process transformation and meet the needs of high-end casting production. In summary, the proposed integrated casting core-making equipment leads to a more environmental-friendly, efficient, and intelligent solution.

www.mingzhi-tech.eu

Patricia Fredal, International Marketing, Suzhou Mingzhi Technology Co., Ltd.

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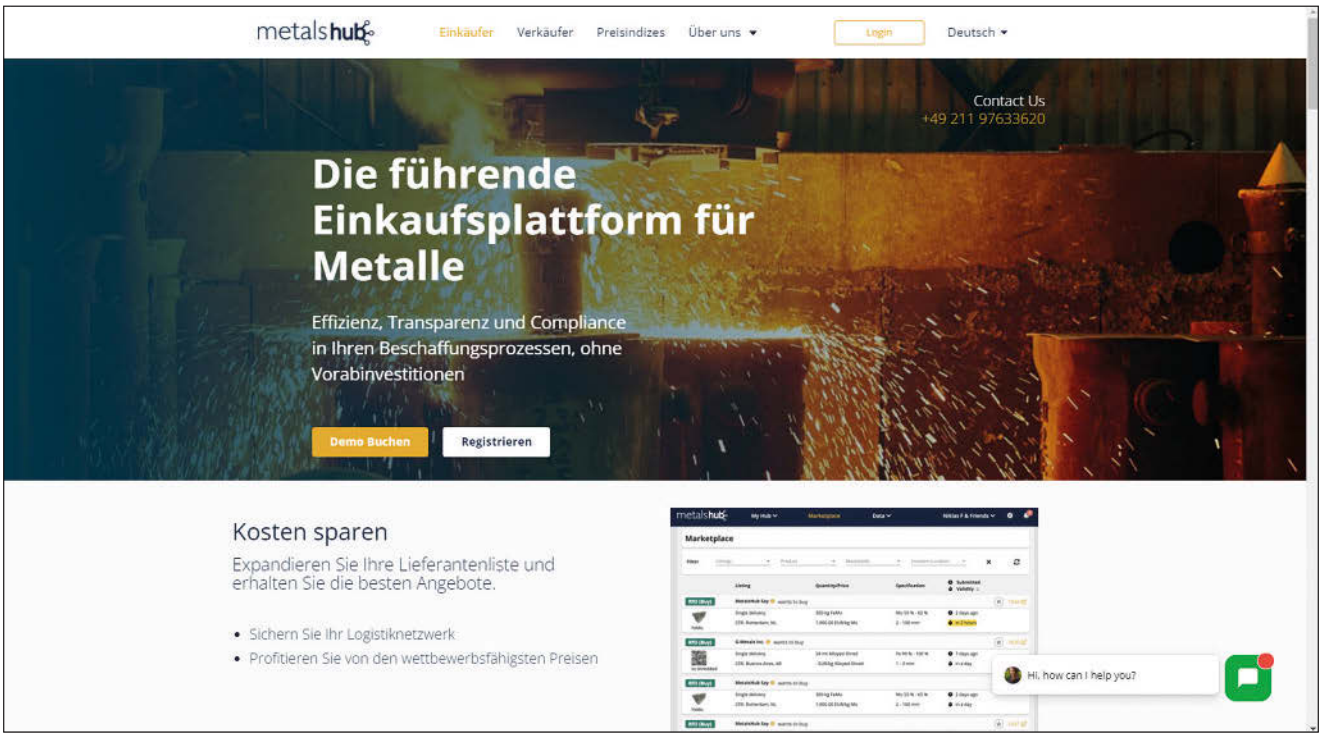


Photos and graphics: Metalshub

Metalshub offers a digital supply-chain solution for raw materials in the metal industry.

Foundry raw materials and consumables

Sustainable, transparent and efficient purchasing

The procurement of raw materials and consumables naturally plays a special role in the functions of a foundry. Raw materials are the largest cost item of any foundry, and the purchase price of raw materials thus directly determines the sale price of castings. At the same time, however, the quality and availability of raw materials have a decisive influence on a foundry's production.

By Frank Jackel, Duesseldorf

Despite the major importance of the purchased raw materials regarding the success and operative processes of a foundry, many of them have barely changed or adapted their purchasing of raw materials to meet the altered market conditions. Tendering by e-mail within a limited circle of recipients, or even ordering by phone without any competitive tendering process, is the norm in most companies. Then purchasing, in effect, becomes operative procurement – and the task is basically to keep an eye on inventories and re-order when required.

Challenges for the foundry industry posed by raw material purchases

But, especially in this day and age, foundries should pay particular attention to raw material purchases. In order to be competitive and attractive in future, the foundry industry cannot overlook certain significant trends. The purchasing task of the future should embrace the following measures, and transition from purely operative procurement to strategic raw material purchasing:

1. Increase the process efficiency and transparency of raw material purchases.
2. Ensure effective quality management, efficient supplier management, and the fulfilment of all the requirements in the Supply Chain Due Diligence Act (LkSG).
3. Enable simple and efficient auditability, particularly at foundries that are certified automotive suppliers.
4. Carry out systematic determination of the CO_2 emissions of the purchased raw materials (Scope 3 emissions) to create a comprehensive CO_2 balance.

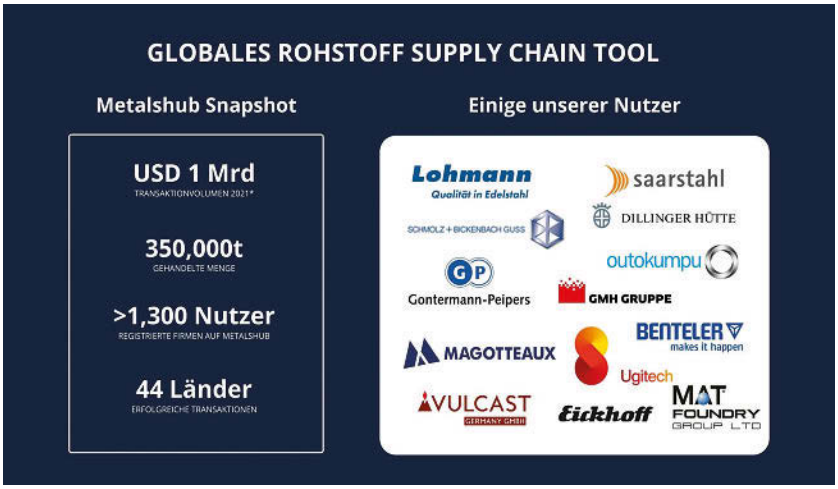


Figure 1: The Metalshub profile.

5. Undertake the management of raw material price risks and volatility through price transparency and expansion of the supplier circle.
6. Maintain a modern presence to attract skilled employees.

The above-mentioned measures are difficult to achieve using manual purchasing processes. These measures require digital support to ensure a modern and up-to-date process.

Metalshub (Figure 1) offers foundries a customized and rapidly implementable digital purchasing solution – already used by many companies in the iron and steel industry – to meet precisely these challenges. Users such as Lohmann Edelstahl or the Georgsmarienhütte Group use Metalshub to successfully manage their purchasing process.

Digital process replaces manual purchasing

The purchasing process at each individual foundry is characterized by six main steps (Figure 2). Whereby the tender itself (the enquiry process), mostly sent to stock suppliers as an e-mail, is a rapid step. Some of the upstream and downstream processes are far more time-consuming and prone to errors when carried out manually. When a need has been reported to a purchasing department and the tendering process has been carried out, offers should be uniformly compared. The more suppliers are asked and make an offer, the more complicated it is to make a transparent and audit-proof offer comparison table that ensures that all the offers are taken into account during selection. If an approval process is necessary (only sensible before conclusion of a contract), the approving authority must have the necessary information (such as an offer comparison table with comparisons to independent market prices) in order to be able to make a reasonable assessment of the offers. The creation of a legally valid contract can, of course, take place verbally and be accepted after sending an order confirmation. Agreement with the terms and conditions that accompany a contract should, however, be recorded in a contractual document and confirmed by both sides.

Leaving the valid terms and conditions open, or even permitting competing terms and conditions (battle of the forms), is negligent and inadvisable even if this is frequently the case. If the contractual documentation is prepared manually, it is often left to the supplier to save the buyer time. Here, too, mistakes can creep in or there may be deviations from the order confirmation, resulting in considerable legal uncertainty.

Preparation of the order confirmation and drawing up the invoice involves the (usually manual) input of the data in the inventory management system – another potential source of mistakes. The data in the system subsequently also serve as the basis for controlling and auditing, but are incomplete because the market price and the offer comparison table are not recorded in the system.

A complete digital process is indispensable in order to design the entire process chain so that it is more efficient and audit-proof, transcription errors are avoided, and employees have transparent data available. When both suppliers and buyers are connected together on the same system they always see the same data for a negotiation. The purchaser has an overview of the progress of a negotiation at any time and can concentrate on the priorities of their work: generating value in purchasing. This is precisely what Metalshub offers by networking suppliers and buyers on a single platform. The digital solution's audit-proofing also protects the company and all its employees against compliance violations.

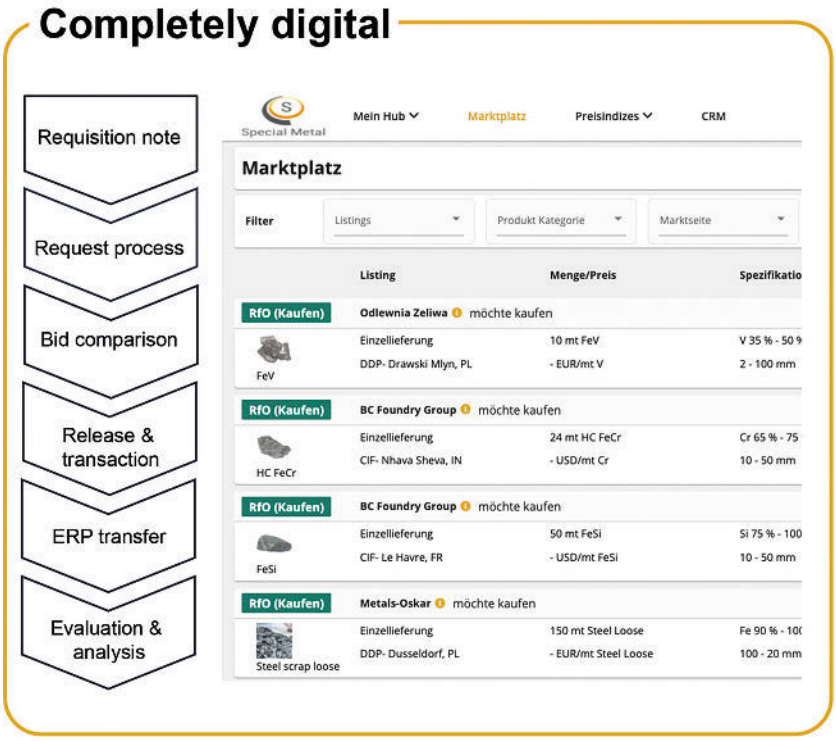


Figure 2: The digital purchasing process on Metalshub.

Quality management is decisive in purchasing, simple onboarding of new suppliers possible

The dependability of suppliers and the quality of the raw materials supplied are naturally of decisive importance for the ultimate quality of foundry products. But because many foundries do not have any analytical possibilities of their own, many companies rely on a very few previously approved suppliers. But they, in turn, obtain their products from a variety of sources, which can cause considerable quality fluctuations in the delivery chain – often unrecognized by incoming goods inspections or in the production area, or simply perceived as variations in the output quantity. In addition to regular and random analyses of the raw material supplied, foundries should evaluate every delivery in their system and record all fluctuations in the output quantity so that accurate and complete documentation is available for supplier assessment. Furthermore, if foundries make their purchases via an open platform they can also include ratings input by other purchasers.

In addition to the documentation obligation to ensure the consistently high quality of casting products, further stipulations in the Supply Chain Due Diligence Act come into force in 2023 – requirements for companies with more than 3,000 employees in 2023 and more than 1,000 employees in 2024. Certificates of origin will have to be obtained, and compliance ensured along the entire delivery chain. Non-observance of this can lead to severe penalties for companies, which may in some cases represent several percent of sales. The Supply Chain Due Diligence Act pays special attention to raw materials, so foundries should not simply rely on their suppliers here. This will involve a considerable amount of documentation, which will be difficult to derive with a purchasing process based on e-mails.

Digital solutions are of decisive importance if companies want to master these challenges without massively driving up the costs for fulfilling their obligations. For this purpose, Metalshub offers a digital supplier management process that systematically records all transactions and deliveries, based on regular supplier assessment. The data can be called up at any time for transparent controlling. Certificates of origin can be added on completion of every contract, and Metalshub carries out a comprehensive examination of every supplier when they register, and regularly monitors them for any sanctions etc., using the same platform.

METALSHUB

Metalshub is a cloud-based specialist purchasing solution for trading raw materials for the metal industry – with more than 1,300 registered companies. Founded in 2016, Metalshub has been offering the iron and steel industry an efficient and user-friendly platform for trading raw materials since early 2018, and is available in nine languages.

Companies use the platform to conclude legally valid contracts for trades in raw materials with competent and inspected trading partners. The platform permits buyers to issue tenders both privately (i.e. only invited companies) and publicly (all registered companies). In addition, there are a variety of modes available, e.g. auctions or negotiating mode, and buyers can choose from between fixed prices and index-based tenders.

In 2021 alone, raw materials worth about USD 1 bn. were traded via Metalshub, involving more than 150 different products. Since October 2021, Metalshub has also been an exclusive cooperation partner of the London Metal Exchange (LME) for the physical trading of non-ferrous metals.

In addition to the trading platform, Metalshub offers transparent and dependable price indices for important alloys and raw materials, as well as financing solutions for companies.

IATF-compliant records of all critical data in a single system

In addition to the requirements mentioned above, foundries that supply the automotive sector must compulsorily fulfil further obligations resulting from IATF-certification. These include, among other things, a systematic onboarding of suppliers with monitoring and recording of all quality certificates, an IATF-compliant clearance process for new suppliers, and the regular assessment of suppliers within the framework of customary business operations.

Foundries, however, are dependent on the systematic expansion of the supplier base in order to increase resilience in the delivery chain. It must therefore be possible to onboard new suppliers easily and efficiently. There are, however, considerable differences in how this is handled, and the success of many companies correlates with the efficiency and agility of their processes. While some companies apply a sensible and pragmatic approval process based on the specification of raw materials, others find ordering raw materials from a new supplier almost impossible due to very strict interpretation of the IATF rules – even if the chemical specification is right, or the material is from the same producer but traded by a different intermediate dealer that lacks approval.

IATF audits may involve weeks of preparation in almost all companies, and proving the existence of a seamless quality management system is often very complex because some of the data is not digitally recorded and/or must be put together from different systems. Digital solutions such as Metalshub can provide enormous added value here. Tedious preparations for audits become a thing of the past when all the data have been logged, e.g. the specifications, certificates, and assessment of deliveries from the supplier profile.

Systematic recording of Scope 3 CO_2 emissions for each raw material delivery

Successfully implementing the climate goals in Europe and the world not only requires determining Scope 1 (direct CO_2 emissions) and Scope 2 emissions (indirect via electricity), but also Scope 3 emissions (**Figure 3**), i.e. those that originate from the purchase of primary materials and services in the value-creation chain.

