

No. 16 – 2018

LIVING METALS

Continuity & Change

PLANSEE
The Plansee Group



Dear reader,

_____ When we speak of continuity in the Plansee Group, we refer to continuity in terms of the company's ownership, continuity with respect to the materials and products and, last but not least, continuity among the employees and in management.

_____ At the same time, this kind of continuity is only possible through continual change – something that is happening more subtly at Plansee and Ceratizit.

_____ We can proudly say that we have changed significantly in recent years, and our change process remains extremely positive.

_____ Through active portfolio management, we have formed one of the largest industrial companies for tungsten and molybdenum – offering everything from powder to the end product.

_____ With the »Marathon« program, we have aligned our global organization to be competitive and agile.

_____ And presently we are working on completing the digital transformation of the Plansee Group by 2021.

_____ You see: despite all continuity, and in light of the favorable business trend in the past fiscal year, as well as in the current year, we must continue to move forward. The challenges as they relate to Plansee and Ceratizit remain essentially the same: topics such as raw material supply, competitiveness, customer focus, skilled labor shortage and digitization will continue to keep us on our toes.

It also holds true for us that change is the only constant. We hope you enjoy reading this issue.

BERNHARD SCHRETTER AND KARLHEINZ WEX
Executive Board Plansee Group



Everything remains different | 4

A SEARCH FOR CLUES AMONG HISTORIANS AND ECONOMISTS

An interview with the Executive Board | 8

BERNHARD SCHRETTER AND KARLHEINZ WEX ON CONTINUITY AND CHANGE

Intelligent tools | 32

IT'S ALL DIGITAL: SELECTING, ORDERING AND BECOMING MORE PRODUCTIVE

Matmatch | 36

A UNIVERSE OF 80,000 MATERIALS

Flexible models | 40

THE ROLE OF HR IN SHAPING DIGITAL TRANSFORMATION

Time travel | 10

WE HAVE BEEN DOING THE SAME THING FOR 100 YEARS – OR HAVE WE?

