livingmetals
No. 13 | 2015
THE MAGAZINE OF THE PLANSEE GROUP
WWW.PLANSEE-GROUP.COM

Final polish for **coating materials**

- Big increase in recycling
- Hard metal lowers production costs

Our responsibility towards people, society and the environment

The sustainability magazine

Last year, we integrated the reports on compliance and the responsibility of the Plansee Group towards people, society and the environment in livingmetals for the first time. The figures in this publication are consolidated Plansee Group figures or average values for the associated production plants. Detailed information on the key figures published by the Plansee Group are available at www.responsibility.plansee-group.com. There, you will find figures and detailed information on: raw materials, research and development, customer satisfaction, environment and energy, personnel, social commitment and corporate management. On our Web site you will also find the Annual Report for the Plansee Group for the 2014/15 fiscal year, which ended on 28 February.

A word on the title

Final polish for coating materials: Molybdenum and tungsten sputtering targets are milled and polished and then prepared for use in the coating systems of the major Asian display manufacturers.

Our metals are keeping us on our toes

» Molybdenum and tungsten are high-tech materials that are needed in ever more cutting-edge applications. It is our job to supply these materials in the quantity and quality needed.«

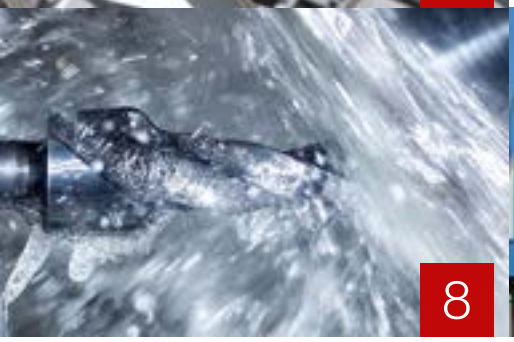
Dear reader,

our metals, molybdenum and tungsten, keep us on our toes: At the one end of the chain, we have launched a number of initiatives and made investments to ensure that the raw materials are produced and recycled in a way that does not impact on the environment. But these metals also need to be converted into tools and components efficiently and with a minimum use of resources. To do this, we are constantly assessing our production methods and working on new, improved technologies. And the two materials we specialize in form a crucial part of many high-tech applications. So we are constantly developing and optimizing our products to ensure that they retain their reliable, high-performance image. In this issue of *livingmetals*, you can find out what this means in practice and see why our molybdenum and tungsten products can make a difference in your application.

Dénes Széchényi,
Head of Group Communications

Move feasibility limits

The requirements for Plansee and its customer in the construction of this cylinder for a hot isostatic press were new and sophisticated. After all, the customer wanted to operate the press at extraordinarily high temperatures and a heavy load. To achieve this, the engineers at Plansee performed simulations to calculate the stresses to which the components would be subjected and also carried out exhaustive testing. Only then were the components which are needed for heating up the hot isostatic press manufactured from molybdenum and assembled.



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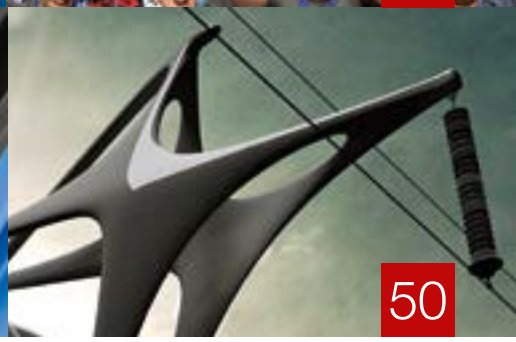
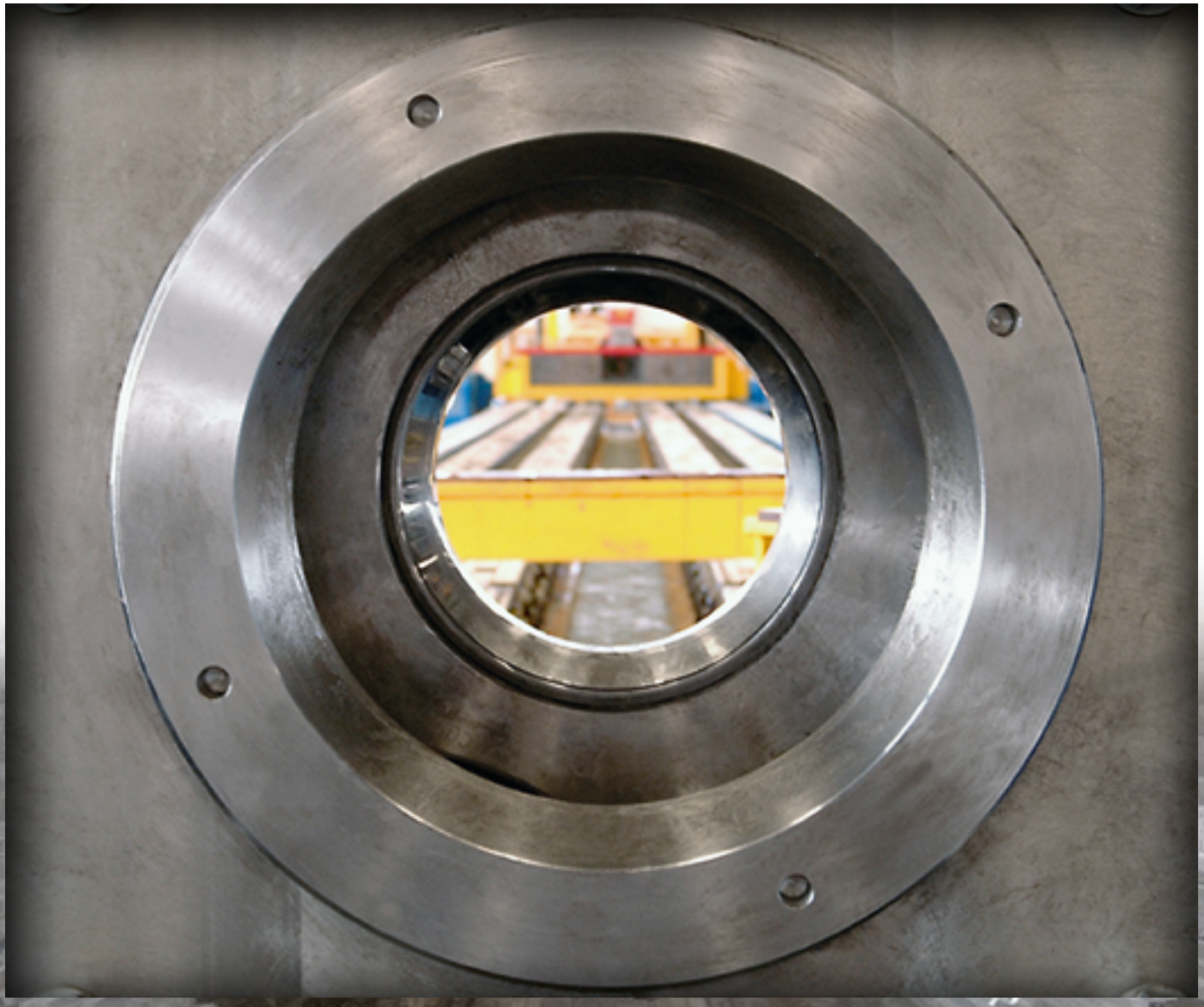


The world of the Plansee Group

All good things come in threes: Ceratizit goes from strength to strength in solid carbide tools. And the most recent addition is Klenk. Klenk makes custom tools for the aerospace and automotive industries. Tool manufacturers Günther Wirth and Promax are already part of Ceratizit.

New from old: No matter how resilient it may be, a carbide tool such as a drill bit or end mill will ultimately reach the end of its service life. Hard metal recycler Tikomet collects and processes the valuable scrap. Hard metal manufacturers are eager to get their hands on recycled hard metal powder, as it allows them to make considerable savings on raw materials.

3D printing technology was used to manufacture this titanium mountain bike frame. Nevertheless, carbide milling tools from WNT were used at critical points. Conventional machining ensured that tolerances were adhered to and produced a high-quality finish.



Clear the stage for drawing tools. Wires, pipes or rods: Ceratizit drawing dies get all these workpieces into shape in no time. And this cuts down processing time. No matter whether it be custom solutions or standard tools, Ceratizit has been right up there with the best since the integration of the Italian tool manufacturer Van Dies.

Plenty to keep them busy: The staff at Plansee Shanghai are hard at work setting up and expanding a new plant. Products made from tungsten and tungsten heavy metals are very much in demand in China. Despite the workload, the 100+ team regularly takes time out to foster a team spirit and to relax and recuperate.

Everything under one roof: Plansee India has brought manufacturing and administration operations together in a new-build plant in Mysore. Plansee India specializes in manufacturing wire and wire products from tungsten and molybdenum for the lighting and automotive industries.

Ready for India

From components for the lighting and automotive industries to solid carbide tools, the Plansee Group and its workforce of 700 is engaged in a wide range of activities in India.

"For us, India is exotic, colorful, hot and an exciting place filled with many different aromas." Just two years ago, Melissa Albeck opened a subsidiary for WNT in India. WNT is the sales arm of the Ceratizit Group for drilling, milling and turning tools. Albeck is responsible for expanding the international presence of WNT beyond the 18 countries in which it is already active. But it still took Melissa Albeck a little time to become familiar with the Indian culture: "To start with, we feel at home because our business partners speak English. But working together is a whole new experience. Nothing runs quite according to plan as it does in Europe, because there is an entirely different perception of time. And yet, everything somehow manages to work, despite the huge divergence from European culture." So many differences, but WNT's service concept is a hit in India: The promise that any of the 8000 standard products in stock in India can be delivered to the customer within 48 hours. The intensive training courses for the highly motivated sales team, all of whom have worked in the machining industry earlier in their careers. The technical support WNT offers its customers at any time, either by phone or with a personal visit. After all, the customer should be working with the perfect tool for their application, for as long and as profitably as possible! In a word, WNT hit the spot when it exported its service concept to the Indian market. Albeck: "Perhaps it even works better here, because personal contacts are so important in

WNT sales engineers in India.

India, often the single most important element." No trust, no business. And when you add in the technical expertise of the generally young machining specialists that WNT trains up as technical sales engineers, the result is an ideal team of people to advise to the Indian customers that rely on the high quality of WNT's cutting tools. WNT has field sales staff in all the important commercial regions of India, be it in Pune, Bangalore or Delhi. Customers are supplied from the central warehouse in Uluberia near Kolkata. "The market is huge and there are plenty of opportunities for the Group here," says Melissa Albeck. When she refers to the Group, she also means Ceratizit, the parent company that has been in India with a production plant for almost the last 20 years. Two years ago, Ceratizit's new plant in Uluberia went online. Given the increasing demand for high-quality cutting tools in Asia, Ceratizit is producing ever greater quantities of indexable cutting inserts and toolholders in Uluberia. And it ▸

Part of the Plansee production network: Plansee High Performance Materials' new production building in Mysore.

► is in Uluberia that WNT's central warehouse can also be found. In this warehouse, every order received is processed, packaged and shipped on the same day.

Reproduced and optimized

A change of scenery. Since the end of the 90s, Günther Wirth, the German manufacturer of solid carbide tools that was acquired by Ceratizit in 2013, has had a production facility in Bangalore. At first glance, anyone passing through the production halls of Günther Wirth in India is reminded of a German production facility: There is German machinery everywhere you look and the same manufacturing technology is used – for everything from grinding to coating.