Scope 3 emissions can represent a considerable proportion of the total emissions of a foundry product. In some segments, e.g. stainless steel, they can make up more than 50 % of total emissions. Making savings, as well as contributing towards climate protection, require a company to reduce their Scope 3 emissions. If foundries want to establish their CO_2 footprint for the buyers of their products they can only fall back on average values that they must collate themselves.

In addition, the EU has introduced the Carbon Border Adjustment Mechanism (CBAM) to prevent so-called car-

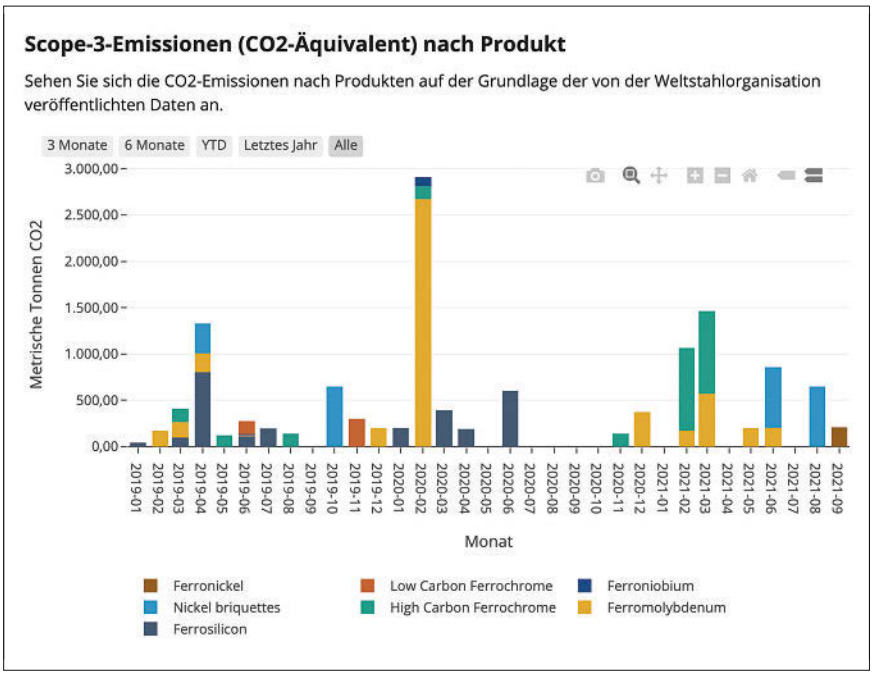


Figure 3: **Scope 3 emissions by product.**

bon leakage. Purchasers of certain products must report the quantity and corresponding CO_2 emissions of the purchased goods – and materials such as iron, steel or aluminum are among the first products for which such reporting is necessary. From 2026 it will even be necessary to purchase CBAM certificates to offset the CO_2 emissions. But nobody is now sufficiently prepared for the systematic determination of Scope 3 emissions within the framework of CBAM, nor can companies show a complete CO_2 balance for their products based on data from different producers.

Metalshub enables purchasing companies to carry out tracking of Scope 3 CO_2 emissions per transaction. Suppliers can input their individual CO_2 intensity for a purchased product and document it with a certificate. Wherever no data for CO_2 intensity are currently available, the Sustainability Research Team at Metalshub provides reliable data – which is constantly becoming more effective thanks to the increasing activity of producers using the Metalshub platform. The resultant database is unique in the industry, and permits companies to prove their climate-protection achievements to customers.

Reducing the price risk with more suppliers and greater price transparency

Raw material markets are characterized by their volatility and a certain price transparency. Although market prices at the start of the coronavirus pandemic reached rock bottom, many prices climbed to absolute all-time highs (Figure 4) just one year later. While one can speculate on a particular market price development and, for example, try to cover oneself using long-term contracts at fixed prices, this can rapidly become a risk for the entire company if the price goes down. Correspondingly, the aim must always be to purchase at current market prices and, where possible, react to rising prices by means of material surcharges. But how can one ensure that one is purchasing at fair and current market prices and that there is sufficient competition between suppliers?

First of all, a broad and flexibly growing range of suppliers is important in raw material purchasing to generate sufficient competition among the suppliers. Metalshub enables this via a wide-ranging network of inspected and trustworthy suppliers that use the platform for their offers. So Metalshub ensures fair market prices. In addition, Metalshub is the first platform to provide worldwide transaction-based price indices for numerous alloys and metals, giving users an overview of the market price during negotiations. Digital records thus give buyers complete transparency when purchasing raw materials.

By using Metalshub, the purchaser in turn contributes towards the constant updating of the indices. The transparent aggregation of numerous transactions to create a price index point also ensures that the data can be trusted, with only the buyer and seller of the goods knowing the individual price of a transaction. Data security at Metalshub is also ensured by an experienced IT team, modern encryption mechanisms, and restricted employee access to data.

Increased attractiveness through the use of modern media

Finding suitable and skilled personnel is a major challenge for all companies. Paper-based processes put young applicants off, and in-house databases and Excel tables make it difficult to transfer tasks to new employees. The use of modern tools and platforms contributes towards presenting a company as an attractive employer, and should not be underestimated.

Metalshub offers courses and training programs on the use of its platform, as well as attractive and interesting

Figure 4: **Metalshub is specially adapted to meet sector needs.**

seminars on the raw material markets – ensuring a smooth transition to the new and younger generation, and providing attractive further education opportunities.

Make or buy?

As shown above, the use of digital tools will be indispensable for the success of a foundry in future. The decision about whether a company purchases appropriate digital tools or develops them themselves can be made on the basis of familiar criteria:

1. Is it possible to decisively differentiate ourselves from the competition by developing our own solution?
2. Does the company have the software development competence required?
3. Can we wait 12 months or more for a functional version?

If just one question is answered with 'no' the company should not attempt to develop its own solution.

The question of whether a solution from outside the sector is suitable for purchasing raw materials can be answered on the basis of simple criteria:

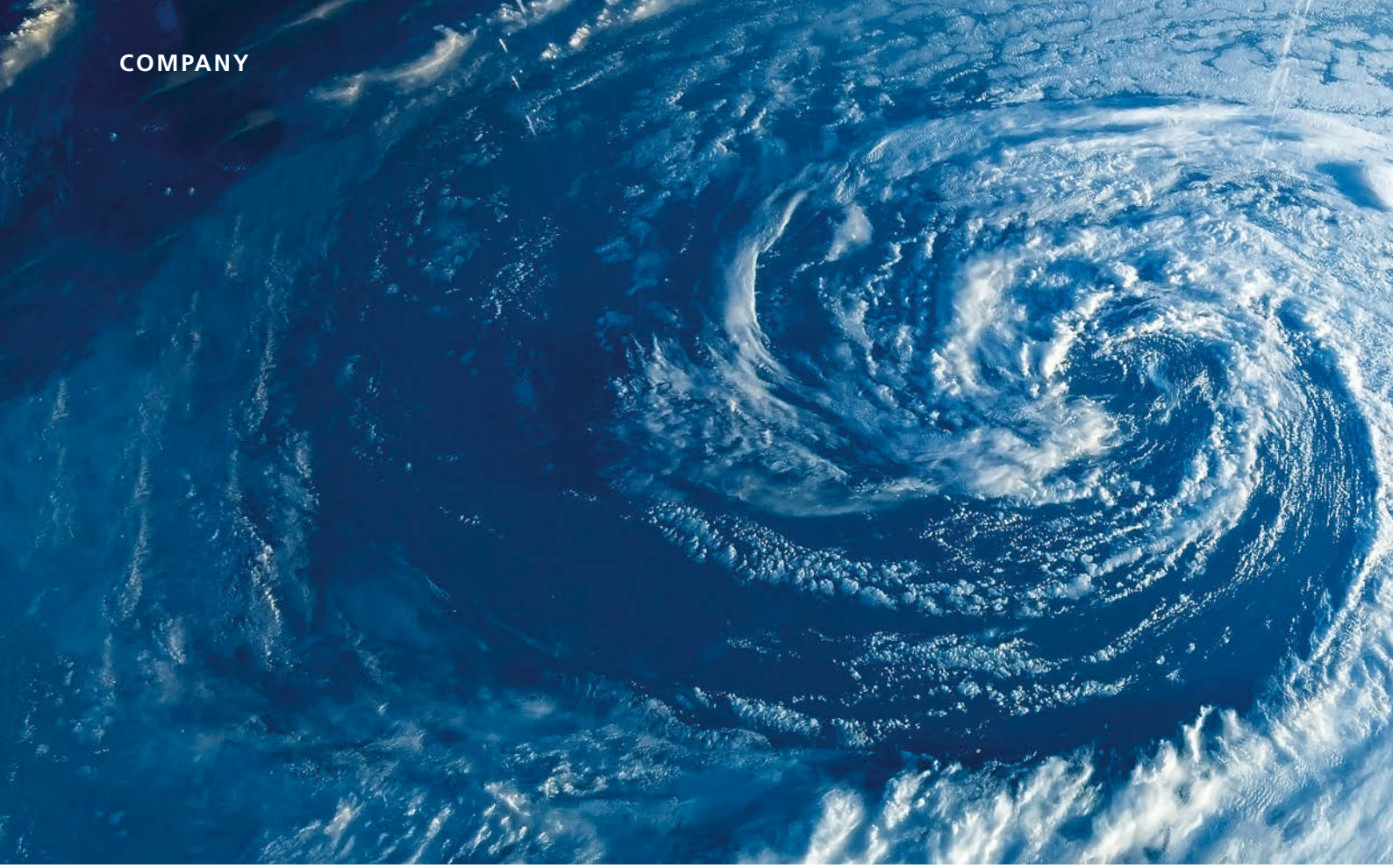
1. Do raw materials/metals play a minor role in total purchasing volumes?
2. Is the company ready to make considerable compromises when using the tool for purchasing raw materials?
3. Is the company able or willing to afford external consultants to adapt and implement the solution?

Here, too, if one of the questions is answered with 'no' the company should not attempt to use a non-sector-specific solution, or even one specifically intended for a different industry. The cost is high; the yield (in the sense of savings and process advantages) tends to be low.

Sector expertise and customization for sector requirements are just two of the reasons why leading and pioneering companies trust Metalshub, and use the platform for their purchases of raw materials and consumables (Figure 5). Rapid and goals-oriented implementation by digital experts with knowledge of raw materials mostly permits a comprehensive start after just a few weeks. Company employees are supported by dedicated experts, and a company's own IT development team can soon implement important requirements using the tool. Customized connections to the goods management system permit error-free data transmission into the company's own systems, and thus further efficiency benefits. The improved data basis leads to increased transparency and more savings potentials in companies. Metalshub employees are pleased to deal with queries and questions at any time.

www.metals-hub.com

Dr. Frank Jackel, Managing Director and co-founder, Metals Hub GmbH



Raw material sourcing dependence on China

How are suppliers strategically dealing?

Raw material prices have been rising sharply for a number of reasons, including extreme demand, and supply bottlenecks are causing serious problems for manufacturers – the raw material crisis is keeping the world on tenterhooks and is likely to do so for some time to come. Companies and suppliers in the foundry industry must adapt to the changing conditions as best they can, because there is no light at the end of the tunnel in sight for the time being.

by Thomas Pfeiffer, Vice President Global Sourcing HA Group

The be-all and end-all: a global network

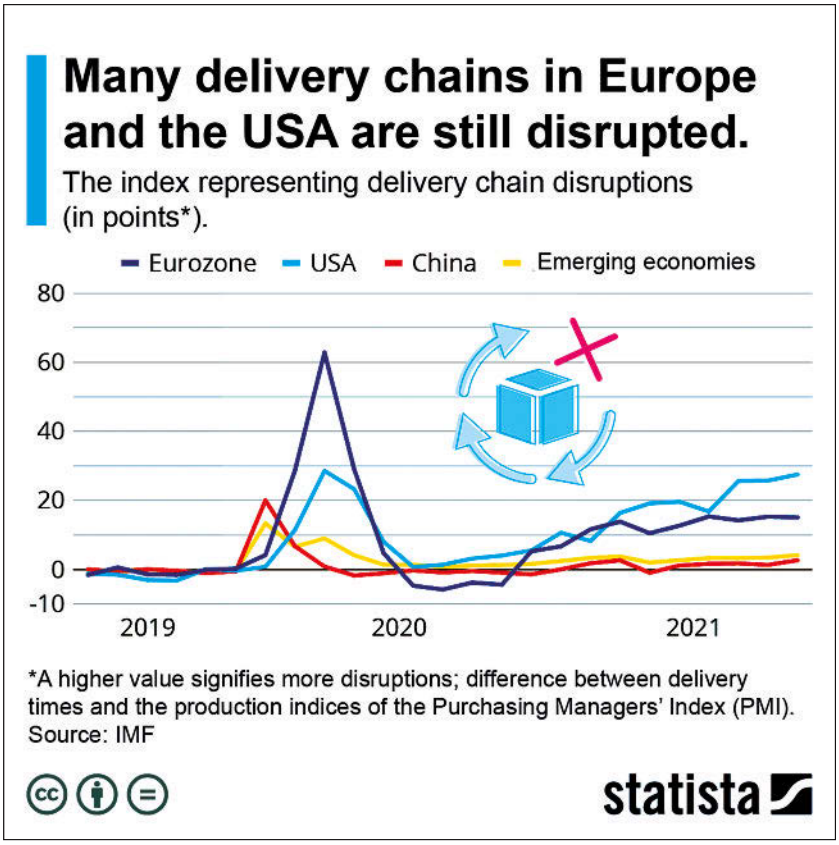
The Hüttenes-Albertus Group (HA) is represented in over 30 countries worldwide. We manage a broad portfolio of chemical raw materials, minerals and sands – from niche specialty materials to large-volume commodities.

In order to ensure that our sourcing for all HA companies is crisis-proof, the group's strategic and operational levels work closely together, yet separately: HA's strategic sourcing operates centrally, while our operational activities are managed locally, close to our customers, at production sites worldwide.

The global companies of the HA Group's sourcing network are in constant communication via digital media in order to ensure that product market information can be transparently exchanged on an international level. With knowledge of the processes and changes in the various countries, HA companies worldwide are able to react quickly, even in times of bottlenecks, and to help each other immediately, in case of need. It is this close networking that allows us to effectively maintain our supply chain.

Photo: HA Group

Global sourcing in an era of 'perfect storms'.



Graphic: Statista

Supply chain disruptions are still ongoing.

HA'S MOTTO IS: "HOPE FOR THE BEST AND PLAN FOR THE WORST"

The challenges in 2020 to 2022

As in 2020, this year has also already been marked by significant disruptions caused by the coronavirus crisis. The pandemic is a burden on the global economy, and companies are facing immense challenges. At the beginning of the pandemic, HA's sourcing department initially focused on assessing our suppliers' ability to deliver and their financial stability. We needed to adjust to the sharp decrease in demand from end customers. On top of that, an unprecedented combination of events occurred in Q3 2021 and exacerbated an already tense situation and continues to do so:

> Highly volatile swings in demand make it difficult to plan effectively.
> Suppliers and logistics partners have a shortage of personnel.
> One-off incidents, such as the UK's exit from the EU and the blockage of the Suez Canal, have exacerbated an already challenging situation.
> The number of force majeure reports is increasing.

Yes, companies face one or more challenges of this nature from time to time, but the fact that all of these events (and their knock-on effects) have hit the world simultaneously is unprecedented. The world has never seen a 'perfect storm' on this scale before.

A strategy for the storm

In dealing with so many concurrent obstacles and disruptions, it is more important than ever to have a cohesive and dedicated workforce. HA's purchasing team is closely networked, working globally and along the entire process chain – and this is what enables us to ensure the efficiency and quality of our deliveries.