Raw materials | 16

GETTING OFF THE ROLLER COASTER

Rhenium | 44

A RARE METAL WITH A ROMANTIC NAME

Team player | 50

9 EMPLOYEE PROFILES: WILLING TO TRAVEL AND OPEN TO NEW THINGS

Protective heavy metals | 22

SAFE HANDLING OF RADIOACTIVE SUBSTANCES

Content

Focus on digitization | 28

NEW PROJECTS OF THE PLANSEE GROUP

Inspiring ideas | 30

SUPPORT FOR INDUSTRY-ORIENTED START-UPS

Cutting tool experts | 60

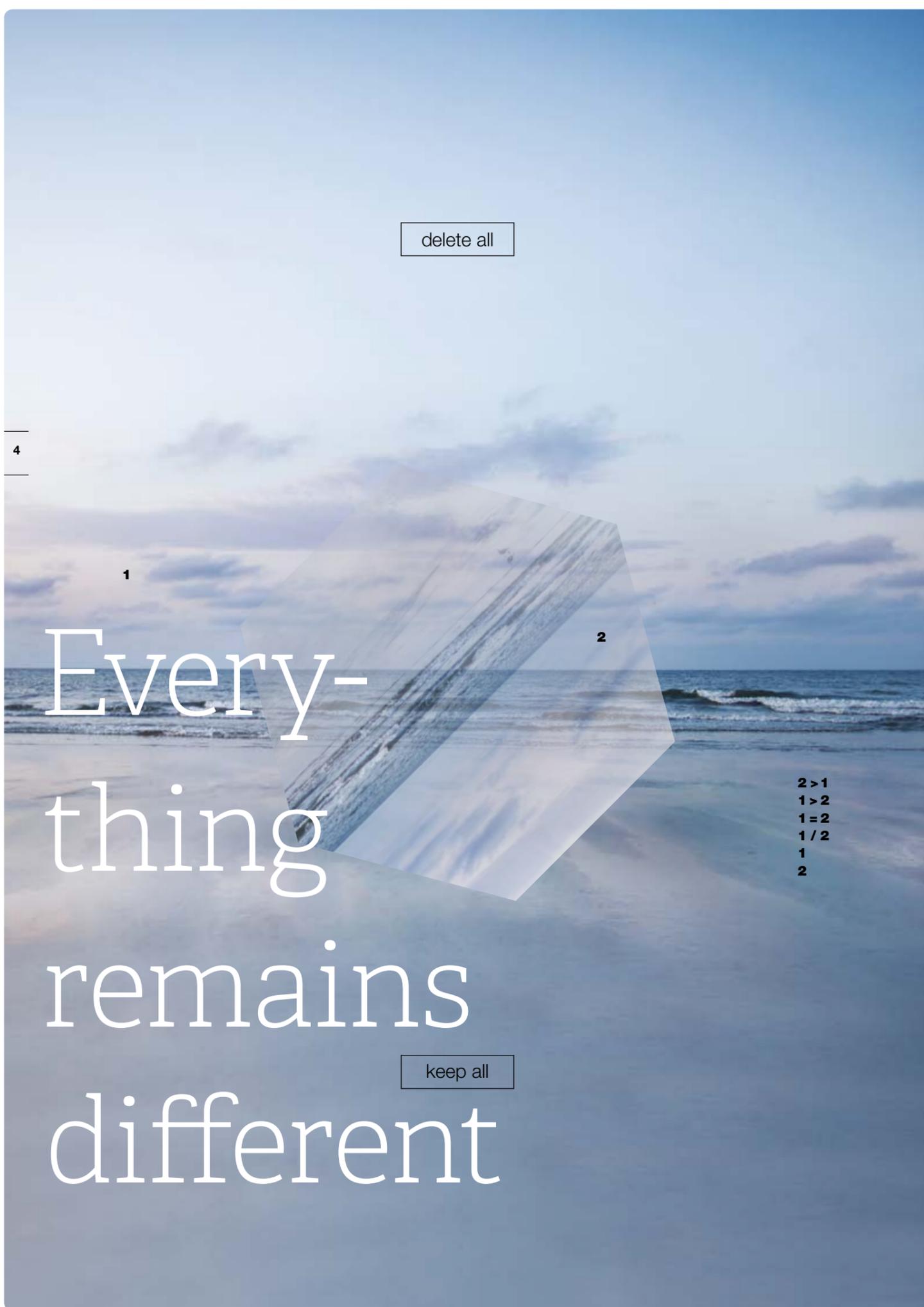
»100-YEAR ANNIVERSARY DRILL« FORGES BOND BETWEEN CERATIZIT AND KOMET

Social responsibility | 64

HOW YOGA, RED RUBBER BOOTS AND A NIOBIUM COIN CREATE A SENSE OF PURPOSE

Investments | 66

MONEY WELL-INVESTED IN NEW PRODUCTS, NEW EQUIPMENT AND NEW BUILDINGS



delete all

keep all

Everything- thing remains different

1

2

2 > 1
1 > 2
1 = 2
1 / 2
1
2

Is continuity really in contradiction to change? Or can they be thought of as equals? **ANDRÉ BOSSE**

A SEARCH FOR CLUES AMONG HISTORIANS AND ECONOMISTS REVEALS THAT COMPANIES AND PEOPLE COPE WITH CHANGE BETTER THAN THEY THINK.

«The happy are oppressed with fear of change,» Friedrich Schiller's Don Manuel exclaims in »The Bride of Messina.« »For where no gain is hoped for, threatens loss.« Admittedly, there are special circumstances that surround the setting in this drama, which is about two feuding brothers, Don Manuel and Don Cesar. The two only reconcile once they learn of the existence of their previously unknown sister. But then they both fall in love with her, resulting in the murder of one brother and the suicide of the other – a tragedy of inconceivable proportions that should not let our hearts be troubled. Still, we should give more thought to this one sentence ...