"When automotive suppliers need tools, they depend on getting the same high quality wherever they are in the world," explains Gerhard Bailom, Co-Managing Director of the Indian company. "That's why Günther Wirth originally opened this plant in tandem with one of our customers." To make sure the projects comply with the quality standards, comprehensive knowledge transfer between Germany and India was ensured.

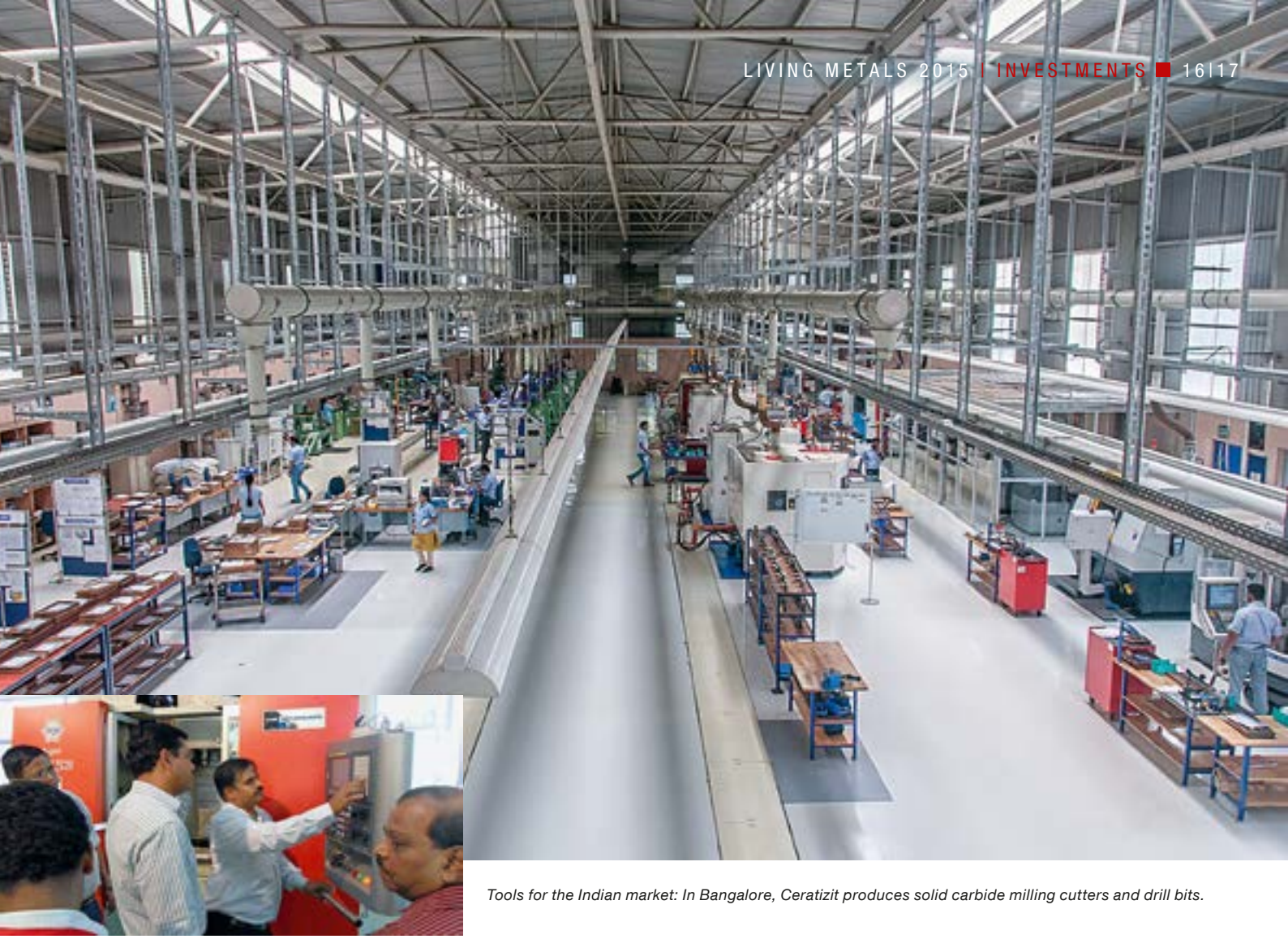
Günther Wirth now produces its entire standard range of solid carbide end mills and drill bits as well as special tools in Bangalore. Collaboration with Ceratizit India has intensified over the last year or so. One key area of focus is project business. "By offering the full range of indexable cutting inserts and solid carbide tools, we want to cater for all our Indian customers' machining needs," says Co-Managing Director Ashwani Sareen. Consequently, there are also plans to broaden the standard range in future. Other key areas of focus are deep-hole drilling and tools for materials that are hard to machine, such as titanium. In order to supply the Indian market from a single source, the company in Bangalore was renamed Ceratizit Roundtool Solutions in April.

Closed-loop material cycles

Wherever carbide tools are sold, it makes sense to collect and recycle hard metal that has reached the end of its service life. And Global Tungsten & Powders has specialized in this field. The tungsten powder expert in the Plansee Group collects hard metal scrap from across the country and converts it to fresh tungsten powder in its plants in Europe and the USA. This is then reused for manufacturing carbide tools.

Plansee – "Made" and "Make in India"

Plansee High Performance Materials (HPM) has been active in India for a quarter of a century. Their involvement began with the establishment of sales offices in the important commercial regions of India. After many years of good and close cooperation, Plansee then took over the private company Wofratech in 2010. Since that time, the Indian company has developed apace. Its products include molybdenum and tungsten fine wire. Wire such as this is needed for halogen lamps and wire EDM machines as well as for the heating elements in front and rear windshields. The largest customer groups include the automotive and electronics industries. Recently, Plansee India also started producing extremely resilient spare parts for



Tools for the Indian market: In Bangalore, Ceratizit produces solid carbide milling cutters and drill bits.

the ion implantation process, an important step in the production of semiconductors.

In the summer of 2015, Plansee HPM moved into a new building in India. With a surface area of some 10,000 square meters, this allows the previous production plants to be housed under one roof and offers plenty of space for further expansions of production capacity.

This investment underscores Plansee's long-term commitment to India.

The new plant forms the competence center for tungsten and molybdenum wire and wire products and uses the very latest in production technology. It is fully integrated in Plansee's global production network for the powder-metallurgical manufacture of the high-performance materials molybdenum and tungsten, including all its processes and IT systems.

Speaking at the opening ceremony, managing director Anil Ramdasi underlined the social aspects: "The new plant not only has a crèche, a canteen and superbly equipped changing rooms, but also meets all the requirements for an exemplary eco-friendly building."

Not only that, it breathes life into the Indian government's "Make in India" campaign.

India launched this campaign to industrialize the country in 2014 in order to encourage foreign investment. It involves dismantling bureaucratic obstacles and simplifying tax regulations. As part of the campaign, the skills of the workforce are to be developed and industrial corridors and industrial estates are to be created.

India: a growth market

According to Dr. Michael Schwarzkopf, chairman of the executive board of the Plansee Group, "As an emerging economic region, India is ready for our products and tools."

While Plansee primarily manufactures products and components from the refractory metals tungsten and molybdenum in India for export, the carbide tools that Ceratizit produces in India are sold almost exclusively in India. Currently, India is regarded as one of the few emerging nations with positive prospects for growth. The country's economy is growing strongly. Inflation has recently been falling. The political system is seen as stable and labor costs are attractive. Up to now, bureaucracy and customs duty have been regarded as the greatest obstacles to investment. ■

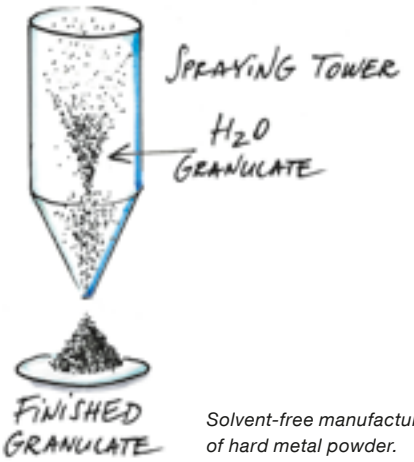
Optimized tool use

Leveraging carbide

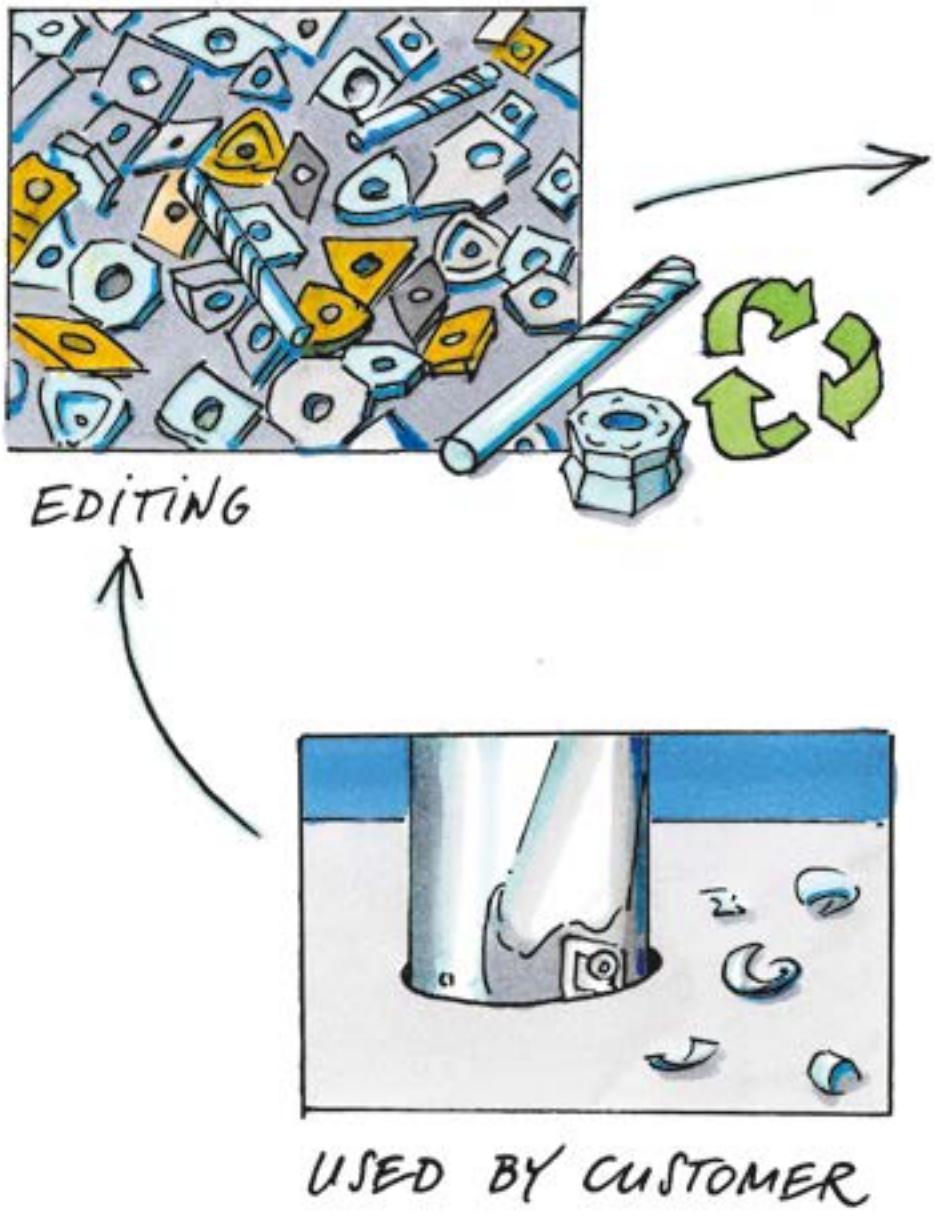
The use of carbide tools can save a lot of time and money in machining operations. And sophisticated technologies are making carbide production more sustainable and environmentally friendly. Explore the process chain at Ceratizit.