No all-clear for 2022

The semi-conductor shortage continues, energy cost increases need to be assessed and, in China in particular, stringent measures to reduce energy consumption and carbon emissions are having an increasing impact. In order to remain fit for the future, companies must strategically adapt to the challenges and developments on the horizon.

The role of China

China is an indispensable core sourcing market for all industries – whether as a direct supplier or as a supplier to a company's own suppliers. In order to plan more effectively and ensure we are prepared for any eventuality, HA incorporates the Chinese government's plans into our own strategies. Our motto is "Hope for the best and plan for the worst".

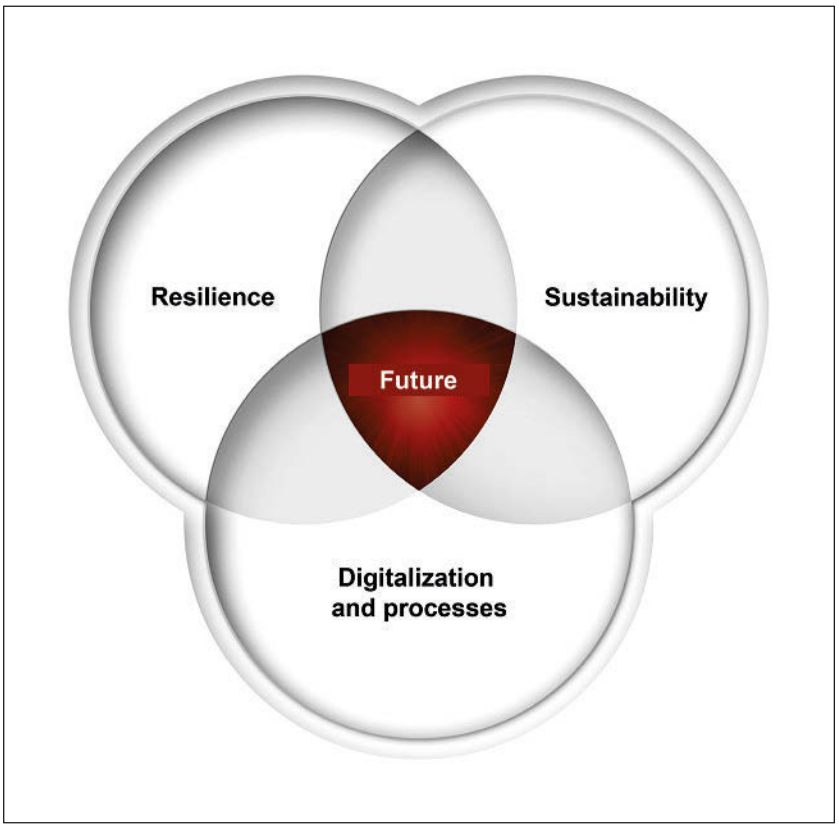


Photo: HA Group

Three core issues will shape the sourcing future at HA.

HA's sourcing strategy is based on supply chains from at least two continents. Nevertheless, we recognise that this may not be enough on its own given the situation today and in the months and years to come. We know how important it is to maintain close lines of communication with our customers and to have alternative solutions tested and approved in case they are needed.

Even and especially in times when face-to-face meetings are not possible, transparent communication plays a key role. HA's sourcing department regularly communicates digitally and directly with our own suppliers – in China and elsewhere around the world. Intercultural communication and understanding the situation of the different stakeholders is therefore one of the core competencies of a good sourcing manager.

The issues that will shape the future

The raw material situation in China is not the only factor that is creating uncertainty today and tomorrow. At HA, we aspire to be a dependable partner for our customers – locally, regionally and globally – for years to come. In addition to performing our regular sourcing tasks, there are three core issues that we believe will shape the future:

> Resilience
> Sustainability
> Digitalisation & Processes

We have clearly defined each of these three core areas for our teams and have used them as the basis of a new set of pragmatic principles that will guide our future business.

1. In our day-to-day business life, resilience means:

a. The consistent implementation of a supply chain / product strategy, in combination with sourcing from suppliers in different regions. Where this is not possible, we conclude clear, long-term supply contracts.
b. Thinking outside the box and, where appropriate, identifying alternative products and suppliers.
c. Proactively optimising the coordination of our demand planning processes.

2. HA is committed to sustainability along the entire process chain:

a. We expect clear commitments from our suppliers, who are required to sign and comply with our Supplier Code of Conduct, or provide us with their own appropriately equivalent code.
b. We analyse the carbon footprint of all of the raw materials we buy and incorporate this as a criterion when we decide which suppliers or products we work with.
c. Sustainability is firmly anchored in our strategy and in all our terms and conditions of ordering, worldwide.
d. We are networked across the HA Group through an internationally certified system. Our standards and principles are global.

3. Digitalisation/Processes

Our strategy in terms of automation, data processing, new systems, and interdisciplinary collaboration is based on the following principles:

a. HA uses a standard sourcing process that is as close to fully automated as possible and makes the best use of enterprise resource planning (ERP) software capabilities.
b. We use automated systems and information programmes wherever possible to allow our sourcing teams to focus on their core tasks.
c. Data analytics: information and data from all over the world help us to determine the most appropriate strategic actions.
d. Last but not least, AI tools and automated programmes play an important role in identifying the best suppliers, possible alternative products and faster processes for HA.

These are major tasks in challenging times. They represent a serious test and one that faces us all.

Only companies that resolutely embrace these challenges and constantly adapt their own strategies flexibly to the latest circumstances will emerge from the crisis stronger and, above all, be and remain reliable and dependable partners for their customers.

www.ha-group.com

Thomas Pfeiffer, executive board member, Vice President Global Sourcing HA Group

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Graphite and graphite electrodes

Dependence on China in difficult times

China is by far the world's largest graphite supplier, with 70 % of global production. In 2017 and 2018, users of graphite electrodes had already experienced that this could become a problem. Turmoil erupted in spring 2017 – panic purchases by procurement managers at steelworks and the unreliability of many contractual partners caused an eightfold rise (and sometimes even more) in the market price. The events of recent weeks indicate that a similar scenario threatens to occur again now.

By Benjamin Sarkoezy, Wiesbaden

Photo: AdobeStock - robu_s

As was the case then, there are now signs of a situation in which political interference is colliding with a shortage of raw materials, leading to a rapid increase in electrode prices.

Anti-dumping tariff on Chinese graphite electrodes

On 17 February 2021, the European Commission announced that it would start an immediate investigation into whether Chinese producers of graphite electrodes were violating anti-dumping rules by selling their electrodes at prices below the production costs of non-Chinese producers in the EU. Within a few days, the investigations had triggered a stampede for the material because every user of Chinese electrodes feared that they would be hit by a retrospective tariff if the goods arrived in Europe too late. This resulted in price rises of about EUR 200 to 300 per week.

This tense state of uncertainty continued until mid-September, when initial results of the investigation and the probable level of the anti-dumping tariff were published. As a result, importers have been hit by a variety of tariffs that have been in effect since 16 October 2021. Electrodes made by Chinese producers who, in the judgement of the EU, "cooperated" during the investigation by permitting complete access to their books were charged levies of 21.6%. Producers that lacked such transparency were punished with a tariff rate of 66.5%, three times higher. Some designated producers, such as the Fangda Group (one of the largest manufacturers) or the Liaoning Dantan Technology Group were allocated tariffs of 24.5% and 17.5% respectively.

Raw material and energy costs soar

While demand for electrodes fell in Europe as a result of the approaching anti-dumping decision, producers in China were worried about rising raw material costs and therefore reduced their electrode production volumes. This was because the manufacture of graphite electrodes for steel production was increasingly competing for the e-vehicle (EV) market with the manufacture of synthetic graphite. Both forms of synthetic graphite require the same raw materials: graphite electrodes are produced using petroleum coke or needle coke with coal pitch as a binder, accounting for about 67% of production costs. Prices for needle coke alone rose by 20% in the summer of 2021.

In addition, production of graphite electrodes requires the same technical plants as used to produce battery anodes, namely so-called graphitization plants with which carbon is converted to graphite. Many users of such plants in China now focus on the anode and e-vehicle market because purchasers are ready to pay a higher price for the graphitization. Demand for EV anodes is growing, reducing the availability of electrodes for steel production.

Moreover, the conversion process of carbon to graphite electrodes is highly energy-intensive, so production costs are normally subject to significant price fluctuations due to ever-changing electricity prices. These higher electricity costs are passed on to users of graphite electrodes. Chinese electrode producers currently have to battle with restrictions in energy consumption and high electricity costs, particularly in the provinces of Inner Mongolia, Hebei and Henan, the main regions for graphite electrode production.

Freight costs impossible to tame

In addition, European industry has been facing the headache of rising freight costs for several months now. Steelworks therefore pay considerably higher purchase prices and expect delivery delays, also due to a shortage of containers.

The current situation and prospects

Up to now, many electrode consumers have relied on their large stocks this year instead of purchasing replacement material. Similarly, the electrode producers have reacted to the rising raw material prices and production costs by depleting their stocks. Inventories are now running low, however, and this can be seen from the rapidly rising prices – at a rate of about EUR 500 per week.

Some of the above-mentioned reasons for the renewed price rises, such as the high transport costs, should be of a short-term nature and normalize in a few months. Other aspects, such as the rising raw material prices and capacity utilization rates, are not so easy to reverse as they involve the megatrend of e-mobility.

The availability of graphite electrodes for steel production depends on graphite deliveries from China.

Despite rising costs for Chinese electrode producers, a shift in electrode production to Europe would be difficult because there is little political support for the construction of new energy-intensive and potentially environmentally damaging plants.

Parts of the market are panicking, and it is not easy to determine the current price level because it is changing almost daily. And nobody wants to make any binding offers. Just like in 2017 and 2018.

The latest developments

Following initial publication of this article, the European Commission started anti-subsidy proceedings on 18 November 2021 regarding the import of Chinese graphite electrodes. This was initiated after local producers Graphite Cova, Showa Denko Carbon Holding and Tokai ErftCarbon had made a special request on 4 October. The period under investigation included the entire year of 2020 and referred to the same electrode specifications as had already been examined in the previous anti-dumping investigation.

These anti-subsidy proceedings were intended to determine "whether the product under investigation originating in the country concerned is being subsidized and whether the subsidized imports have caused injury to the Union industry" according to an announcement by the EU. So there is a threat of additional costs for purchasing graphite electrodes from 2022 onwards.

www.geseurope.de

Benjamin Sarkoezy, CEO,
GES Europe GmbH

Historical design, new material: door and window handles cast in India for the restoration of listed buildings.

Sand casting replicates for historical fittings

Traditional craftsmanship reinvigorated

It all started with a visit to a flea market: having bought a protected listed building, businessman Volker Eloesser was searching for period fittings for his doors and windows. When he failed to find any, he came across Indian foundries that could produce replicates of historical castings that were true to the original. This was the seed for a business idea.

By Jan Kretzmann, Düsseldorf

Anyone wanting to professionally restore a protected listed building knows the difficulties involved – not just that there are many regulations that must be complied with. The procurement of historical original parts often turns into an Odyssey. This was also the experience of Volker Eloesser, Managing Director of Ventano Beschläge GmbH in Bissendorf. The businessman had purchased a historic Meierhof from the 17th century (a building occupied by the administrator of a noble or ecclesiastical estate) and came up against a problem when looking for the required original door fittings and window handles: it was very difficult to find the parts, hundreds of years old and made of cast iron or brass, in sufficient numbers in Europe. It was like an Odyssey. After many visits to flea markets, he realized that he had to find an alternative. Why not produce a replica that is optically identical to the original?

Sand casting made in India: with a lot of manual work

Eloesser's search for suitable companies finally bore fruit in northern India. This is a region with numerous small foundries that master the sought-for traditional craftsmanship and can carry out individual sand casting to meet customer requirements – everything, of course, within the framework of what is possible there, because the technical conditions are very different. There is a lot of manual work involved. So Eloesser sent the first original examples to India to be copied. The coordination and correction loops were very complicated, but in the end he obtained finished castings – new 'old' fittings and handles that looked just like their historical originals.

Photo: Ventano

'Individuality is trumps for us': Volker Eloesser, Managing Director of Ventano Beschläge GmbH, with a selection of newly cast fittings and handles from various eras.

Final assembly and inspection takes place in Germany

What was originally a private interest rapidly turned into a business idea: Eloesser, who started out in the soft-

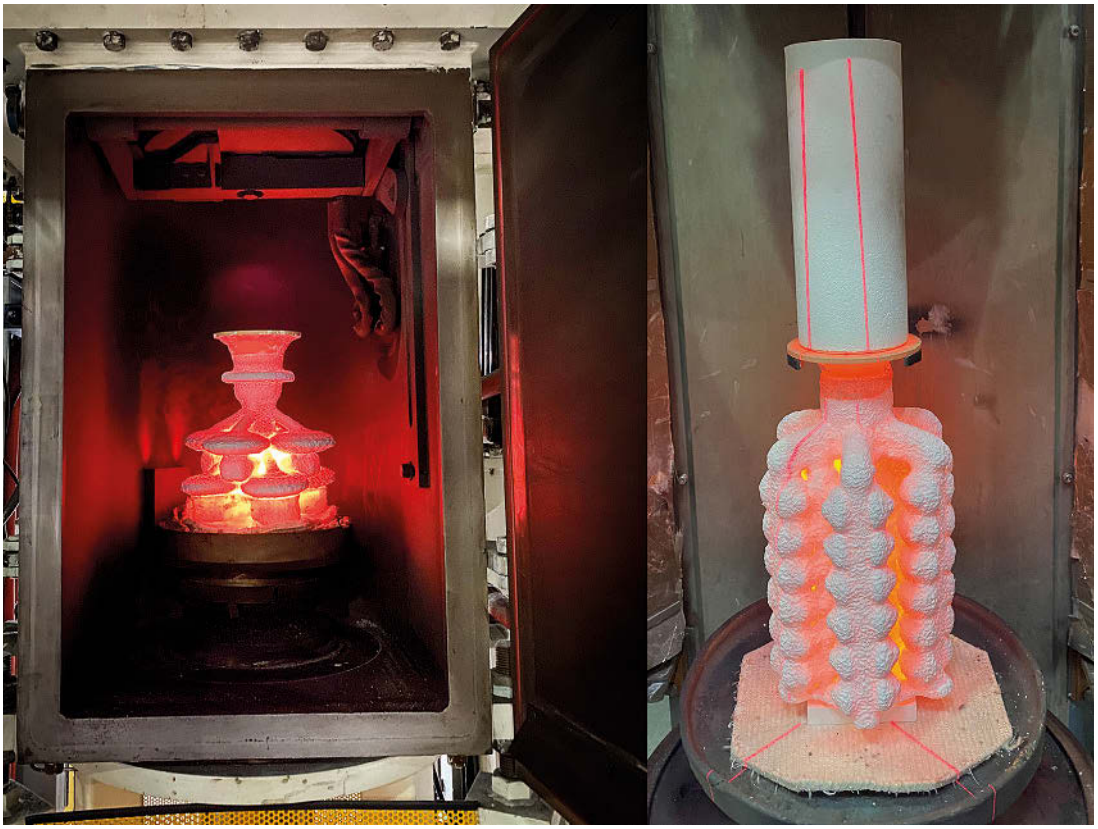
ON VENTANO:

Ventano Beschläge GmbH is a trading company in Bissendorf in lower Saxony (near Osnabrück) that has specialized in replica historical door fittings and window handles for renovating listed buildings. Whether art nouveau, Gründerzeit (the economic phase in 19th century Germany and Austria before the great crash of 1873) or Baroque: the supplier has made a name for itself in the scene with a range of more than 15,000 products. Customers from all over the world can order via the online configurator and are advised by employees who specialize in traditional crafts, trade, architecture, art history and technology. The focus on individuality is clear to see. Casting of the brass or grey iron replicas takes place using the sand casting process with a lot of manual work in northern India, the location of many small foundries that still master this traditional craftsmanship. The products undergo inspection, final assembly and refinement in Germany. More information is available at www.ventano-beschlaege.de.