«The happy are oppressed with fear of change.» – Managers and strategists from successful companies know exactly what Don Manuel is trying to say. Business is good, the numbers add up, and the atmosphere among the employees is satisfactory. Sure, some tweaking is needed here and there; essentially, though, the spirits are high, and it would not be incorrect to assume that many companies are happy organizations. Otherwise, the insolvency numbers would be higher, and the bonuses lower. At the same time, the sword of Damocles is hanging over the business world, and its sharpness and ever-present peril have only increased over the years. Change, they say, is indispensable, as digital and disruptive technologies will turn everything upside down. What's more: those who don't follow along with these inevitable changes, or follow suit too late, will lose everything sooner or later. Schiller put it in less drastic words, but the meaning was the same: »For where no gain is hoped for, threatens loss.«

In the corporate consultants' language, the concept of change is synonymous today with dynamics, future and success. But what does continuity then stand for? For stagnation, the past and loss? Not so fast, says Werner Abelshauser. To begin with, the economic historian working at Bielefeld University wants to place a few things in context and rectify them. When people speak of change today, the catch phrase of the Fourth Industrial Revolution and its consequences is bound to come up eventually. »What they mean is the digitized world; they believe that momentous progress lies in the new way in which production will take place under Industry 4.0.« The vision is familiar: machines communicate with each other via the Internet of Things, artificial intelligence utilizes Big Data, and 3D printers generate even complex single specimens quickly and cost-effectively. There is no doubt that all of this will happen, and much of it is already here. Additionally, these innovations are not unimportant, says Abelshauser. »Industrial enterprises, though, have been focusing on far more than just new approaches to production for quite some time. What's even more significant is intangible value creation.«

*The happy are oppressed with fear of change,
for where no gain is hoped for, threatens loss.*

FRIEDRICH SCHILLER | The Bride of Messina

The creation of value occurs wherever science and business form a symbiotic relationship. That is where change has been time-tested for generations.

WERNER ABELSHAUSER | Economic historian

6 ——— Where and how is revenue generated today? What departments are growing, and where are new job profiles created? What divisions are being upgraded, receiving most of the money? And what corporate issues are taking center stage as a result? Abelshauser lists them: HR and Marketing, tapping new business segments, researching and developing processes, materials, and applications. »The creation of value occurs wherever science and business form a symbiotic relationship.« And that is where change has been time-tested for generations. Take the example of mechanical engineering: as late as the 1990s, this industry was considered to be antiquated in Germany, Austria and Switzerland, lagging on the global stage. »Today, it forms the backbone of the economy because, through research and a business mindset, it managed to take capitalize on technological progress and conquer new business segments.« For decades, these changes have also formed part of the skillset of the chemical or steel industry. Abelshauser states: »Change is part of a continuous success story.«

———— It is interesting that the economic historian does not think of continuity and change in separate terms, but collectively. But does this still hold true in the present age, which is the most complex, global and fast-paced ever? We asked Christian Scholz, an Austrian economist and professor at the University of Saarbrücken. For his studies, Scholz visits companies and other organizations, where he works on change processes and meets with high-performance teams who are required to make a large number of very important decisions very quickly: soccer teams, orchestras, management boards, and innovators. »My short five-second model has been successfully applied in these instances,« Scholz comments.

»The key here is to tackle two contradictory concepts simultaneously and regard them as equal.« One example is continuity and change. Another is perfection and adventure. »Something isn't right when the people on the teams attempt to place particular emphasis on one of the two elements.« When Scholz hears comments such as more would be needed of this, or less of that, he knows: »The balance is off here.« Complex problems cannot be solved with a deli counter approach, where you order a little more of this, and a little less of that.

Change is part of a continuous success story.

Scholz adds: »It is crucial to prepare mentally for complete equality of what appear to be two opposing concepts. Teams who manage this continually strive for perfection, but at the same time, and in equal measure, are knowingly open to an adventure that, ultimately, may not be as perfect.«