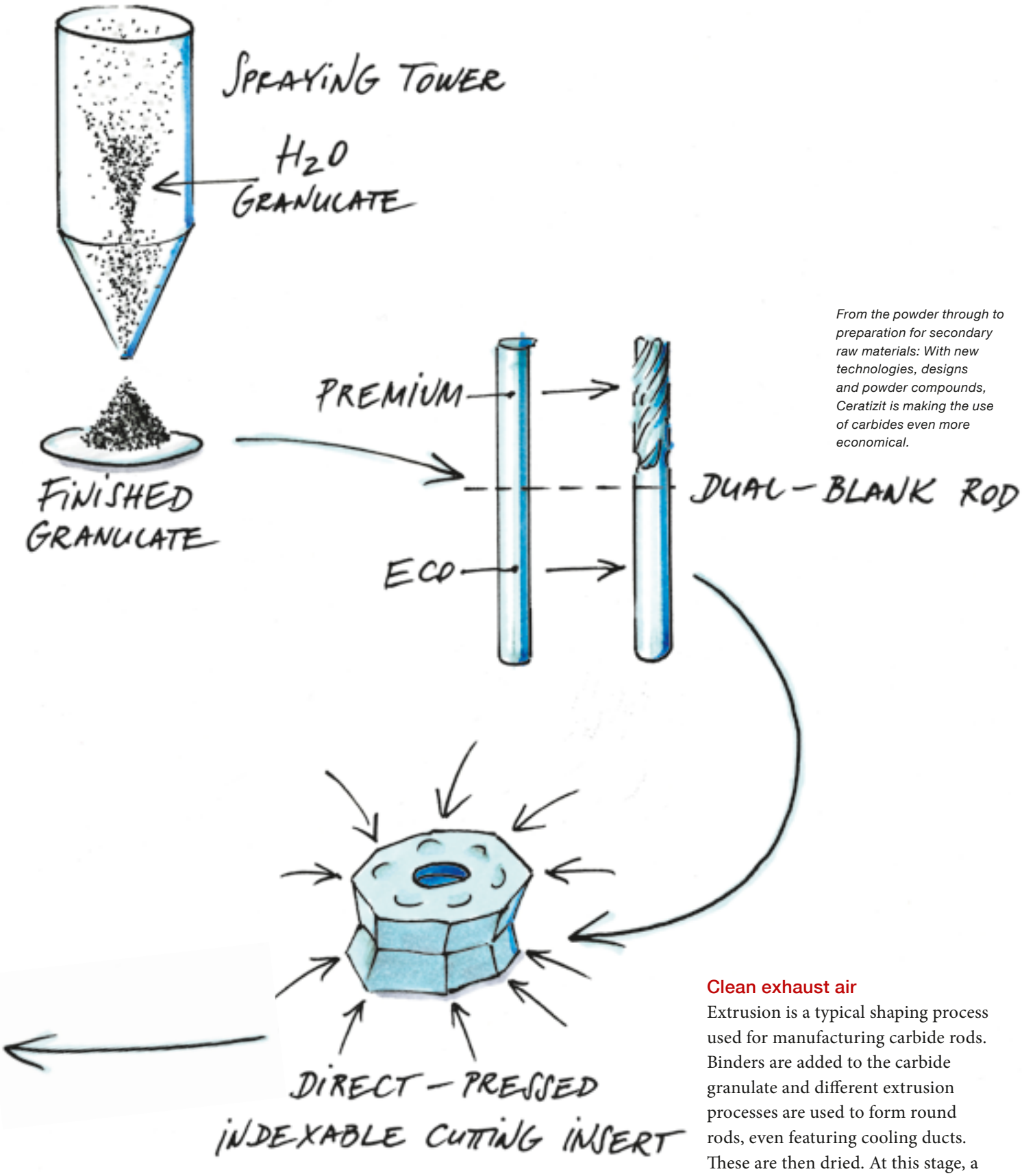
Solvent-free powder compounds

At its Reutte plant, Ceratizit produces dozens of grades of carbide, from ultrafine through to coarse-grained. And all of them are manufactured using the environmentally compatible water-spray technology. This involves milling compounds of tungsten carbide and cobalt in water and then spray-drying the slurry. This produces free-flowing granulate that is then able to be pressed. The benefits of water-spray technology include a significant reduction in power consumption as a result of shorter milling times, avoidance of environmentally harmful emissions compared with solvent-based technologies, and the high quality of the resulting granulate.



Solvent-free manufacture of hard metal powder.





From the powder through to preparation for secondary raw materials: With new technologies, designs and powder compounds, Ceratizit is making the use of carbides even more economical.

Clean exhaust air

Extrusion is a typical shaping process used for manufacturing carbide rods. Binders are added to the carbide granulate and different extrusion processes are used to form round rods, even featuring cooling ducts. These are then dried. At this stage, a proportion of the binder is removed from the extruded products in a thermal process. This escapes into ▸

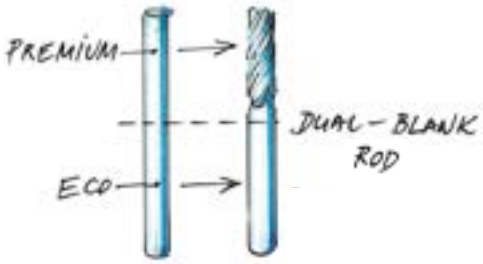
the exhaust air. Ceratizit has developed a cleaning process to get the purity of this exhaust air well within statutory thresholds.
This involves oxidizing the substances contained in the exhaust air in a combustion chamber. The purified hot air flows into a further combustion chamber and releases most of the thermal energy it contains. This cooled, clean gas then leaves the system at the same temperature as when it entered. This makes the process highly energy-efficient and environmentally friendly.

Intelligent use of raw materials

Many tools only wear in a limited area when they are used. The rest of the tool is virtually unaffected by wear. To save costs and resources, it makes sense if only the region that is subject to wear is made from carbide, with the rest of the tool being made from less expensive materials. Many tools are therefore made from carbide and steel composites. Thus, for example, carbide saw teeth are brazed onto a blade and indexable cutting inserts are bolted to steel carriers. When this is done, the join between the carbide and the steel is of special significance. It must be designed in such a way that all the forces that arise when the tool is used can be transmitted.
A number of different joining techniques such as resistance welding, brazing or bolting are used here. In the case of welding and brazing, the wettability of the surfaces of both materials plays a key role. Alongside the use of flux, the carbide parts are coated with cobalt or nickel. This considerably strengthens the join and also makes it possible to reuse the steel element by unbrazing the worn carbide parts and brazing on new ones.

Different raw material grades

And Ceratizit has applied a similar principle to the development of carbide rods, with the top quality (and hence most expensive) material only being used where it is really needed, namely in the region of the cutting edge. For the shaft of the rod, on the other hand, standard grade carbide has proven to be perfectly adequate. The shaft and the cutting edge are joined seamlessly and invisibly. In such tools, the carbide is more than three times as rigid as steel.



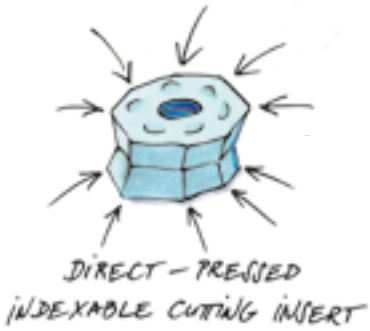
Standard grade carbide is manufactured with a high proportion of secondary raw materials, which consume less resources. The result: The resulting carbide rod performs at least as well as its single-section counterpart and has a better environmental footprint, coupled with a noticeable reduction in costs.

Carefully considered product design

What does the customer really need? And where are the hidden cost drivers? This is the question Ceratizit asked when considering circular saws. There is virtually no other tool that is used as often as the circular saw when it comes to separating materials. In particular when machining laminated particle board and fiber board for the furniture industry, the circular saw rapidly loses its sharpness and the cutting quality deteriorates. And it is therefore common practice in the industry to regularly remove the tools and sharpen the saw teeth to bring them up to scratch again. But sharpening consumes grinding wheels, cooling water and power, not to mention the machine downtime and wastage when restarting the production line. If one looks at the total costs of traditional circular saws, the sharpening costs amount to 100 to 200 percent of the original price of the tool. This insight led to Ceratizit developing a cutting material specially for machining wood. It sharpens itself during the sawing process, thus making any further sharpening unnecessary. Tests carried out by circular saw operators over a period of several months confirmed the sharpening effect and have proved that innovative tool solutions make it possible to use new saws in a way that consumes less resources and is at the same time economical.

Productive tool

Against the backdrop of global competition, the manufacturing industry is faced with the challenge



of constantly reducing costs while at the same time leading the way in terms of innovation and quality. But new materials and the rapid change in expectations with respect to the quality and flexibility of machining operations on the part of the aerospace and automotive industries, for example, confront manufacturers the world over with new challenges each and every day. And machine builders and tool manufacturers also have to face up to the same challenges, as productivity and competitiveness rely on a machining process that is both highly efficient and perfectly matched to requirements. To achieve this, the tool systems must perform as required in terms of reliability, machining performance and the resulting productivity. The three examples below show highly efficient tool systems and cutting material grades that reduce production time and warehousing costs and save energy:

The Maxidrill 900 **drilling tool** machines a high-alloy steel gearbox ring at a higher cutting speed and an increased advance rate. 150 holes were drilled instead of 120, and there was less wear.

A number of different comparative tests have shown that the Ecocut **multi-function tool** significantly reduces processing times when drilling and turning components. Furthermore, the reliability of the process reduces machine downtime and greatly simplifies stock management. Example: When machining a clutch hub, it was possible to drill 140 holes instead of 100 at an increased cutting speed and with improved chip control. Alongside the performance and associated productivity of cutting tools, the price per effective cutting edge is seen as a selection criterion in the machining industry.

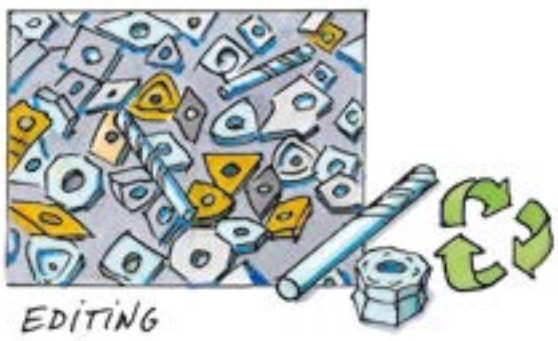
Ceratizit's A273 **face milling cutter** features a direct-pressed, two-sided, octagonal indexable cutting insert with positive clearance angles on both sides. Because it is two-sided, users get 16 effective cutting edges on a single, direct-pressed indexable cutting insert. Another contribution to conserving resources, as less carbide is used to achieve greater cutting performance.