Made in India: a whole region of northern India lives off traditional foundry workmanship. The most varied of brass and grey iron products are made here using sand casting – many of them land in the souvenir shops for tourists. Businessman Eloesser uses this expertise to produce replicas for doors and windows that are true to the original.

ware sector, had already moved into the building component segment after the new economy bubble burst and he saw a gap in the market for these reasonably priced replicas from India. Using the company he manages, Ventano Beschläge GmbH, Eloesser started sending the replicas cast in India to architects, window construction firms, as well as private restorers. Initially, the range was limited to a few products. Now the company offers more than 15,000 different models, whereby customers can order using an online configurator and can even make certain adaptations.

Before the fittings can be sent to customers, however, further work is required: only the casting itself is made in India. After arrival in Germany, each casting is first inspected for dimensional accuracy and quality. The safety and standard-relevant inner life of the components – for example, the screws, square spindles and steel plates for mounting – are made in Germany. Special customer requirements, such as the milling of hard-to-access keyholes, are processed here too. A win-win situation in which builders and specialist companies are offered relatively reasonably priced possibilities for professionally restoring historical components while supporting traditional skilled workmanship in northern India.



Photos: The Blank Group

In the new two-chamber vacuum casting plant (left) the shell no longer cools uncontrollably while the ingot is melting.

Vacuum casting

Automation and two-chamber vacuum casting plant optimizes production and quality

As a supplier to the automotive industry, the BLANK Group employs the vacuum casting process to produce a large proportion of the investment castings for the sector using nickel-based alloys. In order to improve quality and increase output quantity, the existing single-chamber plant has now been modified and expanded using an innovative concept.

By Manuela Schmid

In the existing process, the shells (which have a temperature of over 1000 °C) are manually removed from the circular furnace and placed in the single-chamber plant. In the next step, employees place a fiber crucible with the still-solid alloy on the shell. Between the shell and the crucible a coin-sized 'penny' ensures that the melt in the subsequent casting process is uniformly liquefied under vacuum in the chamber before the melting of the penny clears the way into the shell. This penny, so important for the successful casting process, is made up of the alloying material and is located in a recess below the alloy ingot. The ingot melts from top to bottom (see lead picture) so that finally the penny melts, enabling regular shell filling with the completely liquefied melt. The problem with the previous process, however, was that the shell already cooled uncontrollably during the time it took the melt to liquefy – which could lead to defects in the complex investment castings.

Installation of an additional two-chamber casting plant has increased production reliability and expanded the technical limits. The principle works as follows: the alloy is melted in an upper chamber via an induction coil while the shell is still in the circular furnace losing no heat. The plant only signals its readiness to receive the shell when the melt is ready

Figure 1: The casting process in the two-chamber vacuum casting plant.

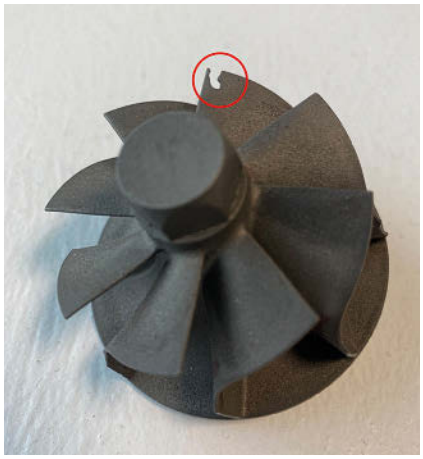


Figure 2: Typical casting defects with highly complex investment casting geometries due to early cooling of the shell.

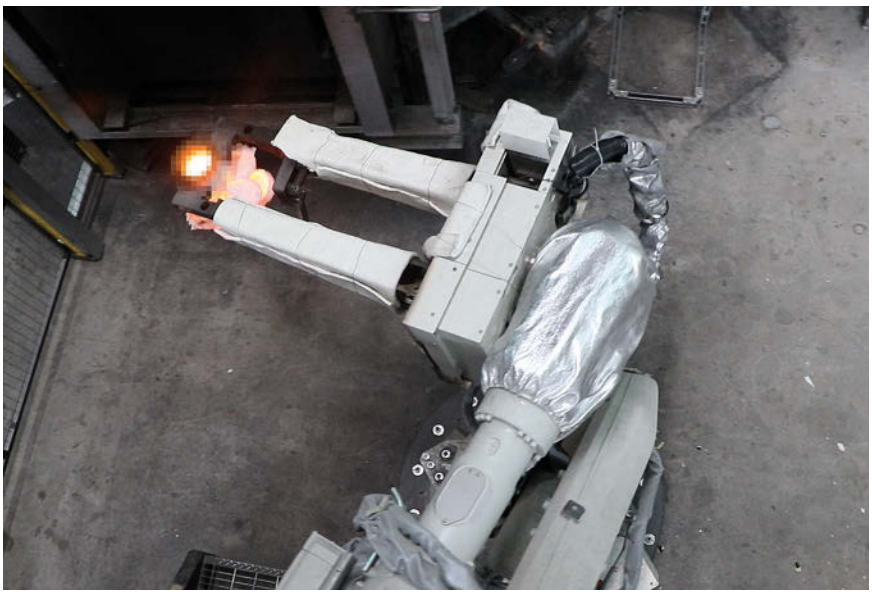


Figure 3: A robot is responsible for shell handling in the two-chamber vacuum casting plant.

for casting. An industrial robot feeds the shell to the lower chamber within a few seconds (see lead picture) and then the air is quickly pumped out to connect both chamber areas after vacuum equalization. The shell is then moved to the pouring position and the cast (Figure 1) is made by tipping the crucible. This optimized process more than halves shell cooling times. It is thus possible to reliably produce difficult-to-cast thin-walled parts because the cooling phase is reduced by two minutes, preventing casting errors (Figure 2) that could occur using the single-chamber vacuum casting plant due to early hardening of the melt. Investment castings, on which the cooling of the shell has less effect, are still cast using the existing single-chamber system. The investment casters at Black, however, have gone a step further and connected both plants, i.e. the single- and the two-chamber casting plants, to further automate the process. This connection was made by a robot that operates both systems simultaneously. The challenge here was mainly in the different timing of the plants. They were, however, able to coordinate the machines and the robot in such a way that the robot is responsible for shell handling and placement of the ingot in the single-chamber system. The insertion of the shell and ingot into the plant is also automated using the robot and a lifting unit. The same robot also operates the filling of the new two-chamber plant (Figure 2), achieving fully automated operation of the machines.

The coordination and movement of the shells by the robot is only possible with a sophisticated gripping system developed in-house by several project teams. So it was possible to arrange that the various ceramic molds with different structures are handled by only one robot gripper, fulfilling the process requirements of both the single-chamber and the two-chamber plants.

In a follow-up step, this concept is to be extended to other plants in the company. Full automation and integration of the new two-chamber plant has enabled Blank to achieve more rapid throughput and better quality for parts that are difficult to cast. In order to use the connected systems, it is necessary to coordinate the composition of the two clusters. This adjustment is now to be carried out on further models, so that in future more-and-more investment castings will be produced in series using the new concept. This will be the next challenge, according to Peter Schäfer, Manager of the Casting Department.

You can find further information on the topic here: https://www.feinguss-blank.de/en

Manuela Schmid, Press Manager, Feinguss Blank GmbH, Riedlingen.

THE BLANK GROUP OF COMPANIES – HIDDEN CHAMPION IN THE HEART OF UPPER SWABIA

Blank is a family-run company with more than 800 employees. It has been producing investment castings successfully for over 60 years, and exports them worldwide. The Blank Group – consisting of Feinguss- und Formenbau Blank GmbH, B² smart precision in Romania, and Feinguss Blank USA Inc. – is a leading group of investment casting foundries with a processing center in Europe. No other metal processing technique can produce similarly complex shapes at comparable prices like investment casting using the lost wax process. Investment castings made by Blank are characterized by first-class quality, accuracy down to the finest detail, and an almost inexhaustible variety of materials. Blank has therefore been the premium partner in the automotive industry, machine and plant construction, electrical engineering, precision mechanics, and many other sectors for more than six decades.

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Media Information

The leading English-language trade journal for the foundry industry with worldwide distribution:

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Issue # 2|2022

- Die-Casting
- Die-Casting Process
- Materials
- Casting Technology
- Simulation
- Cleaning & Finishing

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May 06, 2022

EUROGUSS in Nuremberg (Germany)
08.-10.06.2022

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09.-11.06.2022

Intermold Thailand (Part of Manufacturing Expo) in Bangkok (Thailand) 22.-25.06.2022

ALUMINIUM CHINA in Shanghai (PR China)
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CHINA DIECASTING in Shanghai (PR China)
13.-15.07.2022

62. IFC Portoroz in Portoroz (Slovenia)
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74th World Foundry Congress in Busan (Korea)
16.-20.10.2022

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FOOTBALL WORLD CUP 2022 Match Schedule

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The London Metal Exchange

Infrastructure for functional futures trading in commodities

Since 1877, the London Metal Exchange (LME) has become established as the futures trading exchange for international trade in industrial metals. With a market share of more than 80 %, most futures contracts (derivatives) for non-ferrous metals are transacted through the LME. This generates sales of more than USD 14 billion, representing a volume of about 4 billion tonnes of material.

By Patrick Heisch, Baden-Baden

This enormous trading volume of non-ferrous metal contracts accounts for about forty times total world production. This multiplication exists because an exchange generally buys and sells aluminum, for example, several times although the metal is only produced once. There are other important metal exchanges other than the LME, such as the Shanghai Future Exchange (SHFE) where many Chinese market participants trade, the New York Mercantile Exchange (NYMEX), and the Kuala Lumpur Tin Market (KLTM).

The London Metal Exchange only provides the infrastructure to enable a functioning trade in commodity futures (a trading floor with the 'Ring', office space, administration, a clearing house, etc.). The LME is not involved in the trading itself. This is carried out by brokerage companies that are subject to a strict approval and registration process, and are classified into different catego-

Photo: Shutterstock

The trading floor of the LME in London.

Photo: LME

The London Metal Exchange is one of the world's most important trading centers for metals, e.g. copper.

ries. At present, eight brokerage houses are approved as so-called Ring Dealing Members, and they are entitled to take their place on the red seats arranged in a circle (the Ring) and conduct trade. This circular arrangement stems from the time before the LME was founded in 1877, when one still met openly in the street (in front of the Jerusalem Coffee House) to carry out trading. A large ring was drawn on the ground in chalk in order to achieve a better overview, and the traders had to stand behind the line. That is why one still speaks of the Ring when the individual metals are traded at their fixed times.

Trading in the Ring

The individual metal contracts are traded in five-minute cycles during the four Ring meetings (between 11.40 a.m. and 5.00 p.m. London time). The Ring dealers sit at the spaces purchased by their companies and call out the offers or the requirements loudly and clearly. This is why one speaks of the so-called 'open outcry' that ensures transparent and comprehensible trading for the exchange supervisory authority, preventing any price-fixing. Conspicuous behavior by dealers in the Ring leads to a summons to the supervisory authority to clarify why, for example, dealers grinned at one another or made atypical signs to other dealers. All trading in the Ring is broadcast and recorded via microphones and several cameras under the LME's own supervision. Members of the supervisory authority also sit in the Ring to improve monitoring of the trading there. The use of mobile phones is forbidden on the trading floor because phone conversations cannot be monitored. As the LME is enormously important for the world economy due to its sheer volume of trade, the main priority of the exchange supervisory authority and the management of the LME is the absolute transparency of the business carried out here to demonstrate to the world the credibility of the exchange's trading. The LME is one of the world's last exchanges where such floor trading still takes place.

Whereby the second Ring meeting plays the most important role, because the closing contract agreed then is taken as the reference price (the LME Official Settlement Price) and is used as the price basis for fixing physical contracts worldwide. In addition to the actual floor trading in the Ring, trading is also increasingly being carried out via an electronic trading platform (LME-Select) where brokers can enter their purchase and sell orders into the system from 1.00 a.m. to 7.00 p.m. London time. 24-hour telephone trading provides a third option. If required, all market players can use this to participate in the trading or hedging of metals via their broker. This trading platform allows every market participant to telephone the office of their broker – whether in London, New York, Tokyo, Shanghai, Hong Kong, Singapore, or wherever their broker's office is open day or night – and to trade at any time around the clock. Information, for example in the late news on TV, about strikes or production outages caused by, for instance, a severe storm or disastrous natural catastrophe in a country that produces a raw material, may prompt metal processors to carry out a price-assurance maneuver by buying on the LME to protect themselves against the shortages expected due to the natural catastrophe, or to sell back short positions to avoid a loss-making price rise.

Brokerage companies, producers (mining companies, metal works), consumers (manufacturers of semi-finished products, foundries, processers) and speculative market participants such as banks, hedge funds or pension funds all take part in the trading. Whereby the suppliers and users of metals must have no direct access to the LME's trading. In order to buy or sell metal contracts via the LME, the suppliers and users of metals must approach a licensed LME bro-

Photo: Shutterstock

Currently, only eight brokerage firms are admitted to trade on the red seats 'Ring') are allowed to trade.

ker who will carry out the buy or sell order on behalf of their customers. Some brokerage firms also have their own positions (contracts) in their books and are thus also active dealers.

26 different contracts are currently traded: contracts for non-ferrous metals (copper, aluminum, zinc, nickel, lead, tin, aluminum alloys, primary aluminum), precious metals (gold, silver, platinum and palladium), minor metals (cobalt, molybdenum, lithium) and iron (structural steel, steel sheet and scrap steel). They must all be completed accurately for LME registration, meeting the demands of the processing industry and fulfilling the defined requirements of the LME. In the case of copper or aluminum this involves their electrical conductivity, ductility, tensile strength, maximum permissible chemical impurities, etc. The high technical and analytical standards must be constantly guaranteed by internal and external quality audits, and proven with ISO certification.

All metals sold on the LME must therefore meet very clear specifications regarding their quality, batch size and shape. These specifications are laid down in special LME contracts. An LME contract contains all the elements of a purchase or sale, such as contract date, contractual partner, amount traded in the form of the number of batches, total tonnage, price per unit (e.g. per metric tonne), due date (the so-called 'Prompt Date'). The LME thus takes on an important role in the functioning of the non-ferrous metal market. It basically has four core functions: price determination or a price allocation function by which supply and demand are brought into line in the LME offer via the pricing mechanism; the role of 'market of last resort'; the function of a price-hedging platform; as well as the storage and supply of metals.