———— Adventure – similarly to change – is a term, though, that motivates one, but frightens another. After all, the seemingly happy who meet change with skepticism can be found anywhere. They do not see the potential gain, but the looming loss. So how do you get people to embrace change? Coach and consultant Sebastian Purps-Pardigol, together with neurobiologist Gerald Hütther, established the »Culture Change« initiative. As part of his work, he encounters companies that want

to create change – and wonder how to successfully inspire even those who are intent on playing it safe and slow to embrace change. Purps-Pardigol's work with any company starts at the top: »When I come across bosses who want me to get their employees to enjoy change, but refuse to work on themselves, I don't even accept the engagement. Anyone not willing to undergo change themselves will never be able to set change in motion credibly.« Top management that demands a great deal of openness from its people, for example, but doesn't practice it and remains isolated, will kill any change process. When Sebastian Purps-Pardigol finds that everyone is serious about change, he scrutinizes the corporate and leadership culture. This is where the leverage lies for ensuring that change has a positive connotation. »When asked what specifically can be done, I answer: introduce mindfulness into your company,«

———— At times, it is even simpler than that, for example when language comes into play. Every firm has people from different generations – who all think differently. The economist Christian Scholz categorizes the staff by generation: »As far as the motivation for change is concerned, each generation has a different key trigger.«

The key is to tackle two contradictory concepts simultaneously and regard them as equal. One example is continuity and change. Another is perfection and adventure.

Purps-Pardigol states. A program such as mindfulness-based stress reduction can help people break free from subjectively experiencing all change as a threat. »You can train your brain to learn how to respond positively to external stimuli, rather than automatically reacting negatively from the start.« Again, continuity becomes a catalyst for change: if a person understands that change does not entirely eliminate security, but that the guidelines of the corporate culture are preserved, change is immediately perceived as a lesser threat.

As a result, he recommends adapting the respective language in change management processes based on the generation: Baby boomers (born 1955 to 1969) love »vision,« while generation Xers (born in the 1970s) are less receptive to this term – »for them, the prospects of efficiency and cost effectiveness work.« Millennials (1980s to early 1990s) feel motivated when the onus is put on them, for example by calling upon them: »Competition requires us to do this!« The youngest generation Z (born starting in the late 1990s) want change only to a limited extent: »You're better off referring to it as 'optimizing structures and security'.«

———— Regardless of what change is called, it is to be hoped that its implementation has a better outcome than in Schiller's drama »The Bride of Messina« where both brothers die in the end. Schiller himself referred to his drama as a tragedy. Afterwards, though, he wrote »William Tell« – which not only ends on a good note, but also laid the foundation for a very stable confederacy.

As far as the motivation for change is concerned, each generation has a different key trigger.

ROLE MODEL + DECENCY EXECUTIVE BOARD

New working methods

Ambition

Receptiveness to criticism

Curiosity

Propensity to invest

Mobility

Help get the best ideas accepted
and leave everything behind that
doesn't make us successful.

AN INTERVIEW WITH THE EXECUTIVE BOARD: BERNHARD SCHRETTER AND KARLHEINZ WEX

What do continuity and change mean to you?

We want to reach our goals
more quickly and effectively
with new working methods.

What principle have you stayed true to your entire life?

Bernhard Schretter — Correctness. To me, being correct means to be honest and open, both professionally and personally. And as an executive and a member of the Executive Board, not to allow any ploys that could subvert the company's ethics. I once read that Board members should serve as role models and demonstrate propriety. There is really nothing to add to that.

Karlheinz Wex — Aside from honesty, I have maintained openness in the sense of great curiosity regarding new technologies, new products, new applications. You may also call it inner restlessness that time and again drives me to seek out and accept challenges.

What was the most challenging change you have personally experienced in your career?

Karlheinz Wex — Being appointed to the Executive Board. It's a different kind of responsibility that you feel all of a sudden. Serving in a dual capacity as both Chief Financial Officer of the group and a member of Ceratizit's Executive Board was also challenging for me – primarily due to time constraints, since I was commuting between Reutte, Austria, and Mamer, Luxembourg, for three years. Difficult tasks have always helped me develop!

Bernhard Schretter — My relocation from the »sheltered« Reutte to Hong Kong, China, was challenging – I went on my first business trips to China 25 years ago on my own. And definitely being appointed to the Executive Board.

Suddenly, all eyes are on you, and you bear even greater responsibility for what you do and say.

What trait do we have to preserve as a company?

Bernhard Schretter — Our ambition to grow and be successful with innovative products in a technologically exciting environment and a comparatively small market. And, we must remain an attractive employer to our staff around the globe, based on what we do and how we do it. Fairly successful, consistently innovative and independent as a private company – that's what makes us interesting as an employer.