Systematic raw material savings

Drills, milling tools or indexable cutting inserts: Ceratizit strives to systematically reduce raw materials in the carbide used in tools. To achieve this, the Plansee Group is gradually expanding return and collection capabilities for tools that have reached the end of their service life and is further developing the technology for creating secondary raw materials. It is also increasing production capacity in this area, most recently by acquiring the Finnish company Tikomet. Within the Plansee Group, more than 50 percent of the materials used already come from secondary raw materials. ■

54 %

of the tungsten processed in the Plansee Group has been recovered from worn drills and cutting tools. The aim is to further increase the proportion of secondary tungsten used in production. To achieve this, the Plansee Group this year acquired the Finnish company Tikomet and further expanded its capacity for secondary raw material.



Molybdenum processing

Purified and roasted

Over the course of just five years, Molymet has built a modern plant for processing molybdenum ore concentrate.

Processing capacity for molybdenum doubled: The company invested in a second roasting kiln and in a second desalination plant as well as a cleaning plant for ore concentrate.



Tidiness, cleanliness and safety: Guiding principles during construction of the new molybdenum production plant.

► The 30-hectare site of its subsidiary Molynor in Mejillones is located in the desert in the north of Chile, right on the Pacific coast, around 70 kilometers from the city of Antofagasta. "To satisfy the global demand for molybdenum, we built this plant in the heart of the largest mining region of Chile and southern Peru," explains John Graell, Executive Chairman of Molymet.

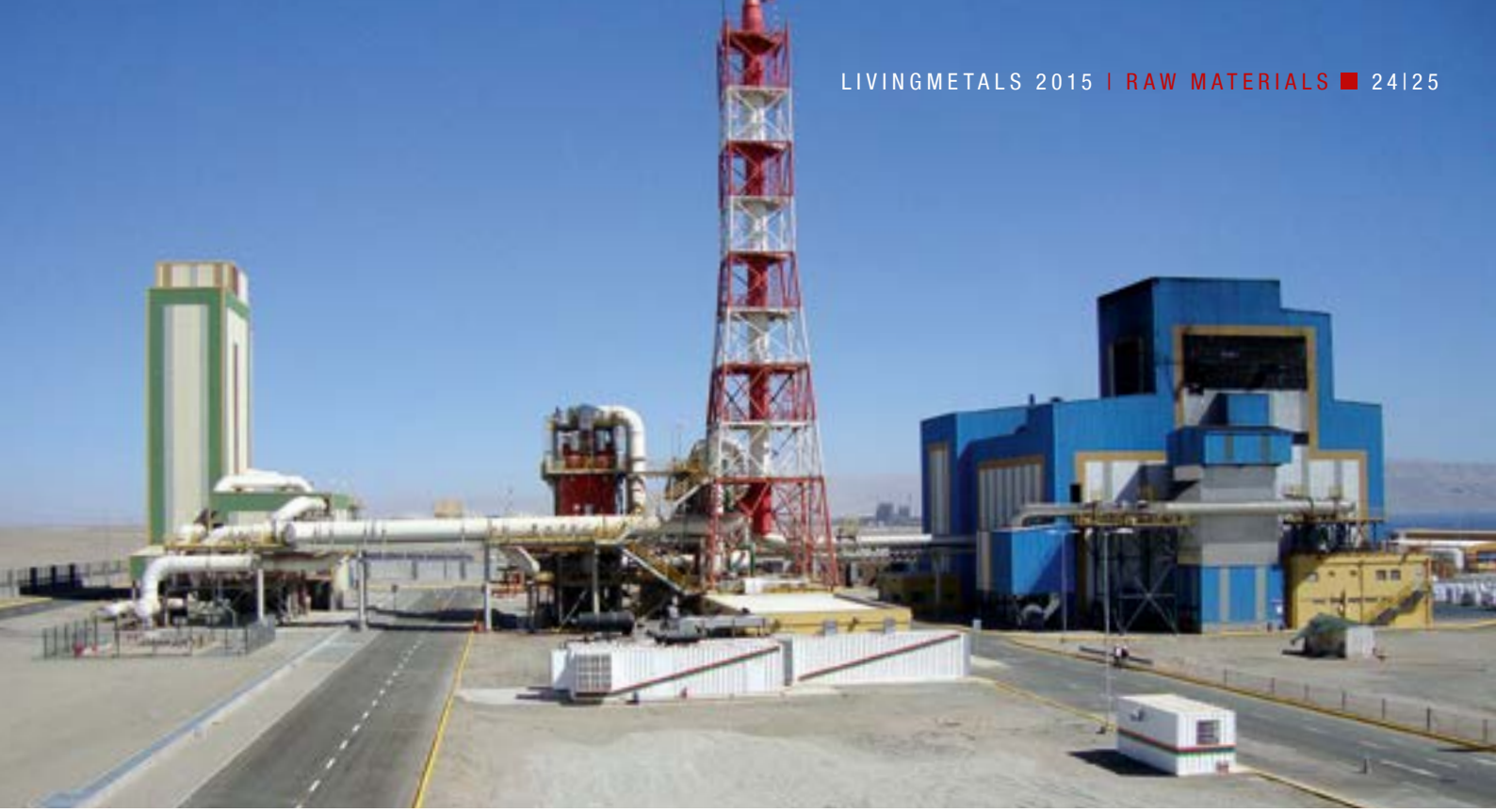
During the initial phase, the new plant had the capacity to produce around 15,000 tonnes of molybdenum per year, and this capacity was quickly doubled. To achieve this, Molymet invested in a second roasting plant, increasing the efficiency of its sulfur dioxide separation plant, as well as in a second module for doubling desalination plant capacity, while also enlarging the related auxiliary facilities.
A cleaning plant for the molybdenum ore concentrate was also built. This removes impurities such as copper, lead and calcium from the molybdenite concentrate prior to roasting.

From ore to concentrate

To obtain molybdenite, the mined molybdenum ore is first crushed to form material the size of gravel, with a large part of the gangue (worthless rock) being separated out. This material is then ground to form a coarse powder. Flotation separates the less dense molybdenum ore from the denser gangue to give up to 90-percent pure molybdenite.

Cleaning the concentrate

Because the molybdenum ore concentrates processed by Molynor can sometimes contain a relatively high proportion of lead, a leaching process using ferric chloride is ideal for dissolving not only the lead, but also sodium and copper from the ore concentrate.
This is done by slurrying the molybdenite concentrate with ferric chloride, hydrochloric acid and water and heating it for some time up to 120 °C in a glass-lined reactor under pressure and constant stirring. When the slurry has cooled and been filtered, the result is the cleaned molybdenite and a ferrous solution



containing the dissolved impurities, primarily copper. This ferrous solution is then further processed to produce such things as cement copper for use in producing copper matte and additives for suppressing dust in highway engineering. The majority, however, is conditioned and reused for cleaning the molybdenite. Because leaching with ferric chloride is an extremely corrosive and dangerous process, Molymet took considerable care over safety at work and protection of the environment when designing the processes, plant, piping and metering.

Roasting the molybdenite

Molybdenite is roasted in multi-level hearth furnaces. Roasting in air at high temperatures between 500 and 650 °C oxidizes the primary component, molybdenum sulfide (MoS_2), to form technical molybdenum oxide (MoO_3). Multi-level furnaces are made up of a steel shell clad with refractory bricks and multi fire-resistant hearths. During the roasting process, the molybdenite passes through the furnace from top to bottom against a strong air current. Rotary rakes move the molybdenite on the hearths floors to promote the chemical reaction.

The effluent gases from the roaster are cooled, dust is electrostatically precipitated and the gases are scrubbed to clean them before final treatment in a sulfuric acid plant to obtain up to 170 tonnes of sulfuric acid per day from the sulfur oxides they contain.

One important by-product of roasting is rhenium oxide, which is present in some of the molybdenite concentrate in concentrations of less than 0.1 percent. The technical molybdenum oxide contains at least 57 percent molybdenum and is used in the steel industry, primarily for ferromolybdenum. A small proportion is cleaned either thermally or chemically and ultimately reduced to molybdenum metal as pure oxide. ■

Valuable raw materials

Recycling is writ large

Thanks to acquisitions, alliances and the development of new processes, the Plansee Group has further increased the quantity of valuable raw materials such as tungsten, cobalt and tantalum that is recycled.

Recycling of cobalt metal powder

GTP has entered into a strategic partnership with the materials technology group Umicore in order to fully recycle cobalt. GTP processes hard metal scrap to produce a cobalt intermediate material that is then converted to cobalt metal powder by Umicore. The company uses chemical processes to convert hard metal tools such as drills and cutting tools that have reached the end of their service life to form intermediate products containing tungsten, cobalt and tantalum.

Recycling of hard metals

In the past, GTP processed hard metals or tungsten carbide to produce fresh tungsten carbide powder using a chemical process. In summer 2015, GTP acquired the hard metal recycler Tikomet, thus extending its product range: "Tikomet is a perfect strategic match for us," says Dr. Andreas Lackner, President and CEO of GTP. Tikomet has furthered development of zinc recycling technology and has invested in a modern manufacturing plant and in research and development to open up new applications for recycled hard metal powder. Lackner: "The better the quality of the recycled hard metal powder, the greater the demand from the hard metal manufacturers, because they can make significant savings in the use of raw materials."

Recycling of tantalum

Thanks to its good adherence to glass and high level of electrical conductivity, molybdenum is a popular material for electrode layers in thin-film transistors (TFT-LCD) and touch sensors (touch panels). Both during the production process and as a component in the future displays, these layers are exposed to atmospheric humidity and perspiration from the user's hand. The answer to corrosion: Molybdenum-tantalum sputtering targets. The sputtering targets are used in the coating systems of the major display manufacturers. But a relatively large quantity of the material remains unused, and this is taken back by Plansee. Plansee has developed a thermal recycling process, primarily to recover the extremely valuable tantalum. "In particular when we are dealing with valuable and rare materials such as tantalum, it is crucial to achieve a closed-loop supply chain, which is why Plansee is placing such emphasis on its recycling activities," explains Ulrich Lausecker, responsible for the display business at Plansee.

Closed-loop recycling chains are intended to reduce the risks associated with raw materials availability and ensure that key customers from high-tech industries always have a reliable supply of these materials. In collaboration with its customers, the Plansee Group will continue to work on developing and establishing efficient recycling processes for valuable metals when they reach the end of their service lives. ▪

Well cooled

A new cooling system for molybdenum glass melting electrodes protects against premature boiling water corrosion. The structure of traditional cooling ducts in electrodes for glass melting tanks has the disadvantage that the temperature rises and the cooling water becomes very hot. The consequence is boiling water corrosion in the cooling duct and oxidation on the exterior of the electrode. To avoid corrosion in the glass melting electrode, Plansee HPM has developed a cooling system that prevents congestion points and at the same time ensures that the cooling duct is precisely positioned and centered.

The two-color niobium core of this coin comes from Plansee.

Power to the powder

A new process allows Plansee to produce coating materials for tools such as drill bits, milling cutters and indexable cutting inserts extremely quickly. With the old manufacturing process, this took several weeks. The new technology involves filling the powder into molds and pre-compressing it. An electrical current is then applied, which flows through the powder and heats it to a temperature of up to 2000 °C in a very short time. At the same time, the powder is compressed still further. After minimal machining, the product is ready for use in the tool manufacturer's coating system.

Tungsten blinds

A window made from electrochromic glass darkens automatically when the sun shines brightly. An extremely thin tungsten oxide film makes this possible. The color changes from transparent through to dark blue entirely automatically, depending how bright the sun is. A tungsten oxide thin film makes this possible. Under normal circumstances, this layer is transparent. Only when a DC voltage is applied does the thin film turn blue. Plansee supplies the input material for manufacturing the electrochromic films: Tungsten-nickel sputtering targets and tungsten targets.