Price determination

Market participants who want to buy or sell come together at the LME. It is a regulated marketplace for authorized traders who want to buy or sell the metals traded there. The LME thus fulfils the important function of price determination for the worldwide trading of metals. The price, e.g. for a tonne of copper, increases when the copper supply is smaller than the demand for copper. The copper quotations fall if the supply of copper exceeds demand. This continues until a price is found that that brings supply and demand into line. This results in an equilibrium price. This equilibrium price – frequently called the LME Settlement Price – forms the basis for fixing the settlement price at which the contracts for many metals are settled, e.g. with producers, refineries, semi-finished works, dealers, etc. The prices quoted in almost all metal contracts worldwide relate to the LME, assuming the metal in question is actually traded there. The LME therefore provides the function of price determination and the regulation of price levels through supply and demand.

Delivery = warehousing

Producers can store their excess quantities in an LME warehouse on their own account, or sell them to an interested exchange participant for storage. They thus free themselves of having to finance large stocks while metal processors, also for reasons of liquidity preservation, only collect the metals from the exchange warehouse as required. There are more than 600 LME-licensed warehouses in Europe, the USA and Asia for this purpose. The best known operators of LME warehouses are companies such as C. Steinweg GmbH or Henry Bath & Son Ltd. The warehouses are mainly found in regions with high demand for physical metal and with advantageous transport connections. Ports are, of

Photo: Shutterstock

Storage of aluminum in an LME warehouse.

course, also important for enabling the receipt of deliveries from overseas.

Hedging

It is also possible to protect against the risks involved in the prices for purchasing or selling metal quantities in daily business via the LME, i.e. to hedge. For example, a producer of secondary blocks purchases input material in the form of scrap at a fixed price per tonne based on the Exchange price valid at the moment contracts are concluded. On the sales side, however, the producer does not yet have a customer for their finished product. Its sale price will also be based on the Exchange price valid at the time of sale. The block producer thus faces a price risk because the price upon which the raw material is based is subject to constant change at the Exchange. Any profit calculated into the purchase decision can very quickly become impossible to realize because the price for the metal has fallen greatly – and the transaction can even become a loss.

For this reason, immediately after completion of the purchase or ideally at the same time, it is advisable to take an opposite position by selling to the LME to remove the risk of price fluctuations. As the block producer's usual purchaser (the customer) may not want to purchase yet due to current falling prices, the purchaser's only recourse here is the possibility of a forward sale of their metal to the LME, in the form of copper cathodes in this example. First of all, the producer thus ensures the price level and prevents any loss if the price goes down. Any loss of physical business is then compensated for by a profit at the LME. Or, conversely, if the price of the physical material on the sale day is higher than was paid for the original purchase, there is a loss when buying back the Exchange position. This, however, is then compensated for by a profit in the physical business. This example shows the important role of the LME: it enables market participants to use hedging contracts to protect themselves against any future losses that could be caused by price fluctuations.

Profits can, of course, also be created if purchases or sales remain unhedged, though then one finds oneself in a speculative situation – with the corresponding risks. Speculation is, however, generally neither desired nor tolerated by business managements.

There are several types of forward contracts (derivatives) available at the LME for such hedging transactions:

Futures contracts

Such a contract is the commitment to buy or sell a specified quantity of batches of a defined metal on a defined future date at a price agreed today. The contract matures up to three months in the future. Contracts exceeding these three months (up to 6 months) are each traded with weekly maturity (always on a Wednesday). Those valid more than six months are traded with monthly maturity on the third Wednesday of a month for up to 123 months.

Options

An option contains the right to fulfil a futures contract at an agreed Strike Price on the day of maturity, or to extend maturity or even let it expire. A commitment to fulfil only exists if the owner of the option, the so-called 'option writer' or grantor, has sold options and the purchaser has declared them. The Strike Price is the value per tonne upon which a futures contract is based at the time of purchase of an option. The most common types of options are:

Call Option: a purchase option (call) gives the purchaser the contractually

The LME in the 1970s to 80s. (Picture from London Metal Exchange: A Commodity Market by Robert Gibson Jarvie) The LME in the 1970s to 80s. (Picture from London Metal Exchange: A Commodity Market by Robert Gibson Jarvie)

THE HISTORY OF THE LONDON METAL EXCHANGE

Metals have always been an important commodity. England's significance during the Middle Ages was largely due to a lively exchange of goods with the European mainland – copper, lead and tin in particular were exported for hundreds of years. The picture changed dramatically, however, with the start of the industrial revolution in the 19th century. England became an industrial nation and its consumption of raw materials rose enormously. Suddenly, almost all metals had to be obtained from beyond Europe in order to meet the greater needs of the many factories. The rapid growth of the processing industries during the 19th century changed England into a country whose metal consumption was considerably greater than its production of metals. Tin was now an import metal and mainly came from Malaysia, while copper was obtained from the new mines in Chile. A similar development took place in Germany in its days of empire and here, too, the hunger for raw materials grew strongly.

The dealers at the Royal Exchange in London were already trading in metals in 1571, though more within the framework of individual discussions that took place within the rooms of the Exchange. A separate metal exchange only started to develop in 1877, though the trading did not initially have any fixed structure. The members continued to complete transactions in small groups or between one another in different parts of the room. The shortcomings of this type of trading, regarding both the speed and the open (and therefore probably more honest) provision of bidding and offer prices, soon became clear. Those who traded in copper and tin, the two main metals, which were also most suitable for trading in standardized quantities and qualities, very soon created a 'Ring', as was already found in some other goods markets. One of them used to remove a piece of chalk from a pocket, draw a large circle on the floor, and everyone gathered in a ring in various places which soon became their regular locations. This was how the basic principle of the LME was established, and the other metals gradually followed suit.

Photo: AdobeStock

Currently, 26 different contracts for metals are traded on the LME.

assured right to be able to purchase a specified amount of underlying asset on previously defined conditions (date, price, etc.). The counterparty to this contract is called the option writer because at any time until expiration of the period for exercising the option (the expiry day) they must be able to supply the reference asset, i.e. they may not sell the optioned asset. In return, they receive from the purchaser of the call a fee (a premium) that in most cases is higher than the earnings of comparable investments on the equities market. The purchaser expects rising prices. They can either sell the option to a third party or exercise it before the expiry day. Their risk is limited to their commitment, i.e. the premium. On the other hand, the seller is counting on stagnant or slightly falling prices. If a purchase option is not exercised it will expire without value.

Put Option: The purchaser of this option acquires the right to sell a certain reference asset (e.g. a tonne of copper) within a defined period at the agreed price (Strike Price). The counterparty of this contract is called the option writer (in money) because they must have the agreed purchase price available at all times until expiration of the period for exercising the option (the expiry day). For this commitment, the writer obtains a fee (premium) from the purchaser of the put option that in most cases is higher than the earnings of comparable investments on the equities market. The purchaser of a put option is counting on falling prices, and if they do fall will make an over-proportional profit from the option. If the purchaser is already in possession of the corresponding reference asset they can thus secure themselves against losses. If the price actually falls they then basically have two alternatives: they can sell the option at a profit and probably roughly offset the price loss for the reference asset; or they can sell the reference asset and speculate on a further fall in price with the put option. On the other hand, the seller of a put option expects rising or at least stagnant prices; in this case their counterparty is unlikely to exercise the option, so the option premium already received can be booked as a profit. Because, however, the option writer (in money) must honor the contract and purchase the asset if, against their expectations, the asset falls in price, their risk is considerable.

Monthly Average Futures

These are LME contracts between two partners whereby at the end of the contractual term the subsequent financial difference is offset by payment. These contracts contain both a fixed price and a floating monthly average settlement price (i.e. a commodity value based on the unknown future monthly average) for the commodity in the month of maturity.

Summary

The fundamental principle and core function of the LME have hardly altered during its 144-year history, even if there have been many new developments and changes. Metal producers and metal consumers use the quotations and services of the LME to fix their physical metal business and, above all, to hedge against the considerable risks posed by price fluctuations. Price risk management activities at the LME are in effect indispensable for the metal industry, particularly given the current enormous price volatility on the raw material markets (e.g. aluminum: 2021: +50 % or copper: 2021: +44 %) caused by a variety of factors (such as material shortages, rising energy costs and extremely high freight rates). The fact that in recent years the LME has developed from a market-regulating instrument of its members towards a profit-oriented company should not, however, be ignored. Speculative market participants such as hedge funds sometimes generate more than 80 - 85 % of turnover at the LME. Ultimately, the question remains about whether the traditional Ring trading still has a future because, since resumption of floor trading (following the end of the coronavirus lockdowns) turnover has fallen by up to 90 %.

www.metalquote.de/en/home-2/

Patrick Heisch, Metalquote Informationsdienste GmbH

The LEAP die-casting machine.

Photos: YIZUMI

Die-casting machines

Cold-chamber die casting with the LEAP series

The worldwide demand for vehicles with alternative drives has increased enormously in recent years. The new components required for them – complex and thin-walled, some with long flow paths – make greater demands of die casting. The LEAP series of die-casting machines from Yizumi promises maximum precision and repeatability.

By Stefan Fritsche, Foshan City, China

Having undertaken wide-ranging market research and performance comparisons with state-of-the-art technologies, Yizumi tackled the challenges of developing its new series of die-casting machines to implement a best-in-class machine technology. The LEAP series offers maximum precision and repeatability. Its modern control system is simple and intuitive for all users.

This technology platform forms the basis for intelligent cell integration and is intended to ensure maximum availability of entire plants. Yizumi also focused on developing suitable products for mold construction and for optimizing the casting process in order to further support customers in achieving competitive overall equipment effectiveness (OEE).

With its high precision and casting process repeatability, the separately developed Yi-Cast casting unit with real-time control improves the casting performance of the LEAP series. Supplemented with an innovative and energy-saving hydraulic drive group as well as a state-of-the-art control panel with intuitive user-oriented programming, the LEAP series enables the intelligent exchange of information on quality, operating performance and process set-

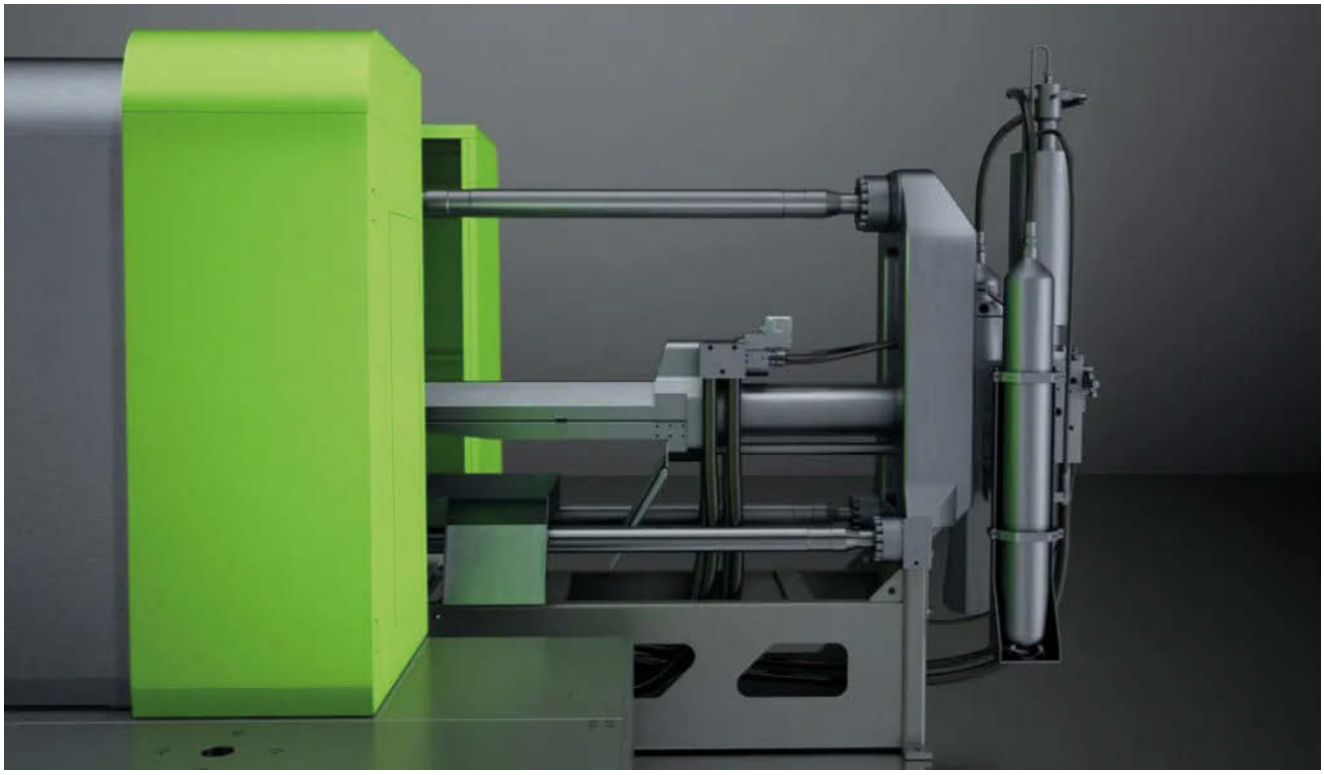


Figure 1: **The injection control system ensures high quality for every shot.**

tings. This makes operating these die-casting machines simple, efficient and transparent.

Product development with international collaboration

Yizumi actively employed integrated product development (IPD) methods that concentrate on customers' various needs and requirements. The developers came to understand the challenges facing their customers' employees in their various roles – in production, maintenance and operation of the die-casting cells. Over several years they thus gained valuable feedback through first-hand observation and studies, enabling them to assist customers achieve a quantum leap in their production with the help of the LEAP series.

International collaboration is the driving force behind the company's technological alignment. In order to create a new generation of powerful products, Yizumi committed itself to integrating advanced European die-casting technology. This included the integration of global resources, the construction of a Sino-European technology platform, and the involvement of European die-casting experts to overcome the technical challenges together. At the same time, the company further developed the core competences of its Chinese engineers – from the transfer of knowledge to active implementation.

Yizumi made considerable investments in the research and development of casting processes to build up a high level of internal expertise on the die-casting process. The company's own Product and Process Application Center (PPAC) is a very good platform for carrying out a variety of casting experiments, for testing tools, and for providing training courses on foundry technology. Setting up the PPAC involved close collaboration with carefully selected international specialists to train its own team on casting processes and tool design. Yizumi can thus also offer its customers technological support – enabling them to better survive in this highly competitive market.

The partnerships set up with European experts in a variety of key technological areas enabled the technology team to consider engineering chal-

Figure 2: **The ORCA control system provides easily understandable intuitive operation.**

Figure 3: **The toggle lever system has been completely reworked.**

lenges from a variety of perspectives, and thus find innovative solutions from which customers can benefit. "We are proud to contribute our more than 30 years of experience in die casting for this international project. It is very exciting and interesting for us to work closely with the Yizumi team," says Andre Dylong, Managing Director of DSD, Yizumi's European service partner.

Success in performance comparisons

The new generation of the LEAP series is the result of collaboration between the experienced international R&D team and Yizumi's technical team in China. "It is characterized by greatly improved casting performance and an intuitive MMI control panel. The improved mold-shooting system and an energy-saving drive group make LEAP an efficient, stable and automated die-casting production unit. Use of the independently developed Yi-Cast casting unit with real-time control guarantees consistently high shot quality," explains Wang Bo, Manager, Product and Market Management at Yizumi's Die Casting Division.

During injection control, precisely coordinated algorithms developed in-house combined with a high-performance control system, high-speed pilot valves and special servo valves ensure first-class shooting performance (Figure 1). The real-time regulatory system recognizes all process deviations and immediately adapts the injection process automatically. This considerably improves the repeatability of processes and the consistency of casting quality. Discontinuation of the injection speed to complete mold filling reduces sprue formation and increases both the productivity and service life of the tool.