Karlheinz Wex — Our propensity to invest, which affords us a very long planning horizon to safeguard the continued existence of our group; the ability to stick together, even under difficult circumstances – just remember the fire in Ceratizit's sintering department in 1996 or the aftermath of the 2009 financial crisis; and the focus on our core competencies – powder metallurgy, our primary materials molybdenum and tungsten, and the recurring question as to how we can continue to advance our core competencies to benefit our customers.

Where do we need to change?

Karlheinz Wex — We must change our working methods – our customers expect this from us as much as our younger employees. Markets such as the consumer electronics industry set the pace.

Our subsidiaries Plansee Shanghai and CB Ceratizit teach us the speed with which decisions must be made and implemented to stay in the game. Our WNT retail brand demonstrates how emotionally charged marketing targets the customer's gut. We expect our materials platform Matmatch to deliver inspiration for customer-focused and flexible product development. At the same time, we have launched a number of in-house initiatives. New working methods are expected to help us reach our goal more quickly and effectively.

Bernhard Schretter — Our corporate culture should be more receptive to criticism – to accomplish this, we also need some self-examination. We all want what is best for the company – that should be the yardstick for criticism and praise. This is the only way for us to help get the best ideas accepted and leave everything behind that doesn't make us successful. Additionally, we must ask ourselves: Do we have a sufficient number of good people on the »bench«? And do we have enough people who can meet tomorrow's challenges? Are they visible in the company, and are they being developed appropriately? We must become more responsive – with respect to deployments, stays abroad, and when it comes to job rotation.

Paul Schwarzkopf | Company founder

_____ I then continued by taking a journey back into the founding years. Company founder Paul Schwarzkopf published a book some 80 years ago. Its title: Living metals. In easy to understand terms, Paul Schwarzkopf describes the structure and composition of a wide range of materials, which at that time were predominantly based on (scientifically well-substantiated) assumptions. Plansee's Head of Development Heinrich Kestler comments: »Today, we can use a high-tech probe and count atoms at boundaries between individual grains in the material microstructure. We can use complex simulation methods and calculate what happens between the atoms when materials are alloyed, pressed, rolled, annealed or processed otherwise. Still, what we are capable of technologically essentially confirms how

Michael Androsch | Lighting business

_____ So the technological know-how has drastically evolved over all these years – does the same apply to the markets and industries in which our materials are used? Plansee grew up with the lighting industry. During the early years of the 20th century, incandescent bulbs equipped with tungsten filaments made their way into all areas of life. This necessitated the development of production methods that would allow tungsten wires to be manufactured on an industrial scale. Paul Schwarzkopf accomplished this, and for many years Plansee generated a large portion of its revenue from tungsten wire. The lighting industry has remained a customer to this day. Michael Androsch who is in charge of Plansee's lighting business comments: »We are one of the last industrial enterprises that manufactures wires, ribbons and components for conventional lamps such as incandescent lamps, halogen lamps or cinema lamps.« At the same time, the Plansee Group today generates more than 50 percent of its revenue from the automotive industry, mechanical engineering, and consumer electronics. And new products can be found primarily in high-tech applications.

We are one of the last industrial enterprises that manufactures wires, ribbons and components for conventional lamps such as incandescent lamps, halogen lamps or cinema lamps. At the same time, the Plansee Group today generates more than 50 percent of its revenue from the automotive industry, mechanical engineering, and consumer electronics.

things were seen 100 years ago.« In other words, we can now calculate processes and make them technologically accessible. This is an important prerequisite for the continual enhancement and optimization of processes in large machines, such as sintering furnaces and rolling mills.

What we are capable of technologically essentially confirms how things were seen 100 years ago. In other words, we can now calculate processes.

Molybdenum is a great conductor of electrical currents – an important prerequisite for controlling every single pixel in the display.