More than just spare parts

Plansee has designed a new replacement module to provide support for more stable ion implantation processes and trouble-free installation in implanters from a major OEM.
Ion implanters are used to set basic properties of a chip. In order to increase service life and facilitate replacement, Plansee has completely redesigned the extraction optics and now offers the module as a replacement for all implanter systems from this vendor.

Tungsten helps to speed up aluminum shaping

If aluminum foundries use tungsten molds instead of steel molds, this speeds up the casting cycles and leads to less wastage. The results of a scientific comparison between a mold made of steel and one made of a tungsten alloy have revealed that the tungsten alloy excels through its extremely high thermal conductivity and superb resistance against corrosion resulting from the aggressive molten aluminum. The detailed findings of this research have been published at www.plansee.com.

34 %

of sales revenues in the Plansee Group last year were achieved with products that are less than five years old. This is a record and is the result of long-term investment in research and development. During the course of the 2014/15 fiscal year, 60 million euros or five percent of sales revenues were invested in innovation projects.

Reversing the principle behind the fuel cell

Return trip to Mars, please!

It's a truly ambitious goal: The plan is to establish an oxygen production plant on Mars that will make it possible to send manned missions to the red planet.

In his well-researched, bestselling novel "The Martian", Andy Weir describes why a manned mission to Mars will crucially depend on a reliable supply of oxygen. Following a dust storm, it becomes necessary to abort a Mars mission. Engineer and botanist Mark Watney is left stranded on Mars as a result of a tragic accident and tries to survive on the planet until the next mission arrives. The first thing Watney uses to survive is the "fuel generator" from the Mars Ascent Vehicle, or MAV. More properly a "propellant generator", the system he describes collects and compresses carbon dioxide in order to convert it to oxygen, which was presumably used as a reaction gas to burn the fuel that lifted the rest of the crew safely to orbit.

Up to now, all of mankind's trips to Mars have been one-way, and the only crewmembers have been robots. But while NASA may not be ready for the mission described in Weir's novel, they are making a beginning with Moxie, a 1:100 scale prototype of the MAV propellant generator to be flown on the Mars 2020 mission.

A precursor to the nuclear reactor described in The Martian, Mars 2020's radioisotope thermoelectric generator (RTG) supplies Moxie with the power to convert the carbon dioxide in the Martian atmosphere into oxygen. Sometime in the 2030s, NASA plans to establish a full-size oxygen plant on Mars, together with a power plant and an empty habitat, to generate oxygen and store it cryogenically in large tanks in preparation for arrival of a human crew.

In essence, Moxie uses the reverse of the principle behind the fuel cell. Conversion of the gas takes place in a stack of Solid Oxide Electrolysis Cells (SOEC). The US company Ceramatec has been awarded the contract for building the prototype SOEC stacks, and Plansee is supplying the interconnects for the stacks. If everything goes according to plan, Moxie will produce 20 grams of oxygen per hour and spend at least 50 days working on Mars. ▪

Exploration rover for Mars mission: On board, carbon dioxide from the Martian atmosphere is converted to oxygen.

Lighting industry

“Basic human need”

More than a century ago, light became a mass product. The thing that opened the door for light from the electric socket was the spiral tungsten filament for incandescent light bulbs – a product that accompanied the growth of Plansee. And the lighting industry remains an important business activity for the Group. ▸

Triumph of the tungsten filament: It lit our houses for almost 100 years.

Today's technological world is increasingly relying on the high-tech materials molybdenum and tungsten.

► Let's take a look back at the period between 1910 and 1915. Excitement the world round. Electrification is coming on in leaps and bounds. Light is coming. But not in the shape of the dim carbon filament lamps that had been around in the late 19th century. Instead, people are seeing the advent of light bulbs with spiral tungsten filaments that give off far more light. The secret behind the triumph of the tungsten filament is a new technique that allows the normally brittle tungsten to be drawn into extremely fine filaments. And Paul Schwarzkopf also develops a method of manufacturing tungsten wire and starts making the sought-after wire; originally in Berlin, then in Nijmegen in the Netherlands and, as of 1921, in Reutte in the Tyrol. His main customer is the emerging lighting industry. With the companies he founds, Paul Schwarzkopf lays the foundation for a corporation that will concentrate primarily on molybdenum and tungsten for the next 100 years.

Pioneer in the lighting industry

Although the quality of the incandescent filaments is already quite acceptable, Paul Schwarzkopf is looking for ways of reducing the costs of production. Since the beginning of the 30s, he has been using another development, namely carbide. He manufactures drawing dies and the service life during production increases significantly. This was the inception of the carbide activities of the Plansee Group, which are now under the aegis of the Ceratizit division. But Paul Schwarzkopf is not simply a pioneer in the lighting industry; he is also a visionary. He knows that a world that is rapidly becoming technology-driven will become increasingly reliant on the high-tech materials molybdenum and tungsten. In the lighting industry, it's all about material properties such as a high melting point, low vapor pressure, excellent thermal conductivity and a low electron work function. But molybdenum and tungsten, often alloyed with traces of other elements, offer a wide range of other important properties. And it is precisely these properties that have allowed Plansee to constantly open up new areas of application for their materials in the lighting industry. After all, our old friend the light bulb has long ceased to be a market for Plansee.

Nowadays, Plansee's refractory metals are used in halogen lamps, high intensity discharge lamps and in the manufacture of high-performance LEDs. Current products for the lighting industry include fine tungsten wire for incandescent filaments, molybdenum retaining and feed wire, dipping caps for H4 lights and tungsten electrodes. Not to mention a whole range of materials needed in the LED production process.

At the same time, Plansee is urgently developing thorium-free materials for the lighting industry.

LEDs: a growth market

But it has been a long time since it was only the lighting industry that needed the high-tech materials offered by the Plansee Group: Major markets also include consumer electronics, mechanical engineering, medical technology and toolmaking.

To allow Plansee to continue as a reliable supplier to the lighting industry going forward, the company is currently investing in a new plant in Mysore, India. Tungsten wire for halogen lamps will be drawn here.

"Light is a basic need for all humanity, no matter whether it comes from a light bulb, a halogen lamp or an LED," says Alexander Tautermann, head of sales for lighting products. "Alongside all the markets that Plansee has opened up over the past decades, the lighting industry has always been a key pillar of our activities. Even if traditional lighting business is declining as a result of the enormous success of LED technology, we shall always continue to offer a wide range of products and solutions for the lighting industry, whether it be for traditional applications or for entirely new lighting technologies." ■

Environment initiative

Ceratizit is continuing to develop the Mamer location with an environment initiative. All buildings are being fitted with LED lighting. The air compressors have been set up to match requirements and have been connected to a central management system. And staff have been made aware of the need to eliminate any leaks. Together with one of the suppliers of the sintering furnaces, a project was launched to reduce the amount of cooling water used. A new recycling center has been established to allow even more systematic collection and separation of recyclable materials. The outdated oil burners are being replaced by heat recovery systems, heat pumps and gas condensing boilers. This also means that the underground oil storage tanks are no longer needed. Mamer, the second largest of the Plansee Group's locations, is home to a workforce of around 1,230.

260 tonnes of CO_2 saved

A high-temperature heat pump has been taken into service in Reutte. It feeds the waste heat from the production plants into the two-kilometer-long district heating network. This measure has brought the location a lot closer to the goal it has set itself, namely 20 percent less power consumed per kilogram of product. To date, more than 1,000 megawatt hours of gas worth 50,000 euros have been saved, alongside a reduction in carbon dioxide emissions of 260 tonnes.

Only as needed

Prior to sintering, the wax has to be removed from the pressed tungsten alloy parts. In Lechbruck, Plansee used to use a continuous furnace for removing the binder. Because this was designed for continuous operation, it was constantly consuming power. To save power, Lechbruck has now invested in a batch furnace. This can be switched on and off as needed. This means that Lechbruck saves 130,000 kilowatt hours of electricity and 35,000 cubic meters of hydrogen per year.

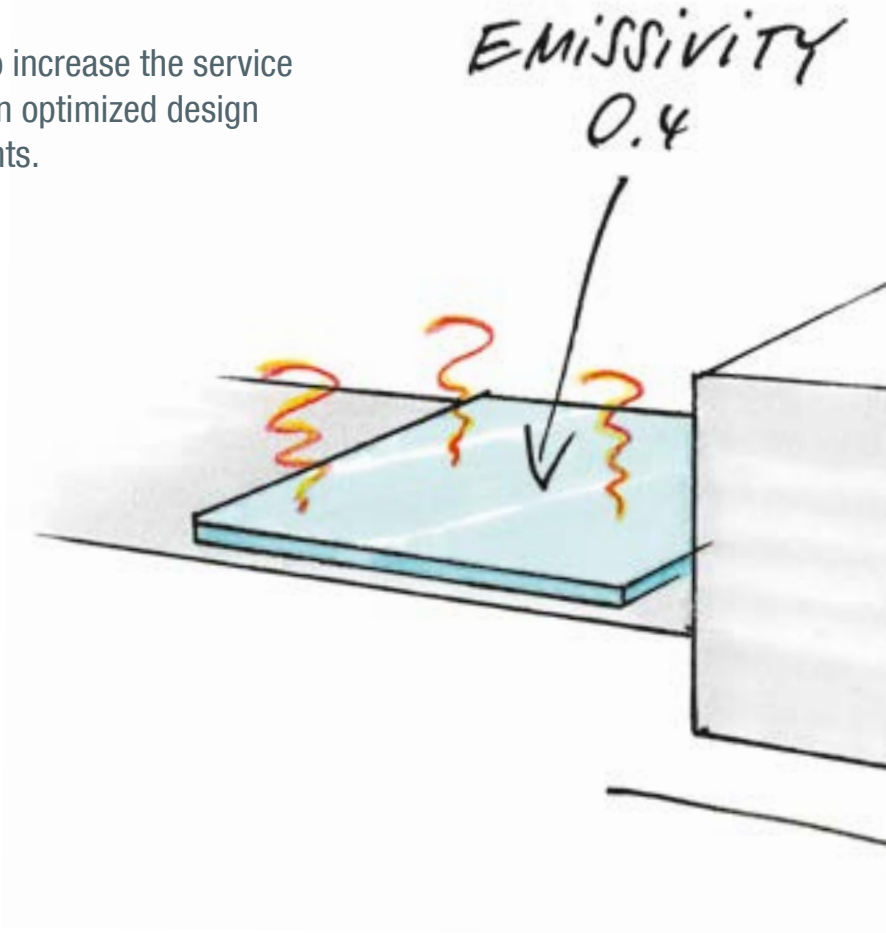
10 percent

The earthquake and nuclear catastrophe in Japan in 2011 caused Plansee Japan to think carefully about how they do things. Every aspect of the company was investigated to find ways of saving energy and using it more responsibly. In just a short time, they managed to reduce their energy consumption by ten percent. Air-conditioning systems were turned down, plant equipment was switched on and off as needed and staff received training in the responsible use of energy.

Semiconductor industry

On the same wavelength

Plansee helps operators of MOCVD reactors to increase the service life and the productivity of the systems with an optimized design and a patented coating for the heating elements.