The ORCA control system is also the result of close collaboration with renowned European specialists (Figure 2). With the help of this control system, users can easily and effectively administrate, adapt and monitor production parameters – such as speeds, pressures, path points, piston resistance in the shot sleeves, pressure build-up time, injection stroke, sprue thickness, vacuum level, clamping force, temperatures and technological data, etc.. This makes it possible to maintain constant high production efficiency and process quality. Intuitive and easily understandable graphic displays cut programming time and reduce the need for training. The control panel menu offers equally easy access for operators, process engineers, maintenance teams and quality managers. The user interface, with a large 24-inch touchscreen, ensures direct access to programming functions, warning messages, and the multifunctional shot curve display. The adjustment of tolerance ranges for critical process parameters and the SPC data management system simplify quality management and ensure maximum overall equipment effectiveness (OEE).

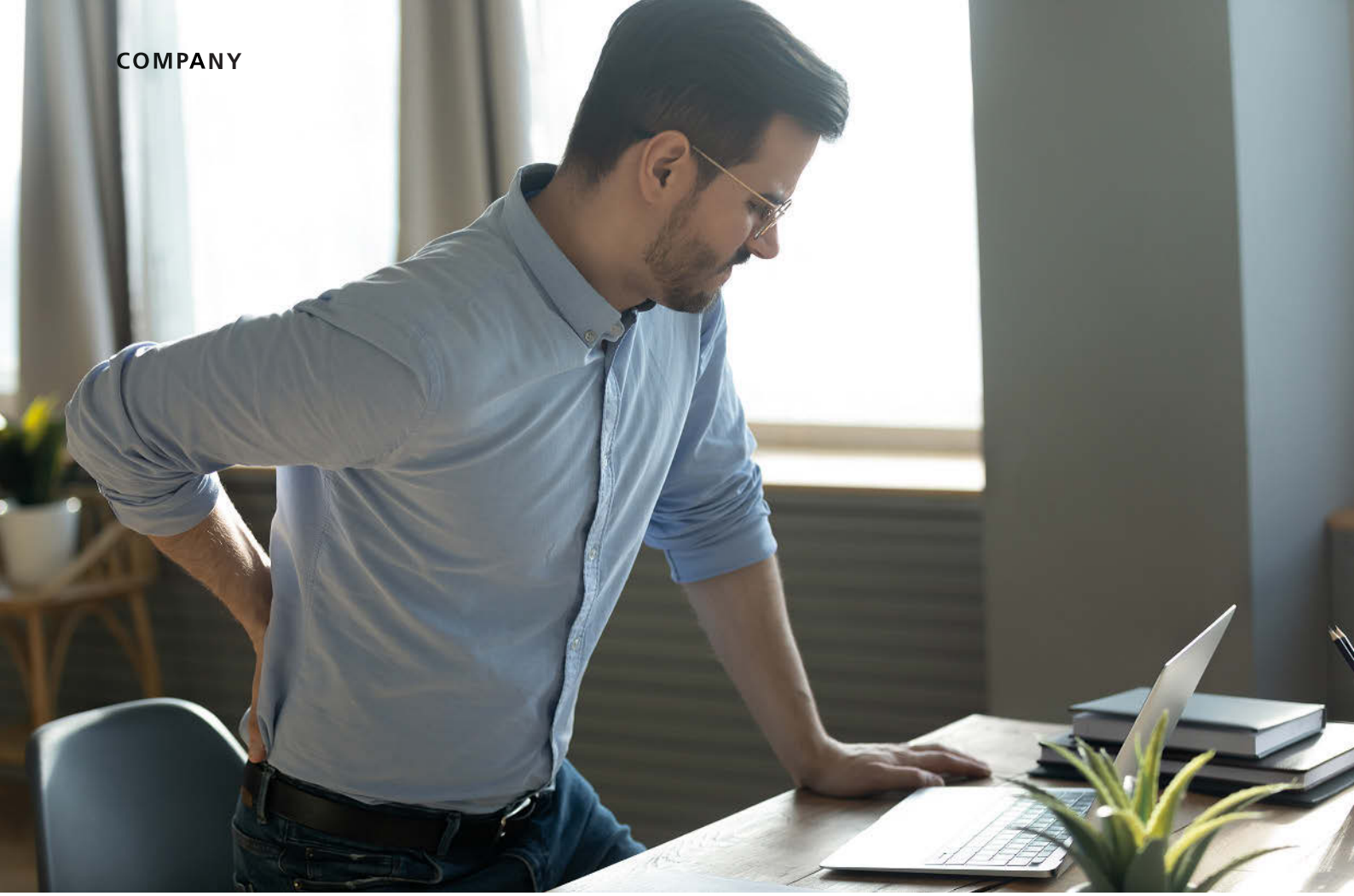
A completely reworked toggle lever system was also designed for the series – for longer service life and greater plate rigidity (Figure 3). In combination with the innovative hydraulic drive system, clamping and opening times can be up to 10% quicker. The servo drives, proven over many years, reduce energy consumption by up to 40%. The simple programming of speeds, automatic mold construction height, clamping force, and precise mold position stops also contribute towards overall efficiency. Flexible energy tables allow simple adjustment and adaptation of all energy and functional connections between the die-casting machine and the tool.

Prospects

The LEAP series is suitable for all process requirements in the casting of aluminum or magnesium alloys, as well as semi-solid applications. The first available model of this series is the 1250T. Further clamping forces of from 400 to 5000 tonnes will follow to complete the series.

www.yizumi.com

Stefan Fritsche, CSO Die Casting & Metal Molding, Yizumi



Employees in the office at work or in their home office must contend with the causes of illness, some of which originate in their private lives.

Employee health

Promoting and maintaining health – holistically

Many illnesses that company employees suffer from – such as mental problems, back pain and cardiovascular disorders – have their roots in their private lives. Workplace health promotion must also take this into account.

By Sabine Machwürth, Visselhövede

Drafts. Poisonous gases. Deafening noise. Companies can easily identify such sources of illness at the workplace. The same applies when an employee in a production area has their hand squashed while using a stamping machine, for example. Then it is instantly clear what caused the accident. Then companies can also take immediate countermeasures.

Hidden sources of illness

The same is not true for office work – regardless of whether an accident takes place at the company or while in the home office. It is often not evident at first glance what has impacted the employee's health. Nevertheless, there are also sources of illness in office work – they are just different from those in the production area. This can be seen when one looks at the most frequent illnesses of office workers. Apart from infections, these are:

> spinal disorders and problems with the locomotion system,
> cardiovascular and metabolic disorders, as well as
> psychosomatic illnesses.

These so-called 'civilization diseases' cause almost 80 percent of work days lost due to illness – also because they are often chronic.

Start with prevention early on

This is why prevention of these problems should start as soon as possible. The experts all agree on this. What is less clear, however, is how to avoid them – because these illnesses often have no single clear cause. Thus, for

Photos: Adobe Stock

Active collaboration, e.g. in health circles, helps trace the causes of illness.

example, stress causes or contributes to many cardiovascular and psychosomatic illnesses. This, however, can be triggered by many factors, for example deadline pressure or overwork. And what a particular person perceives as stress is subjective. On being given a new task, one employee thinks, "Super, now I can finally prove myself," while another is gripped with panic: "I'll never manage that." Such personal thought and behavior patterns play an important role in the perception of stress.

But workers do not only display this thought and behavior pattern at the workplace, but also in their free time. Those who are most rapidly stressed at work often cannot find peace in their private lives either. Consequently, work lives and private lives are generally closely interwoven with one another when stress is involved as a cause of illness.

This also applies for other risk factors that frequently trigger the above-mentioned civilization diseases. Unhealthy nutrition, for example. Those with a fondness for meat and French fries at the works canteen are unlikely to eat salad and wholegrain bread at home. This is also the case regarding lack of physical activity. Many office workers also spend most of their free time sitting – for example in the car, watching television or in front of a games console.

This is why companies that have a prevention concept that solely concentrates on the health-promoting design of workplaces do not achieve much. They should have a holistic view of people. But companies do not have any direct influence on what their employees do in their free time. They cannot dictate that the workforce should stop smoking, or go jogging twice a week. Such behavioral changes cannot be ordered by decree. They are only possible when employees recognize their advantages, and experience behavioral change as a personal gain. This is why most corporate health promotion concepts no longer focus on the aim of 'preventing illness' per se. Instead, the objective is to promote and maintain the wellbeing, performance capacity and joie de vivre of their employees.

Active cooperation is required

This can only happen when employees actively participate. For example in health circles, which can also take place online; in other words discussion groups in which the employees themselves determine which factors negatively impact their wellbeing, and how they can be overcome. Thus

Employers cannot insist on healthy nutrition …

aspects that promote illness – and which outsiders would find difficult to uncover – come to light. For example, deficiencies in communication and management culture. Or working hours and staffing schedules that run counter to the needs of the employees. They, too, can reduce the wellbeing of personnel. This is why one does not get far with patent solutions when it comes to the topic of health promotion.

Nevertheless, there are some useful factors that characterize modern preventive concepts. They do not purely involve the provision of information, for example. Because knowledge alone does not usually lead people to change their behavior. This can be seen with the example of smoking. Nowadays everyone knows that smoking harms health. But 23 percent of adults in Germany still smoked regularly in 2019. This shows that health promotion concepts that rely solely on information are seldom successful. So they are often enhanced with elements of training and diagnostics.

Training new thought and behavior patterns

Diagnostic elements, such as determining blood values, make sense because of the differences between the subjective physical perceptions and the objective heath data of many people who are not yet sick. Thus, for example, a 35-year-old highly energetic male manager who is told that heart attacks are the most frequent cause of death among the under-60s mostly reacts with a shoulder-shrugging "So what?" But if one presents the same person with his health data – showing that he has a considerably higher probability of suffering a heart attack next year than the average for the population – he will be more concerned. Then he will almost inevitably ask what he should do to prevent the heart attack.

Then it is by no means enough to tell him, "You should eat more healthy foods, move more, and make time for relaxation." because most people already know this. It is far more important to show the person, for example, how they should do sport that promotes their health, and describe relaxation techniques – at the workplace, too, or between two appointments.

Key role for managers

Another feature of almost all modern health promotion concepts is that managers play a key role because they largely influence the employees' working conditions. Stress is generated if a 'boss' provides no clear instructions and employees do not know what they have to do. And it is no better when the 'boss' regularly pillories employees for mistakes. Then they are plagued by anxiety: "I hope I don't do anything wrong." Their wellbeing is also not helped when a company believes that the longer an employee is in the office and at their desk, the more valuable they are. In such cases it is predictable that the lives of the employees will

Photos: Fotolia

…nor sufficient physical activity.

become unbalanced – because they hardly have any time left for their families, their hobbies, or to relax.

So it is important that managers are made aware of the significance of health and the work/life balance. Managers are role models for their employees – both positively and negatively. Most companies have recognized this. So most of the larger companies now have special health promotion programs for their managers – also because the companies know the direct and indirect extra costs that arise when a high achiever is absent for a long time.

A challenge: reaching all employees

Many companies, however, still have problems extending the health promotion system to the entire workforce. It is still not unusual for the majority of employees to be subjected to numerous apparently arbitrary individual measures – starting with stress management seminars and extending to informative events on the topic of nutrition. All these measures are meaningful, and it is good that companies offer them. But, unfortunately, they often do not achieve the desired effect because they are not embedded in any coherent overall concept.

Reports by health insurance companies often play a key role in the creation of such concepts. Companies can find out from them which illnesses affected their employees during the previous year, and in which departments they frequently occurred. They also provide information on what changes were achieved compared to the year before. And what illnesses affect the employees of other comparable companies.

One shortcoming of the health reports, however, is that they only reflect the illness data. They provide no details on what percentage of the employees suffer from stress, how many have high blood pressure, and how many are overweight – information that is important for preventive work. So a growing number of companies are carrying out regular screening events, where employees can have their blood values or body fat percentage determined anonymously and voluntarily.

The data gained from such events flows into a central database so that the company then knows, for example: that about 30 percent of their employees have elevated total cholesterol levels; 40 percent are overweight. Another way to gain the desired information is to survey employees themselves by asking them, for example:

> Do you suffer from stress?
> What causes you stress?
> How does stress affect you?

Such surveys are very helpful, particularly when the working conditions of many employees have changed radically due to working more in the home office, because the information gained can be used to develop measures adapted to the needs of the employees.

Taking individual needs into account

These, however, do not yet meet individual needs. Ultimately, recognized stress symptoms for example, such as muscle tenseness, stomach complaints and anger, can have the most varied of causes both at work and in private lives. The same applies when someone has the feeling that “everything is getting to be too much for me”. This can also be caused by teenage children being constantly ‘annoying’.

Such factors are usually impossible to address in (online) seminars and meetings attended by many people – above all because they involve the private lives of the employees. So companies are increasingly also offering their employees the possibility of contacting a health coach anonymously to:

> analyze what is troubling them and why, as well as
> draw up an individual action plan together.

Many companies have had positive experiences with an appropriate combination of support measures, above all because they link the preventive measures intended for all employees with individual support and encouragement.

www.mticonsultancy.com

Sabine Machwürth is Managing Partner of the corporate consultancy Machwürth Team International (MTI Consultancy), in Visselhövede (D), which supports companies in the development, implementation and realization of customized digital and hybrid health promotion programs, among other things.

Photo: Mercedes-Benz Group

Mercedes-Benz EQS

HECK & BECKER/HANOMAG LOHNHÄRTEREI

Ready-to-install prototype component for new Mercedes EQS

Heck & Becker GmbH & Co.KG and the Hanomag Lohnhärterei Group will present the A-pillar for the new Mercedes EQS at EUROGUSS, which will be held in Nuremberg, Germany from 8 to 10 June 2022.

The joint project between Heck & Becker GmbH & Co. KG and the Hanomag Lohnhärterei Group began back in 2018. The initiator for the cooperation was the order from Mercedes to manufacture the prototypes of the A-pillar for the latest luxury electric model, the Mercedes EQS. As part of the close collaboration, Heck & Becker's casting technology experts produced the castings using the K1 prototyping process at the Heck & Becker Diecasting Technology Center (DTC), replacing the sand casting process previously used in this area. The advantages are obvious: "By using the die-casting process, which is ultimately also used to manufacture the series components, we can represent at an early stage exactly the properties that are expected in the series parts that are later installed. With the special K1 prototyping process, we create the conditions to produce the components in 12 weeks from the design freeze. With a series mold, on the other hand, you would have to reckon with a manufacturing time of four to five months until the first castings are available", states Martin Baumann, Managing Director at Heck & Becker.

After production at Heck & Becker in Dautphetal, the prototypes were solution annealed at Hanomag Lohnhärterei GmbH in Hanover using individually tailored heat treatment parameters, manually straightened and then artificially aged. The Hanomag Lohnhärterei Group is a leader in Germany in heat treatments for steel and aluminum materials that are individually tailored to the material. For the completion of the parts, the company relies on Herbst Zerspanungs- und Messtechnik GmbH in Hildesheim, which, as a member of the Hanomag Lohnhärterei Group, specializes in the mechanical machining of prototypes.