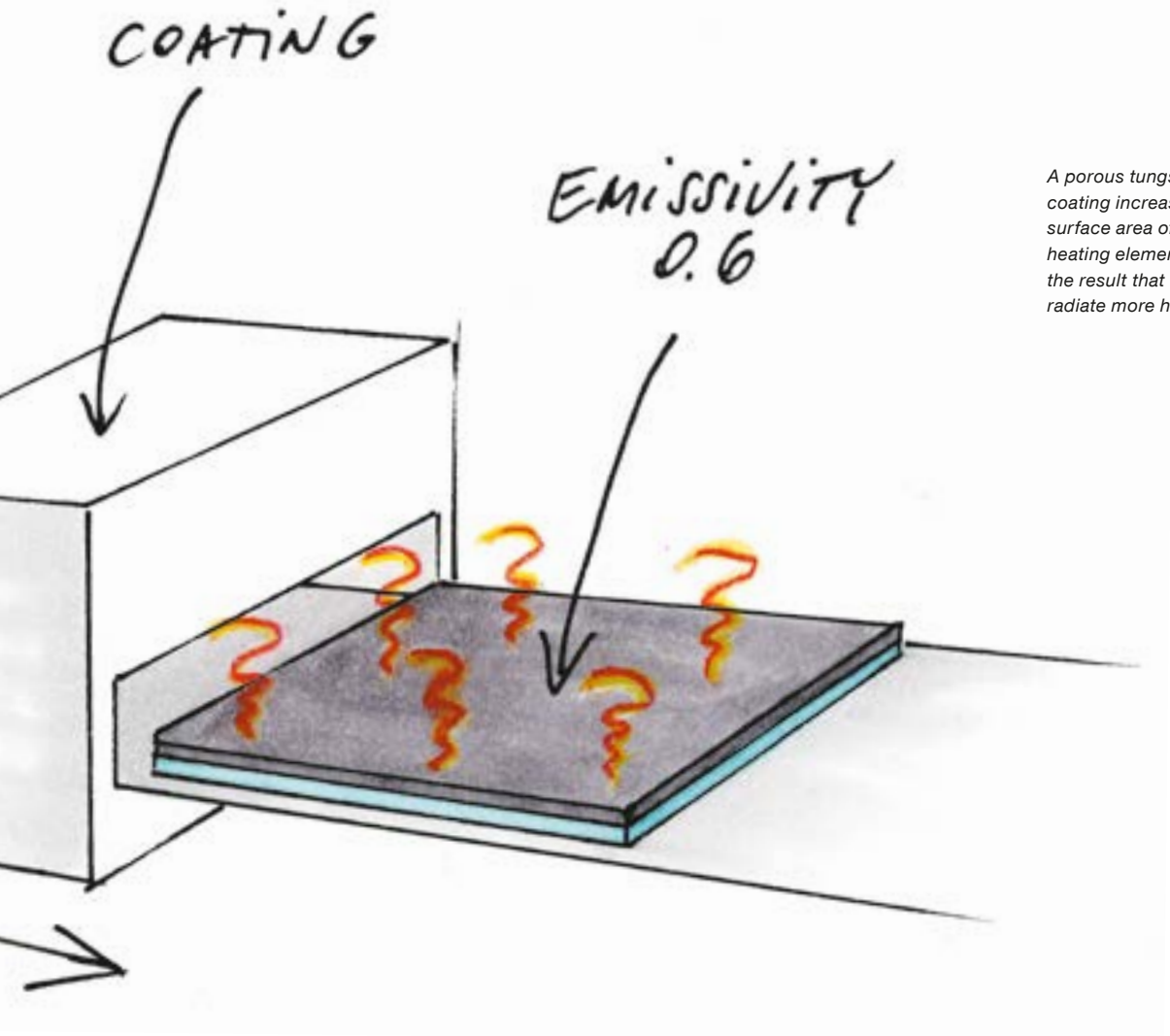


MOCVD is the most important process used in manufacturing LEDs. The process creates the active semiconductor layers that emit the light. White LEDs require a gallium nitride layer, and this is deposited using MOCVD. The abbreviation stands for metal organic chemical vapor phase deposition. It is an epitaxial process for creating crystalline semiconductor layers such as those used in LEDs, solar cells and other opto-electronic components. Temperatures in excess of 1000 °C are needed to create gallium nitride (GaN) in MOCVD reactors.

To achieve such temperatures, it is necessary to bring the heating elements in the furnace to a temperature of up to 2000 °C. And these high temperatures mean that it is necessary to use the high-performance materials molybdenum and tungsten, along with their alloys. A range of different shield packs, gas manifolds and heating elements are used, and Plansee supplies more than 50 different components for some reactor types. Plansee is not only an original equipment manufacturer for reactors. They are also active in the spare parts market. Plansee also helps operators of MOCVD reactors to increase the service life and the productivity of the systems with an optimized heating element design and a patented coating for these heating elements.

Light of the same wavelength

The aim of the manufacturers is to ensure that the semiconductor layers emit light of the same wavelength. In the MOCVD



A porous tungsten coating increases the surface area of the heating elements, with the result that they radiate more heat.

process, this goal is best achieved if the temperature distribution at the wafer is as homogeneous as possible. The wafer is the carrier for the semiconductor layer and is made of sapphire, for instance. Any discrepancy in the temperature profile leads to a change in the color of the LED. Therefore, Plansee optimizes the design of the heating elements to meet the customer's requirements. Plansee's engineers carry out complex finite element calculations to simulate the conditions in the reactor and optimize the design of the different heating components. The aim is to achieve greater homogeneity of the temperature throughout the reactor and match the temperature profile to the process used by the customer. The customer benefits from a greater yield from each coating cycle and thus from increased productivity.

Heating elements that emit more heat

The more heat the heating elements can radiate in the reactor, the less they need to be heated up. Plansee has developed a patented coating process. The tungsten-based coating is very porous. This greatly increases the surface area of the heating elements, which results in more heat being radiated. The benefit for the customer: The lower working temperature reduces power consumption and extends the service life of the heating elements by several months. This in turn reduces the cost of manufacturing LEDs. ▪

Training center for cutting tools

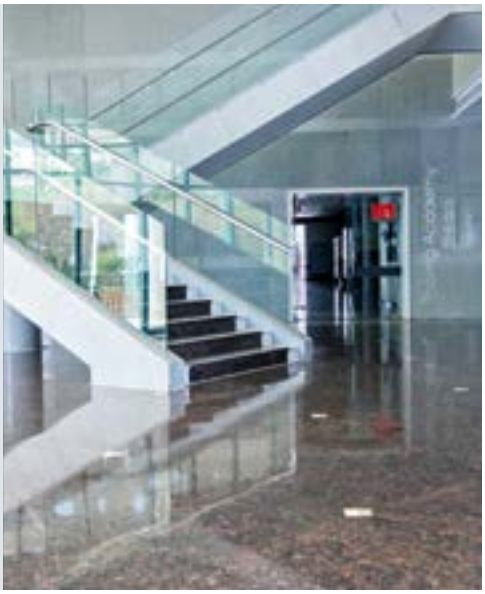
“A real bonus for our customers”

Every year, hundreds of customers complete a course at Ceratizit’s training center for cutting tools in Tianjin. The ideal tool for each customer application is determined on the basis of practical trials.

Practical trials: Concrete tooling recommendations for machining operations.

The concept behind the Tooling Academy

The performance of the overall system is crucial in machining processes. The machine, the spindle and the tool must be perfectly matched. This ensures an economical manufacturing process and high-quality results.
Before any tool that has been newly developed or enhanced is launched on the market, Ceratizit subjects it to comprehensive stress testing at the Tooling Academy. The realistic deployment conditions there ensure realistic results and give insights into the ideal machining parameters. And it is extremely important for the Ceratizit staff and the dealers to know the cutting tools inside out. At the Tooling Academy, they are trained on the same machines that the customers use.
But a machining process will only ever be efficient and successful if the machine operators have been trained up to an appropriate level of skill on the tool itself. And so, the Tooling Academy holds a great number of customer-specific seminars. For Europe, Ceratizit also maintains a Tooling Academy in Reutte, Austria.



Training for customers: Johannes Duller (4th from right) heads up CB Ceratizit's Tooling Academy in Tianjin, China.

Ceratizit's Tooling Academy in Tianjin, 100 kilometers southeast of Beijing, is much more than just a training center. Tests, practical trials and discussions are the order of the day here. It is the birthplace of good ideas for an ideal machining strategy. Above all in sectors in which speed, precision and efficiency are of the essence in machining operations, such as in the automotive industry. Or where workpieces that are particularly difficult to machine are processed, such as in the aerospace industry. And it is also a place where people work on solutions that regularly lead to new or enhanced tools. Johannes Duller from Austria has been working in Tianjin since 2012. For a year now, he has been heading up the Tooling Academy and is responsible for sales on the machining business side of CB Ceratizit. Several times a year, Duller organizes training courses for dealers who sell cutting tools on behalf of Ceratizit. In addition, staff from larger customers regularly receive training at the Tooling Academy. Duller: "These training courses are a real bonus for our customers." Because operators of cutting machines receive no formal training in China, the machining specialists from CB Ceratizit are also able to provide basic knowledge about machining in these courses. Duller: "But our day-to-day business lies in the practical trials." This means that if a customer has a problem with their machining process, the staff at CB Ceratizit examine the workpiece and the material used. On the basis of the practical trials and the subsequent simulations, they are able to make practical tooling recommendations or to develop and build a custom tool. ■

Display industry

On the safe side

All in safe hands: The supply of raw materials, production, transport to the customer, the delivery date. A large number of display manufacturers in Asia rely on sputtering targets from Plansee.

Plansee manufactures both rotary and planar sputtering targets for the display industry.

Should the transport container be fitted with wheels when it is delivered? And if so, where exactly should they be fitted? Can the lid of the transport container be opened on the correct side? In such a way that the sputtering target can be lifted from the crate and installed in the coating system without any complicated maneuvering?

Admittedly, these may be finicky details, but they are of great importance. And they are details for which Plansee High Performance Materials has the right answer for each and every display manufacturer.

After all, a transport container and its valuable contents, planar or rotary sputtering targets, weighs an impressive 800 kilograms or so. And this container needs to be transported safely from one side of the world to the other. From the production plant in Reutte to one of the four bonding shops in Asia, where the sputtering targets are used by one of the many end customers for coating displays or solar panels. Which means that the crates must be designed for carriage by air, optimized for forklift handling and suitable for transportation into cleanrooms.

"We make use of every visit to our customers to get ideas for how we can do things better and in what ways we can increase customer benefits and improve customer service still further," explains Ulrich Lausecker, responsible for sputtering target business at Plansee High Performance Materials.

It is often a case of subtle signals that have to be interpreted properly. Immediately after Chile had suffered an earthquake in mid-April, 2015, Lausecker started receiving calls from concerned customers in Asia. They wanted to be assured that there would be no interruptions to the supply of sputtering targets. The background is that Plansee sources molybdenum powder for manufacturing sputtering targets from the Chilean company Molymet. The mines are located in the north of this long country. It is there that the ore is converted to fine metal powder. Lausecker was able to give the all-clear. On the one hand, many tonnes of the valuable metal are always on container ships on the way to Europe at any given time, and on the other, Plansee has several suppliers. The customers were reassured. And once again they were reminded that in Plansee they have put their faith in a supplier that has the entire supply chain under control, and has a complete understanding of the raw materials it uses. Even if we are talking about tungsten sputtering targets. In this case, the raw material comes from the sister company Global Tungsten & Powders. The company manufactures tungsten powder in the USA.