"Many reasons were decisive for the successful cooperation," says Hanomag Managing Director Karsten Seehafer and continues that the cooperation includes the entire process competence for aluminum components. "The advantage for our customer is that he receives all production steps from a single source and significantly faster," emphasize the two managing directors Karsten Seehafer and Martin Baumann, clarifying that the client has nothing to do with internal coordination and logistics. Both companies attach great importance to the fact that the customer does not have to worry about auditing the entire supplier chain - regardless of whether prototypes, replacement or series components are involved - but only has to approve the final product.

www.heck-becker.com
www.haertecenter.de/en/

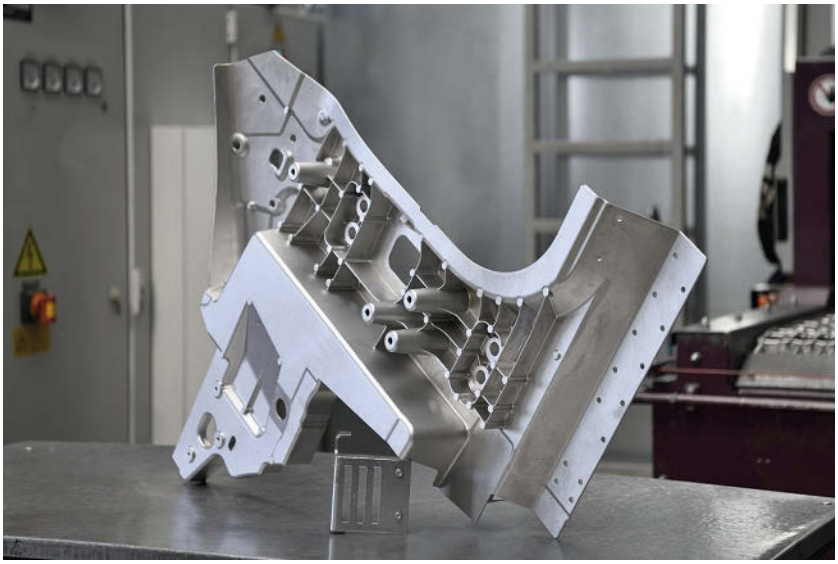


Photo: Daniel Moeller Fotografie

A-pillar for new Mercedes-Benz EQS.

GAS ANALYSIS

Portable gas sampling probe

In addition to stationary analysers, gas analysis for monitoring emissions also uses portable methods. The actual measuring task determines the complexity of the sampling/ analysis units. Since not all control points are easy to access, operators are interested in suitable and light equipment with a compact size.

In the field of emission monitoring, but also in other fields of application of gas analysis, it is common to check the function of stationary analysis systems at regular intervals by means of transportable measuring instruments. In addition, there are applications - e.g. exhaust gas monitoring - in which gas analysis is carried out at intervals.

It is a necessity that the portable measuring equipment is of high quality, especially for control measurements since they are mostly carried out by external monitoring companies. The purpose of these controls is to verify the reliability of the measurement results from the stationary analysis system. Thus, the data measured during these interval measurements is expected to be as reliable and precise.

To obtain precise test results in these fields of application, it is necessary that the measuring equipment is easy and safe to handle as well as light weight, in addition to the already mentioned high quality.

Buehler Technologies - a global supplier of equipment for gas analysis - has a comprehensive programme for portable gas analysis in its portfolio. It consists of a gas sampling probe "Smart Sample Tube" which described with more detail below, the "Smartline", a heated sample gas line with integrated particle filter and the PCS Smart series, a range of sample gas conditioning systems.

The main design criteria for the gas sampling probe – the "Smart Sample Tube" were the lowest possible energy consumption combined with the avoidance of cold bridges and a high degree of protection against accidental contact for the measuring technicians. The sampling tube protruding into the process stream is heated internally. The power connection required for this and the controller for controlling the heating are located within an insulating housing made of silicone. The connector for the sample gas line – "Smartline" is also located inside this housing. It is easily accessible through a closable opening on the side of the housing. The sealing cap is inextricably linked to the housing. The dimensions are matched in such a way that the filter housing of the sample gas line directly adjoins the insulating housing of the gas sampling probe. This avoids any cold bridge both at the sample gas line and at the end of the external probe. At the same time, the insulating housing offers excellent contact protection.

A calibration connection and a fixing bracket with a 2-metre safety chain are optionally available.The sampling tube is available in lengths of 0.5 m; 1.0 m; 1.5 m and 2.0 m and has an outer diameter of 25 millimetres. The power supply is 115V or 230V AC 50/60Hz. The heating capacity depends on the extraction tube length as well as the supplied power and ranges from 103 to 500 watts. The weight of the "Smart Sample Tube" is between approx. 2 - 4 kg, depending on the selected variant.

https://www.buehler-technologies.com/

Photo: Buehler Technologies

Buehler portable heated sample tube.

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INDUSTRIAL PROCESSES 4.0

Atlas Copco develops vacuum controller

Atlas Copco has developed the industrial vacuum controller of the future. It serves as an enhanced control centre for vacuum pumps and systems. Ensuring higher vacuum performance and functionality as well as increased user empowerment across a large range of applications. By also offering increased connectivity and system integration, HEX@ brings convenient remote access to their vacuum system with increased control anywhere.

Photo: Atlas Copco

Atlas Copco HEX@ controller: smart functions, optional HMI features.

HEX@ has a clean and intuitive user interface. This is vital. HEX@ users access key data directly on the home screen and can access further settings and controls easily using the on-display menu. Relevant pump data is displayed quickly and legibly. "The controller can be individually configured by our customers so that only selected values, such as discharge temperature, power consumption or inlet pressure are displayed" explains the responsible product manager at Atlas Copco, Alistair Darroch.

The communication options for HEX@ enabled pumps are also diverse, users can access the unit remotely using smartphones, tablets, laptops or PC; alternatively, access can be via the onboard HMI interface or a local device connected to the machine using wired or WiFi based connections.

"Customers can choose to connect fully to their local network and also the cloud to take complete advantage of a fully connected pump including automatic updates to software and functionality as well as remote support from Atlas Copco in the event support is required. If this level of connectivity is not desired, HEX@ can connect only to the customers network or even not at all" informs Alistair Darroch. Further, HEX@ will also support other communication protocols such as Ethernet/IP, EtherCat, Profinet, Modbus TCP, Profibus and OPC UA.

The HEX@ controller is continuously collecting and processing a wide range of pump data. When it comes to making use of this data, Atlas Copco have defined four elementary yet powerful vacuum system attributes we can use to evaluate a vacuum system: Uptime, Performance, ECO and Health.

These indicators allow customers to quickly assess the status of their vacuum pump, to understand the impact of any changes made on their vacuum system and ultimately, their process.

> The uptime is the indicator for the availability of the pump. It documents how long the pump runs without failures.
> In the case of performance, HEX@ considers if the pump is achieving the required vacuum targets set by the customer.
> The so-called ECO status provides information about the efficiency potential of the vacuum pumps. By comparing the targeted set-point pressure with the current operating pressure, users receive feedback if vacuum pump is using more energy than necessary.
> Finally, the health status evaluates failures and key measurements to assess the pumps current status and also takes into account when services are due. Informing the customer if their pump health can be improved.

"These four key performance indicators (KPI) are used to draw conclusions about the

current conditions on what we introduce with HEX@ as Insight Cards, which provide

feedback on the status of the vacuum system as well as optimization recommendations," says Alistair Darroch. In addition, they include recommendations for increasing pump life, reducing energy consumption, improving the carbon footprint and extending maintenance intervals.

The configured pump settings can be saved as a "mode" and then recalled at any time. The appropriate mode ensures that the pump also calls up the required performance. These HEX@ modes can be accessed easily and quickly by the user by pressing a button on the control panel or by accessing the pump remotely. This is not all, the HEX@ has additional smart functionalities, such as Trends: Trends showcase historic data to give valuable overviews of various measured parameters, including data on inlet pressure, engine speed, power consumption oil temperature and more. By comparing the current and historic data, users can better understand the consequences of changes in process or pump settings.

www.atlascopco.com/vacuum

METSO OUTOTEC

New heavy-duty slurry pump

Metso Outotec introduces the Metso Outotec MDM900 mill discharge slurry pump, the latest addition to its flagship Mill Discharge (MD) Pump Series.

The massive MDM900 is one of the world's largest mill discharge slurry pumps, designed for heavy-duty use in concentrator plants, where capacity and wear-resistance are of essence. The MDM900 is an all-metal, thick-walled, extra heavy-duty pump designed specifically for extremely arduous mill duty applications.

Photo: Hersteller

Metso Outotec MDM900 mill discharge slurry pump.

"Slurry handling is vital in maximizing a minerals processing plant's productivity and efficiency. The advanced design of the MDM900 enables minimized slurry velocities in the pumps, thus reducing the rate of wear significantly. This translates to increased uptime and productivity for our customers. We are also proud to have implemented many environmentally sustainable design initiatives in the MDM900 pump, which is part of our Planet Positive offering, as are all our MD Series pumps. As examples of its environmentally sustainable features, I would like to mention the reduced footprint of this massive pump, and its standard low-flow shaft seal to minimize the pump's freshwater requirement during operation," says Diwakar Aduri, Product Manager for MD Pumps at Metso Outotec.

Specifications of the MDM900 mill discharge slurry pump

> Flows up to 13,500 m³/h (60,000 gpm)
> Heads up to 40 m (132 ft)
> Frame: FR2100
> Impeller diameter: 2100 mm (83 inches)
> Inlet size: 900 mm (36 inches)

The MD pumps have been designed for efficient operation and long wear life to match the mill's uptime. Metso Outotec's MD Series pumps come in two tailored solutions, MDM and MDR. The MDM (Mill Discharge Metal) pumps are available in size ranges of 250-900, and the MDR (Mill Discharge Rubber) models come in size ranges of 250-700. Both pump types are suited for heavy-duty use in concentrator plants offering excellent resistance to abrasion and erosion.

www.mogroup.com/

HUMBOLDT RESEARCH AWARD WINNER

Prof. Haruyuki Inui joins the MPIE

Prof. Haruyuki Inui, professor of materials science and engineering from the Kyoto University (Japan), has been granted the Humboldt Research Award in November 2021.

This renowned award, endowed with 60,000 euros, is presented annually by the Alexander von Humboldt Foundation to internationally recognized scientists from abroad to support collaborative projects with researchers in Germany. Inui plans several research stays in Germany, and the Max-Planck-Institut für Eisenforschung (MPIE) in Düsseldorf is proud to be one of his host institutions.

"We are most exited to welcome Haruyuki soon at the MPIE. He is a worldwide leading material scientist and expert in crystal mechanics and high-entropy alloys. We will intensify our cooperation with him in both fields.", says Prof. Dierk Raabe, director of the department "Microstructure Physics and Alloy Design" at the MPIE. Together with Prof. Martin Heilmaier from the Karlsruher Institute of Technology (KIT), Raabe successfully nominated Inui for the Humboldt Research Award.

Inui is also an expert on intermetallic phases which play a significant role in the development of new types of structural materials for extreme environmental conditions, e.g. in the field of combustion processes. For decades, the fundamental research work at Kyoto has been trend-setting for worldwide research in this field, which eventually enabled the commercial use of TiAl-based materials in aircraft engines. The main topic of his research is the experimental investigation of the deformation of metallic and intermetallic materials from the nano- up to the macro-scale. In doing so, he spans the range from complex iron- and cobalt-based superalloys to novel intermetallic phases and so-called high entropy alloys – in the materials science and engineering community currently a hot topic to which the award winner has also contributed substantially.

Inui plans to spend his stay associated with the Humboldt Research Award in Germany beginning in 2022, at the MPIE, the KIT, the Ruhr-Universität Bochum and the University Bayreuth.

Photo: Max-Planck-Institut

Prof. Haruyuki Inui, Humboldt Research Award winner.

www.mpie.de/2281/en

SMART GLASSES

Seeing through the eyes of the mobile worker

Wearables for industry rethought: The Pepperl+Fuchs brand ECOM Instruments, together with its cooperation partner Iristick, is introducing Visor-Ex® 01 smart glasses for industrial use in hazardous areas.

The intelligent wearable, weighing just 180 g, combines high camera / display quality and reliable communication features in an ergonomic design for user's utmost comfort. This provides mobile workers with an optimal companion for tasks that require hands-free use as well as continuous communication, for example with remote expert support. A total of three integrated cameras transform Visor-Ex® 01 into the remote expert's bionic eye. Two 16-megapixel cameras are centrally positioned to depict the wearer's natural field of vision – this way remote support views what is happening from the same angle and perspective as the mobile worker. A secondary camera offers a 6x optical zoom for zooming without loss of quality and scanning of barcodes and QR codes.

The system utilises the ECOM Smart-Ex® 02 smartphone for hazardous areas as a computing unit with LTE connectivity and a pocket unit with a replaceable battery for power supply, an intelligent ecosystem is created for a wide range of application scenarios in the industrial sector. The distribution of functions across the individual system components helps to minimise the weight of the headset unit – without compromising on performance, connectivity or battery life. By connecting to the Smart-Ex® 02, users can continue to use their tried-and-tested smartphone for harsh environmental conditions without restriction and benefit from all the advantages and security features and controls of the Android 11 operating system, including over-the-air updates, ease of use and TCO.

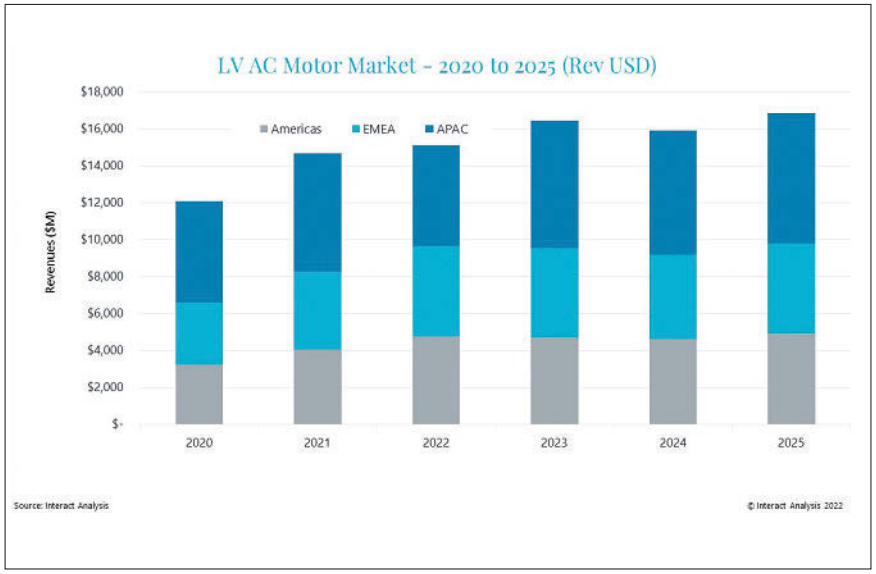
Photo: ECOM Instruments

The Visor-Ex® 01 from ECOM Instruments are smart glasses for industrial use in hazardous areas.

Visor-Ex® 01 will be certified for ATEX/IECEx Zone 1/21 and 2/22 as well as NEC/CEC Division 1 and 2 and will have protection class IP68. It can be used within a temperature range of -20 to +60 °C.

LOW VOLTAGE AC MOTORS

Market grew 21.5% by revenue in 2021



New research from Interact Analysis shows that the low voltage motors market saw the highest revenue growth in living memory during 2021, driven by historic price increases as a result of supply chain disruptions.

Growth in unit terms of 6.6% was much more in line with the broader rate of recovery seen in the manufacturing sector globally. Supply chain disruptions have included shortages of key components and raw materials – with steel, copper, and aluminum in particular reaching record highs in 2021 – as well as major increases to shipping prices.

China continues to be the world's largest motor market and, although ABB and Siemens continue to be global market leaders, domestic Chinese companies, including Wolong Electric and Wanan Motors are now entering the top ten global suppliers. During 2022 we expect to see Wolong hit the top spot in APAC, which will be a first for a Chinese supplier.

Despite strong performance in 2021 the overall machinery production sector is expected to suffer a short period of contraction in 2023/24 as a result of rising interest rates. This will be felt in the motor market. Europe in particular is expected to suffer from this period of downturn as it is heavily weighted towards machinery production.

Shipping rates have created a significant problem for the LV motors market, with the 2021 container shortage seeing rates increase tenfold. They will not return to normal anytime soon, if ever. A combination of high demand and an increased number of truck drivers exiting the industry does not bode well for the market. The knock-on effect of this coupled with the rise in energy prices has caused an exponential rise in raw material costs. In particular, steel prices are through the roof (and will remain so for the foreseeable future), which is having a major impact on the price of motors.

Blake Griffin, Senior Analyst at Interact Analysis comments, "For me, one of the most interesting findings of this research is related to new high efficiency IE4 and IE5 motors. There is a lot of hype surrounding them, but the market has shown that it will generally not adopt them unless forced to by legislation. Currently, the IE4 & IE5 motor market is in its infancy with a market size of $134 m in 2020. But major growth is predicted in the European Union which is putting IE4 minimum efficiency performance standards in place."

About the Report:

To produce this report, Interact Analysis conducted interviews with suppliers and users of LV motors to reach a comprehensive understanding of forces driving the market. Interact Analysis collected data directly from suppliers to form a bottom-up analysis market size and supplier shares. Additionally, Interact Analysis has modelled demand for LV motors at the country and industry level. This resolution of data is formed thorough a proven methodology which Interact Analysis has iterated upon since the founding of the company.

www.interactanalysis.com

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🌍: www.keytocasting.com/

03 Melting Plants and Equipment for NFM

03.02 Melting and Holding Furnaces, Electrically Heated

▼ Aluminium Melting Furnaces 630

LOI Thermoprocess GmbH
45141 Essen/Germany
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Internet: www.loi.tenova.com

▼ Remelting Furnaces 700

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E-Mail: service-loi@tenova.com
Internet: www.loi.tenova.com

04 Refractories Technology

04.01 Plants, Equipment and Tools for Lining in Melting and Casting

▼ Mixers and Chargers for Refractory Mixes 930

UELZENER Maschinen GmbH
Stahlstr. 26-28, 65428 Rüsselsheim, Germany
☎ +49 6142 177 68 0
E-Mail: contact@uelzener-ums.de
Internet: www.uelzener-ums.de

▼ Gunning for Relining of Cupolas 950

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Internet: www.uelzener-ums.de

04.02 Refractory Materials (Shaped and Non Shaped)

▼ Refractories, in general 1040

EIKA, S.COOP
Urresolo 47, 48277 Etxebarria
☎ +34 946 16 77 32
Internet: Spain
E-Mail: aagirregomezkorta@isoleika.es
Internet: www.isoleika.es

Refratechnik Steel GmbH
Refratechnik Casting GmbH
Am Seestern 5, 40547 Düsseldorf, Germany
☎ +49 211 5858-0
E-Mail: steel@refra.com
Internet: www.refra.com

▼ Insulating Products 1130

EIKA, S.COOP
Urresolo 47, 48277 Etxebarria
☎ +34 946 16 77 32
Internet: Spain
E-Mail: aagirregomezkorta@isoleika.es
Internet: www.isoleika.es

▼ Micro Porous Insulating Materials 1220

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Internet: www.isoleika.es

▼ Ladle Refractory Mixes 1240

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Internet: www.uelzener-ums.de

04.04 Refractory Building

▼ Maintenance of Refractory Linings 1462

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☎ +49 6142 177 68 0
E-Mail: contact@uelzener-ums.de
Internet: www.uelzener-ums.de

05 Non-metal Raw Materials and Auxiliaries for Melting Shop

05.04 Carburization Agents

▼ Coke Breeze, Coke-Dust 1680

ARISTON Formstaub-Werke GmbH & Co. KG
Worringerstr. 255, 45289 Essen, Germany
☎ +49 201 57761 🖷 +49 201 570648
Internet: www.ariston-essen.de

08 Plants and Machines for Moulding and Coremaking Processes

08.02 Moulding and Coremaking Machines

▼ Multi-Stage Vacuum Process 3223

Pfeiffer Vacuum GmbH
35614 Asslar, Germany
☎ +49 6441 802-1190 🖷 +49 6441 802-1199
E-Mail: andreas.wuerz@pfeiffer-vacuum.de
Internet: www.pfeiffer-vacuum.de

09 Moulding Sands

09.01 Basic Moulding Sands

▼ Chromite Sands 3630

GTP Schäfer GmbH
41515 Grevenbroich, Germany
☎ +49 2181 23394-0 🖷 +49 2181 23394-55
E-Mail: info@gtp-schaefer.de
Internet: www.gtp-schaefer.com

▼ Ceramic Sands/Chamotte Sands 3645

GTP Schäfer GmbH
41515 Grevenbroich, Germany
☎ +49 2181 23394-0 🖷 +49 2181 23394-55
E-Mail: info@gtp-schaefer.de
Internet: www.gtp-schaefer.com

▼ Silica Sands 3720

STROBEL QUARZSAND GmbH
Freihungsand, 92271 Freihung, Germany
☎ +49 9646 9201-0 🖷 +49 9646 9201-701
E-Mail: info@strobel-quarzsand.de
Internet: www.strobel-quarzsand.de

09.04 Mould and Core Coating

▼ Blackings, in general 4270

ARISTON Formstaub-Werke GmbH & Co. KG
Worringerstr. 255, 45289 Essen, Germany
☎ +49 201 57761 🖷 +49 201 570648
Internet: www.ariston-essen.de

09.06 Moulding Sands Testing

▼ Moisture Testing Equipment for Moulding Sand 4410

Maschinenfabrik Gustav Eirich GmbH & Co KG
Walldürner Str. 50, 74736 Hardheim, Germany
Internet: www.eirich.de

▼ Moulding Sand Testing Equipment, in general 4420

Maschinenfabrik Gustav Eirich GmbH & Co KG
Walldürner Str. 50, 74736 Hardheim, Germany
Internet: www.eirich.de

10 Sand Conditioning and Reclamation

10.01 Moulding Sand Conditioning

▼ Aerators for Moulding Sand Ready-to-Use 4470

Maschinenfabrik Gustav Eirich GmbH & Co KG
Walldürner Str. 50, 74736 Hardheim, Germany
Internet: www.eirich.de

▼ Sand Preparation Plants and Machines 4480

Maschinenfabrik Gustav Eirich GmbH & Co KG
Walldürner Str. 50, 74736 Hardheim, Germany
Internet: www.eirich.de

▼ Mixers 4520

Maschinenfabrik Gustav Eirich GmbH & Co KG
Walldürner Str. 50, 74736 Hardheim, Germany
Internet: www.eirich.de

▼ Sand Mixers 4550

Maschinenfabrik Gustav Eirich GmbH & Co KG
Walldürner Str. 50, 74736 Hardheim, Germany
Internet: www.eirich.de

▼ Aerators 4560

Maschinenfabrik Gustav Eirich GmbH & Co KG
Walldürner Str. 50, 74736 Hardheim, Germany
Internet: www.eirich.de

▼ Scales and Weighing Control 4590

Maschinenfabrik Gustav Eirich GmbH & Co KG
Walldürner Str. 50, 74736 Hardheim, Germany
Internet: www.eirich.de

10.04 Sand Reconditioning

▼ Sand Coolers 4720

Maschinenfabrik Gustav Eirich GmbH & Co KG
Walldürner Str. 50, 74736 Hardheim, Germany
Internet: www.eirich.de

12 Gating and Feeding

▼ Covering Agents 5320

Refratechnik Steel GmbH
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Am Seestern 5, 40547 Düsseldorf, Germany
☎ +49 211 5858-0
E-Mail: steel@refra.com
Internet: www.refra.com

▼ Breaker Cores 5340

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▼ Exothermic Products 5360

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13 Casting Machines and Equipment

13.02 Die Casting and Accessories

▼ Diecasting Lubricants 5670

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17 Surface Treatment and Drying

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17.01 Plants and Furnaces

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▼ Heat Treating Furnaces 7520

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▼ Hearth Bogie Type Furnaces 7525

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18 Plant, Transport, Stock, and Handling Engineering

18.01 Continuous Conveyors and Accessories

▼ Vibratory Motors 7980

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20 Control Systems and Automation

20.01 Control and Adjustment Systems

▼ Automation and Control for Sand Preparation 9030

Maschinenfabrik Gustav Eirich GmbH & Co KG
Walldürner Str. 50, 74736 Hardheim, Germany
Internet: www.eirich.de

20.02 Measuring and Control Instruments

▼ Immersion Thermo Couples 9230

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20.03 Data Acquisition and Processing

▼ Numerical Solidification Analysis and Process Simulation 9500

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22 Analysis Technique and Laboratory Equipment

▼ Sampling Systems 9970

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24 Environmental Protection and Disposal

▼ Waste Disposal, Repreparation, and Utilization 24.03

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☎ +49 2306 106 8831
Internet: Germany
E-Mail: yannik.droste@remondis.de
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26 Other Products for Casting Industry

26.02 Industrial Commodities

▼ Joints, Asbestos-free 11120

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27 Consulting and Service

▼ Machining 11292

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Internet: www.loecher-glueherei.de

28 Castings

▼ Aluminium Pressure Diecasting 11390

Schött Druckguß GmbH
Aluminium Die Casting
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☎ +49 2373 1608-0 🖷 +49 2373 1608-110
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Internet: www.schoett-druckguss.de

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30 Data Processing Technology

▼ Mold Filling and Solidification Simulation 11700

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31 Foundries

31.01 Iron, Steel, and Malleable-Iron Foundries

▼ Iron Foudries 11855

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Chem Trend (Deutschland) GmbH	5670, 5680, 5790, 5850, 5865
Maschinenfabrik Gustav Eirich GmbH u. Co KG	4410, 4420, 4470, 4480, 4520 , 4550, 4560, 4590, 4720, 9030
Friedrich Schwingtechnik GmbH	7980
GTP Schäfer Giesstechnische Produkte GmbH	3630, 3645, 5340, 5360, 5375, 5400, 5420, 5430
HYDROPNEU GmbH	5750
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www.intermold.jp/english/top/

CASTEXPO 2022
April, 23-26, Columbus, USA
www.afsinc.org/tradeshows/castexpo-2022

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www.lightcon.info/en

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www.euroguss.de/en

6. Conference „Steels in Cars and Trucks"
June, 19-23, 2022, Milan, Italy
www.sct-2022.com

CastForge
June, 21-23, 2022, Stuttgart, Germany
www.messe-stuttgart.de/castforge/en

Zinc Die Casting Conference – Europe
October, 5-7, 2022, Koblenz, Germany
www.zinc.org/2020-zinc-die-casting-conference-europe

GIFA Southeast Asia 2022
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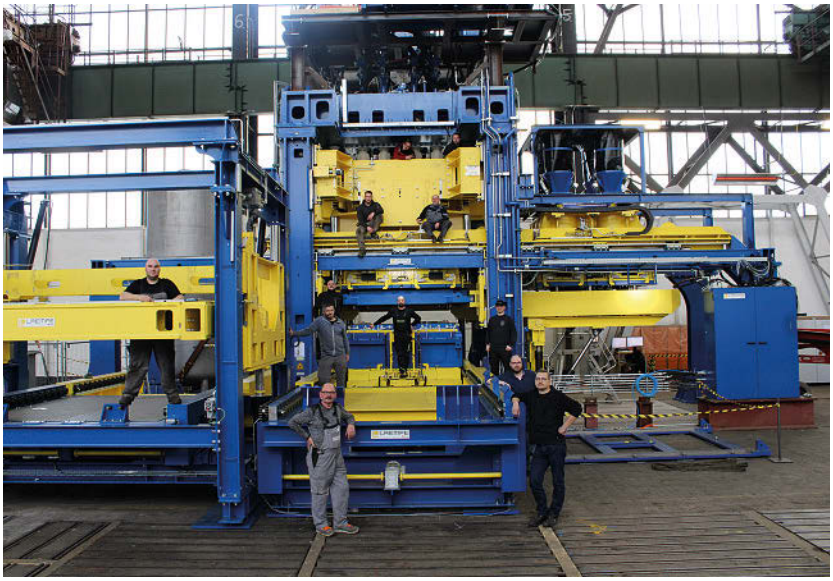

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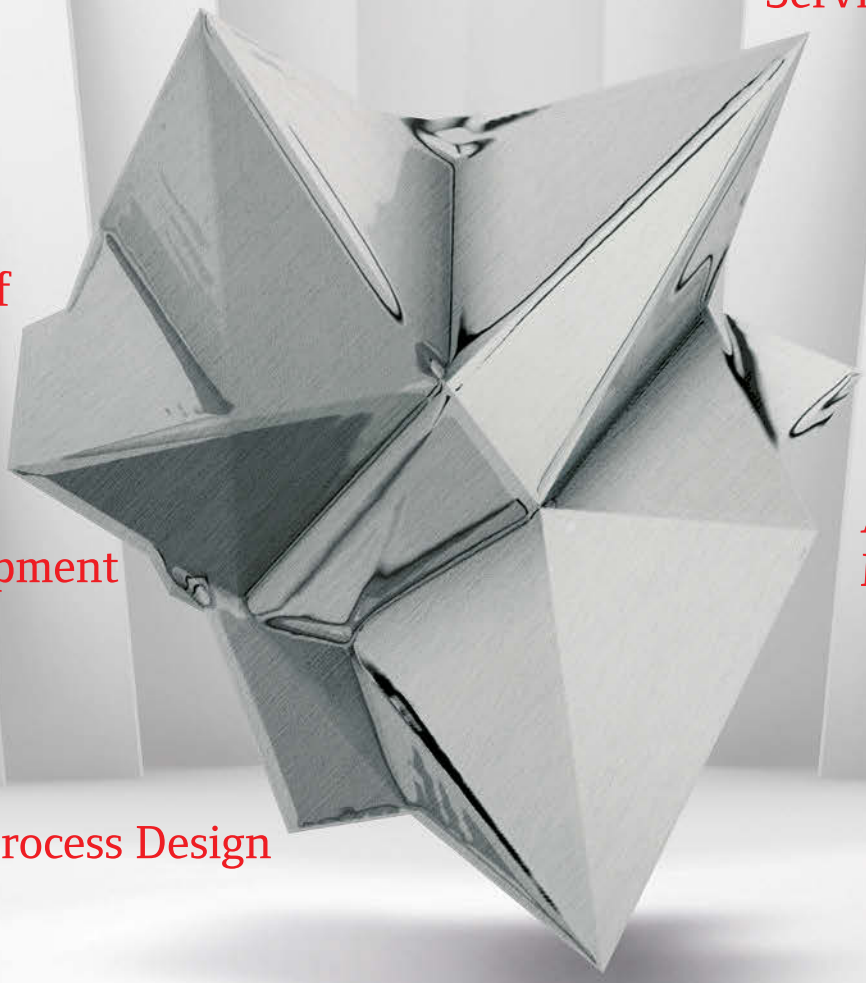

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