Supply chain under control

Sputtering targets are manufactured in a series of many individual production steps. Molybdenum ore is converted to molybdenum trioxide, which is then further processed to form pure molybdenum powder. This powder is then pressed into blocks, sintered at high temperatures and formed into sheets in several passes. Between the various steps, the material is constantly reheated and thoroughly cleaned in chemical baths. The final shape of the sputtering target is then machined from the molybdenum sheets and polished. Much the same applies when manufacturing rotary

Final polish: The ultimate shape of the sputtering target is machined from molybdenum and tungsten sheets.

sputtering targets, which are becoming increasingly popular.

Right on the doorstep of its customers in Asia, Plansee prepares the sputtering targets to be used for weeks or months in the coating machines. The sputtering target is bonded to a copper plate using indium. Plansee offers this bonding service in China, Japan, Korea and Taiwan. And that's not all: As soon as the sputtering target has come to the end of its service life, the customer puts it back in the transport container. Plansee then takes on the job of picking it up, conditioning it and recovering the materials.

Indeed, all the various processes that underpin delivery and collection of the sputtering target are taking on ever greater importance. Together with its customers, Plansee draws up forecasts for future material requirements. Lausecker: "The better the forecast, the greater the flexibility with which we can react to unplanned requirements." This includes being able to deliver an urgently needed sputtering target within a week in the event that the plant would otherwise come to a standstill. The average delivery time is 4 to 5 weeks. But there is much more to our service: "For instance, when they start purchasing from us, our customers can choose the currency in which they wish to receive invoices. Or they can choose the country from which they want their sputtering targets delivered from our local bonding shops in China, Korea, Taiwan and Japan. As far as possible, we react to our customers' needs and to local legislation," explains Lausecker.

Everything under one roof

Plansee manufactures the ready-to-use sputtering targets using cutting-edge, highly efficient manufacturing technologies. Significant investments were recently made to increase machining capacity. This has given us the basis for sustainable growth and the ability to meet our customers' needs efficiently. "From powder to a product that is ready to use, everything is under one roof at Plansee. This makes us unique and means that we are an absolutely reliable partner for our customers," says Lausecker. ■

8,3

out of 10: Customers' opinions about the Plansee High Performance Material's products and services are more than welcome. Compared with last year, Plansee was able to show an improvement in the areas of "Flexibility" and "Openness to customer suggestions". The overall satisfaction rating of 8.3 out of a possible 10 points has risen slightly compared with last year. Nevertheless, Plansee will not rest on its laurels and wants to align its service offering even more closely with the requirements of its customers. Around 30 percent of customers responded to the survey. Aspects customers were invited to evaluate after each delivery included product quality, service quality, flexibility of the service offering, customer care provided by the sales team, openness to customer requests and willingness to exchange information.

Supply chain management

Materials logistics without boundaries

Increasingly, logistics is moving away from being a support function and is becoming a competitive factor that is receiving ever more attention from Plansee High Performance Materials and its customers.

Logistics sees itself as a shaper of process and information networks, both within and across companies. It is supported by well-qualified teams and is intended to meet operational and strategic challenges arising within both the corporation itself and the market. As far as Plansee is concerned, these challenges are due to the fact that it is becoming increasingly difficult to plan the demand for products made from the refractory metals molybdenum and tungsten. Sales volumes in important markets such as the automotive industry and consumer electronics are extremely volatile, and suppliers like Plansee have to cope with this volatility.

Plansee's value-added chain, from ore concentrate through to ready-to-install components, is distributed across different production plants in different parts of the globe.

Furthermore, project business is growing in importance. "Increasingly, our customers think in terms of entire scenarios when they plan to introduce new functionality into their products. For this approach to be successful, they must be able to find qualified suppliers who have the ability to introduce these new functions quickly and efficiently," explains Harro Borowski, head of supply chain management at Plansee.

These are developments that Plansee is responding to and which demand ongoing adaptation and optimization of the logistics process chains. And that's not all: "For us, the challenge is to use intelligent supply chain management to give our customers a competitive edge and differentiate ourselves from the competition," Borowski continues.

So what impact do these challenges have on organizational aspects and supply chain management at Plansee?

As of 2007, SAP has been deployed systematically throughout Plansee. This established the foundation for designing and rolling out uniform process standards worldwide. As well as the integration of customer forecasts that are relevant to production, Plansee now offers its customers a wide range of ways of working together to simplify order processing:

Direct deliveries: The introduction of direct deliveries across the group allowed Plansee to ship products directly from the production plant to the end customer. This had a significant impact in reducing delivery times and logistics costs. One major benefit is that the organizational structures and processes in the various corporate units are increasingly converging, with the result that it has been possible to significantly increase the flexibility and speed with which we react to changes in market needs and specific demand.

Consignment stores: In order to offer customers the ultimate in supply reliability, Plansee operates consignment stores for individual customer groups. The agreed quantity of quality-checked material is constantly reserved for the customers.

EDI connection to customers: Plansee has set up the necessary electronic interfaces to individual customers to allow data to be exchanged without delay. At the same time, the roles played by the customers and Plansee in the field of logistics management have been adapted to match the new logistics requirements. This allows Plansee to adjust its production flexibly to suit customer demand at any time. Efficiency in the supply chain rises and transaction costs fall.

Customs duty: In its shipping operations, Plansee offers its customers the

option of DDP deliveries (Delivered Duty Paid) worldwide. This involves Plansee, as the shipper, paying applicable customs duty in countries in which the company has subsidiaries. This entire process is accompanied by active tracking and tracing of all consignments, rapid electronic provision of shipping and delivery documents and early identification and handling of other requirements relating to export and import, such as tariffs and import turnover tax. This requires a detailed, application-specific description of the materials and products used, which is provided to the carrier for customs clearance purposes.

Compliance: As soon as a purchase order is created, the system performs a background check to establish whether the customer is from a country to which an embargo applies or is on a sanctions list. The material classification is used to determine whether, for example, the customer needs to provide an end-user certificate for the product. This provides legal certainty for both the customer and Plansee.

Intermediate storage: Plansee uses modern methods for defining and controlling decoupling points in production in order to reduce delivery times and balance out fluctuations in demand in the market. Decoupling points take the form of intelligently controlled intermediate storage. On the one hand, such storage facilities can be filled, irrespective of fluctuations in market demand, thus permitting continuous production. On the other hand, however, they allow customers to be supplied with additional quantities at short notice. Throughput times are controlled and, wherever possible, reduced, in order to increase flexibility in production. This process is supported by active control of the production lines and capacities to meet daily requirements. At Plansee, this production strategy is now deployed for virtually all semifinished molybdenum and tungsten products such as sheets, strips, rods and wires. The semifinished product is kept in stock in a limited number of dimensions and can quickly be processed to meet customer requirements before being shipped. One important driver behind the implementation of this production strategy is the display and lighting industry.

Transparency: Most sales staff at Plansee have real-time access to information on their customer, production and distribution transactions, irrespective of their location. Customer care staff can respond to inquiries about customer orders and distribution operations irrespective of the production and delivery location and of the relevant time zone.

To make sure it can continue to meet the ever-increasing requirements of both internal and external customers, the Plansee supply chain management team systematically develops its global and local business processes. The aim is to reduce delivery times, to increase the flexibility of both production and the supply chain network, to implement staff development activities that help employees meet these challenges, to increase the transparency and quality of information, and to strengthen the global operational collaboration that makes Plansee a globally active, virtual organization. ■

6:57 pm

It takes an average of three minutes for an order to be prepared for dispatch in Ceratizit's logistics center.

7:00 pm

Logistics center

Purchasing tools after hours

While others are ready to put their feet up, many of Ceratizit's customers are busy ordering their tools for the following day. Anything ordered by 7:00 pm is guaranteed to be there the following day – anywhere in Europe.

Ceratizit's logistics center in Kempten is one of the largest marketplaces in Europe for carbide products. Each and every day, many tonnes of carbide tools and blanks and thousands of indexable cutting inserts go onto the shelves. And every day, thousands of packages leave the warehouse. They are headed for customers from the automotive or mechanical engineering industries or distributors throughout Europe and the rest of the world. 99 percent of the packages that leave the logistics center by 8:00 pm reach their destination in Europe on the following day. Deliveries to metropolitan regions outside Europe generally reach their destination within two days. And it is rare that a customer has to wait for more than three days, no matter whether they are in Mexico or Australia.

For Ceratizit, the decisive issue is when the order is received. Let us take the example of a German-based precision toolmaker who orders a milling cutter. The order is sent electronically to the fully automated picking system. The system knows that the milling cutter ordered by 'Mayer Präzisionstechnik' is in the tray with the sequence number 12.345, one of many thousand trays. And the system also knows where this tray is currently located in the 50 meter long, ten meter high shelf assembly. A shuttle fetches the tray from the shelf and places it on a conveyor, which takes it to the picking station. Here, an LED lamp lights up the box holding the required milling cutter. The employee at the station removes the milling cutter and releases the tray which is quickly transported back into the stock picking system. The employee in the dispatch area carefully packs the milling cutter, puts in the delivery note and attaches the address label – the order is now ready for shipment. Less than three minutes have passed since the order was placed. If the order is received any time up to shortly before 7:00 pm Central European Time, the package is guaranteed to leave the warehouse the same day.

In the Kempten logistics center, this operation is repeated time and time again. And it doesn't matter whether the order comes from a Polish sales representative ordering 10 indexable cutting inserts for a test for their customer or from a toolmaker in Turkey who needs carbide blanks for an important customer order. Ceratizit stocks well over 60,000 articles in its logistics center. From indexable cutting inserts weighing just a few grams for lathing processes or solid carbide milling cutters and drills right up to six-kilogram extra-long rod blanks. Furthermore, there is no minimum order quantity and Ceratizit will take care of the necessary customs clearance.

Sharpening service: Worn carbide tools are picked up from the customer, reworked and returned after 15 working days of the latest.

Solid carbide tool configurator

It takes just a few clicks of the mouse for a French automotive supplier to configure their custom solid carbide tool in the Ceratizit Web shop (www.e-techstore.com). And as often as not this will be done outside normal working hours. In this small business, the customer is the owner, head of production and purchaser all in one. During the day, he is on the shop floor helping his staff. As soon as they have knocked off, he orders the tools for the next few days. To do this, he enters the necessary dimensions on the basis of Ceratizit's standard range of solid carbide milling cutters and drills. At the touch of a button, the system checks whether the specifications he has made can be implemented. He can order immediately or request a quotation. Within a matter of a few minutes, he receives an email with an order confirmation or a quotation including a delivery time and a drawing and CAD data to accompany the quotation. The configurator can also be used on tablets and smartphones. It is available to all European customers. Customers can obtain login credentials from their local Ceratizit sales office.

Regrinding service and recycling

But Ceratizit's service is by no means over when the French customer has received their custom solid carbide tool by post. No matter how good the tool may be, sooner or later even this milling cutter will wear out.

Then it needs to be sharpened and, if necessary, re-coated (restoration service). For this purpose, Ceratizit provides its customers with special containers that are collected on request and returned with the reworked tools after 15 working days at most. Ceratizit re-conditions the solid carbide tools in such a way that virtually 100 percent of the service life and cutting performance of a new tool are restored. The customer benefits from a high level of process reliability and significantly lower production and tooling costs and has to keep fewer tools in stock, thanks to the rapid service. The only condition is that the diameter and length of the tool are still within tolerance and that the ultimate wear threshold has not been exceeded. But even in this case, Ceratizit has a solution and will take back the carbide tool for its scrap value when it has reached the end of its service life. And so the cycle starts again from the beginning. The carbide is expertly conditioned for reuse in new tools. And these will then find their way onto the shelves of Ceratizit's logistics center, where they will wait for a customer to place another urgent order shortly before 7:00 pm … ■

Product management

Great place for replacement parts

In his role as Business Development Manager for the semiconductor industry, Keith Allen is based at the hub of the industry, namely in Singapore, far from his home in California.

Well-connected across all the different time zones and cultures: Keith Allen (left).

"It was a fantastic experience. I took away far more than I invested." Keith Allen takes stock. He has been with Plansee for four years now. He started as a product manager at the Vista factory in California. But it soon became clear that, as far as the semiconductor industry was concerned, Asia was the place to be.

Communicating the added value

Plansee has built up a worldwide sales and production network for its replacement parts business for implanter components and offers hundreds of different components. The plant in Vista, California specializes in graphite replacement parts. The plant in Esashi, Japan, is specialist for replacement parts made from the refractory metals molybdenum and tungsten. And Plansee is currently investing in a plant in Mysore, India for finishing replacement parts made from refractory metals. But Plansee is aware that the replacement parts business in the semiconductor industry depends on fast, extremely flexible suppliers. The sales and production network must always be finely tuned to respond to the requirements of the customers. And this is what Keith Allen has been responsible for over the past year. He has just completed his first overseas deployment for Plansee. In a replacement parts market in which price appears to be the dominant factor, his mission was to show customers the benefits of the Plansee offering, calculate lifecycle costs, and convince customers of the advantages of improved, sustainably cost-efficient replacement parts solutions. After all, Plansee is not just about supplying replacement parts. "Taking the equipment manufacturer's original spare parts as our starting point, we optimize the geometries and material compositions. The customer benefits from easier installation and removal of the components, longer service life, lower cleaning costs, reduced maintenance outlay and less downtime."

Overcoming barriers

When asked about his move from Vista to Esashi, Keith Allen described it at first as a real culture shock: "My stay opened my eyes to the magnitude of the communication barriers between the different cultures, but also that these barriers can be managed if you are aware of the issues and know how to conduct yourself appropriately." Allen: "We joined forces to work on our processes, our R&D strategies, quality issues and on how to help our sales teams be a force to be reckoned with." Amid all these activities, Keith Allen's first year's deployment overseas simply flew by. And it won't be his last. Since june this year, he has been living in Singapore. Singapore is regarded as the secret capital of the semiconductor industry. All the major players from the West have a presence here. And it is the gateway to the manufacturers in Asia. And it is exactly the right place for Keith Allen: "As a Business Development Manager, this is a great place for me." Within his own company, he has already established strong networks across all the different time zones and cultures. "Now it is time to focus on networking even more intensively with our customers, on being in at the inception of new trends and challenges and on convincing our customers of the long-term benefits of our improved replacement parts." ▪

Finance and accounting

Boss in China

The wide range of products presents a real challenge for efficient IT and financial processes: Charis Heuzé has been the CFO at CB Ceratizit in Xiamen since 2015.

It is a fairytale career: For six years, Charis Heuzé worked at Deloitte, spending four years in auditing. This put her in good stead to switch to her customer Ceratizit, where she became Group Finance Manager. "That move gave me back some of the things I had been missing as a project manager at Deloitte, namely working in an operational environment, hands-on involvement in facts and figures and, once again, more time for my family and leisure activities," remembers Heuzé happily. Heuzé has been working at Ceratizit for nine years. And they have been exciting years. She established the reporting system. Almost every year, Ceratizit opened up a new sales office. In 2010, a joint venture was set up with CB Carbide, a company that had several production plants in China and Taiwan. Heuzé was there right from the beginning, initially working on due diligence and later as part of the initial consolidation and the first audit.

Standing on her own feet

In the fall of 2014, a vacancy came up as the CFO of CB Ceratizit in Xiamen, China. Heuzé was offered the job. Heuzé: "I could well imagine living there. For years, I had already been in close contact with my colleagues at CB and had already visited Xiamen a number of times."
And she is thoroughly familiar with being on the move in her private life. Born in Leipzig, Germany, she studied financial accounting and controlling in France and subsequently worked in Luxembourg and lived in Belgium. And her daughter has now flown the nest. "We often share a meal together, via Skype. It doesn't entirely get rid of the 10,000 kilometers between us, but it still brings us far closer together," says Heuzé.
She recently got her Chinese driving license and has since been battling her way through the chaotic traffic without a driver. And increasingly she is able to stand on her own two feet with the language: "I started learning Chinese in Luxembourg and I'm becoming ever more confident using the language in daily life."

Wide range of products

So what's it like to be head of finance in China? Heuzé: "You have to be very careful in conveying your objectives." After all, the staff are hugely motivated and spare no effort to complete an assignment. It's not unheard of to see people working through until daybreak. With her devotion to figures, is Heuzé also interested in Ceratizit's products? She smiles: "Oh yes. Ultimately, it is the wide range of products that makes our IT and finance operations so varied and complex." This is because the Ceratizit Group operates several production plants across the globe. And the products are sold through a large number of sales offices, some of which are very small.

Making a name in the company

Heuzé: "The management training courses at Ceratizit have helped me to sharpen my soft skills in particular. After all, in the first place it is your technical skills that earn you promotion." Over time, she has learned to give feedback even if it is uncomfortable and to react appropriately in times of crisis. The presentations she gave to the board were good practice. "That does help to make a name for yourself in the company."
Nowadays, she particularly enjoys the benefit of the network she built up across the entire Plansee Group during the training courses. Heuzé is convinced: "That really does provide a good basis for implementing complex financial and IT projects far more successfully." ■

Motivated team: Charis Heuzé heads up finance and accounting at CB Ceratizit in China.

Gerard Theurl: work experience in the US.

Well-earned work experience

Each year, under the motto "Be the Best", the Förderverein Technik Tirol in Austria awards prizes for final project work submitted by graduates of the Higher Technical Institutes (HTLs). The judges includes staff from the Plansee Group. As part of the competition, the Plansee Group awarded two two-month work experience programs including overseas deployments. And the winner was Gerald Theurl. During the familiarization phase in Reutte, he supported process engineers in their daily work. Then he worked for a month at Plansee in Franklin, USA. Gerald Theurl: "It was a fantastic experience for me. I enjoyed the work so much that I extended my work experience contract."

Well done!

At the University of Leoben in Austria, David Lang has been working on behalf of Plansee to produce an in-depth study of the material properties of molybdenum hafnium carbide (MHC). This material has greater thermal and mechanical resilience than the widely used titanium-zirconium-molybdenum (TZM). David Lang's findings allowed more efficient production of MHC and led to a more precise definition of the material properties. His diploma thesis on this topic was awarded a prize by the European Powder Metallurgy Association (EPMA). Now, Lang is continuing his research in a dissertation, which he is also writing at Plansee.

2 days

Understanding how the factory works: All new employees at Plansee USA begin with a two-day tour round the factory. They pass through the departments in the same way as a customer order and observe their future colleagues at work: Sales, product development, procurement, planning, production, quality assurance and logistics, right up to accounting. The aim is to give all new employees an understanding of how the factory works and how they will contribute to ensuring that each order results in a good product and a satisfied customer.

89 %

internal recruitment: It is the Plansee Group's aim to fill eight out of every ten management posts from internal applicants. Last year, this goal was achieved with 89 percent in middle management. A figure of 80 percent was achieved in top management.

8 out of 10

The Plansee Group wants to fill eight out of every ten management posts with talented people within the company. Massimo Cigardi started work with Ceratizit in Alserio as a lathe operator. After he had become a specialist for machining and shaping drawing dies, he took on his first management role, coordinating a team of ten staff. "This experience, coupled with the training courses offered by Ceratizit and, above all, my own motivation and passion, put me in a position where I was promoted to head of department," explains Cigardi. He is now responsible for three production lines and more than 40 staff.

Head of production line Massimo Cigardi.

Insurance for all

In India, employees who earn within a certain range are part of the state social insurance program. To ensure that all members of staff receive medical care if they fall ill, Plansee India and Ceratizit India offer all employees with a permanent contract and their families private insurance cover. Not only that, they are also covered by the company against accidents.

Loyal staff

The annual long-service celebrations are an indication of how happy the staff are with their work and working environment. Last year, senior management recognized 342 employees for long service of up to 45 years at nine locations across the globe.

Sound investment

From paid work experience programs through to the recognition of long-serving employees, the investments made in well-qualified, motivated and loyal staff by the Plansee Group have been paying dividends for many years.

The team is the star

Ceratizit Germany invited its management team to a rather unusual team development event. They spent a half day with professional volleyball team TV Rottenburg. The coach explained to the 25 managers that success is only possible by working as a team and by fostering and properly using various individual skills. He also demonstrated the importance of objectives, and how they must be understood and accepted if they are to take people along with them. The managers were able to explore the concept of teamwork thoroughly and put it into practice during the final training session with the volleyball team. After the final whistle, one thing was clear: “We are a team!”

Long-service awards at Plansee in the USA.

Good neighbors

Help and support that really makes a difference: How staff at our production plants across the globe are getting involved with people and projects in their neighborhood.

A point of honor!

"Taking part is a point of honor" is the name of the initiative by a German Young Peoples' Foundation on International Volunteer Day. School is closed for the day. Instead, schoolchildren go to work and donate their wages of five euros an hour to regional youth projects. Ceratizit Germany employed five schoolchildren who helped out in production for the day.

Books for 1600 schoolchildren

Every year, Ceratizit India donates money and resources to social projects in the region around Uluberia. Last year, Joarberia Union High School open a library. The school provides education for 1600 disadvantaged children. Ceratizit India provided books, bookshelves, chairs, desks and benches.

The beat of the drum

15 men and women in a boat followed the beat of a drum to master a 200-meter course. It was the Dragon Boat Charity Cup organized by the Rotary Club on the Austrian Heiterwanger See. Plansee Lechbruck came in a very creditable third. This year saw the first appearance of the Uni Leoben team, featuring employees from Plansee and Ceratizit studying at the Montan University in Leoben. Both the teams made a donation of 500 euros. The money will go towards social projects in the region.

Donating blood

Four employees of GTP in Towanda have donated more than 65 liters of blood in 145 sessions. Their efforts have been recognized by the regional blood donation and transfusion center in Bradford County, Pennsylvania. One in five employees at GTP visits the center once a month and donates blood and plasma. But staff in Brúntal, Reutte and Warren regularly donate life-saving blood. In Reutte, 150 employees gave 70 liters of blood and eight liters of blood are regularly collected at Ceratizit's quarterly blood donor day in Warren.

Participation sport

Professionally equipped: The newly founded youth team at the Lechbruck ice hockey club have been equipped by Plansee. And the tennis team also received new shirts. Ceratizit Germany supports the professional volleyball team TV Rottenburg.

Cycling without frontiers

Team WNT has won the 2015 Allgäu tour in Germany and donated 12,050 euros to Médecins Sans Frontières. This meant that the team was three times better than last year, as was the donation. A total of 190 WNT employees and their families from a large number of European WNT subsidiaries were at the start.

A relay for life

For the tenth time, the 24-hour run in aid of cancer support took place in Luxembourg and Ceratizit has been supporting the event from its inception. Last year, 44 employees took part in the relay. The company donated a total of 1415 euros.

Switching contacts

Reliable power supply

The design may be extravagant, but the function remains the same. Electricity pylons will continue to be indispensable for transmitting electricity over long distances well into the future. Plansee has been supplying the tungsten-copper switching contacts needed to regulate the high-voltage and super-high-voltage electricity for decades. And throughout that time they have been constantly improving the performance and service life of the switching contacts.

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