Gerhard Munz | Product Manager

_____ Gerhard Munz is Product Manager for Plansee in Germany for a highly promising new use. Gigantic wafer steppers operating in the ultraviolet range are projected to make the next chip generation possible, and the performance capability of today's chips is forecast to increase multiple times. These exposure machines use a hot tin melt, and molybdenum is excellent for this application – due to the very good corrosion resistance and because complex components can be made from molybdenum. Gerhard Munz adds: »One of molybdenum's long-known qualities inspires an entirely new application.« Conclusion: the material remains the same, but the application would have been inconceivable even just a few years ago.

_____ Speaking of properties: Why use tungsten or molybdenum in a certain product or in a particular application? The material scientist's spontaneous answer sounds simple: he lists the key qualities that distinguish tungsten and molybdenum. High melting point. High density. Low vapor pressure. High temperature strength. High thermal conductivity. High corrosion resistance. So I contemplate – tungsten wire as a filament? Sure, the filament has to be extremely heat-resistant. After all, the filament is heated up to 3000° Celsius during operation. But why is molybdenum used as a functional layer in displays? Is the temperature there just as hot? It is not, but molybdenum is a great conductor of electrical currents – an important prerequisite for controlling every single pixel in the display. A number of other metals, though, could do that as well. The more important reason is that molybdenum has a coefficient of expansion very similar to glass, which is why molybdenum is applied directly to the glass of displays, serving as an electrically conducting layer. When the display heats up during operation, no stresses are created between the glass and the molybdenum coating, which could impair its function.

Melissa Albeck | Matmatch

_____ In today's high-tech applications, it is therefore the combination of a wide variety of properties that make molybdenum, tungsten and alloys of them the materials of choice. During my journey through the world of Plansee, however, I often learned that our materials and their properties are frequently not well-known, even among material developers and engineers. As a result, they are often not considered in the early stages of product development. Plansee took notice, and we quickly realized that this also holds true for many other material manufacturers. »This was precisely the reason why we created the materials platform Matmatch,« comments Melissa Albeck in Munich, Germany. Together with an ambitious team, she is working on the first materials platform that some day is expected to list all available materials. Users are able to search by requirements, properties and uses. The search results are always recommendations for the materials best suited for the project. »Developing such a platform just for our materials and molybdenum would not have been worth the effort,« Albeck opines. They account for approximately one percent of all uses. »By committing to becoming the relevant platform of all materials worldwide, we have created a product that is extremely interesting for many other material manufacturers as well,« Albeck adds. They have the opportunity to list their materials on the platform, making them accessible to potential customers.

During my journey through the world of Plansee, however, I often learned that our materials and their properties are frequently not well-known, even among material developers and engineers.

The use of electrodes in large laser machines in the Far East for the production of displays or the use of razor blade-like carbide cutters in the aircraft industry would have been inconceivable even just a few years ago.

Thomas Granzer | Head of Development

14 ——— Our journey continues in Germany. I speak with Head of Development Thomas Granzer in Lechbruck. He and his team developed ready-to-install laser electrodes. The electrodes are used in large laser machines in the Far East in the production of displays. Again, the application would have been inconceivable even just a few years ago. The same goes for razor blade-like carbide cutters that allow the more productive manufacture of honeycomb components in the aircraft industry. These cutters were developed by Ceratizit's Sales Engineer Michael Rapp and his colleagues in Luxembourg and Italy to meet the need of the aviation industry for more lightweight components. During my journey through the world of Plansee, I learned about many other incredibly exciting applications. Unfortunately many interviewees indicated that these are highly confidential and subject to non-disclosure agreements. We are not allowed to write about them and, of course, I stick to that.

Andreas Lackner | General Manager, Plansee

———— Then, I asked the General Manager of Plansee's production in Reutte: What is it that customers expect from Plansee? For Andreas Lackner only one thing matters – namely that Plansee is able to supply every customer on time with the required quantity of tungsten or molybdenum. He and his teams are working incessantly to ensure timely delivery. This is another reason why many customers rely on Plansee as their sole supplier, no ifs, ands, or buts. While this has not changed in the last 50 years, Plansee had far less competition than it does today.

Ulrich Lausecker | General Manager, Plansee

———— Speaking of customers: an incredible number of changes have been made in terms of collaboration, says General Manager Sales Ulrich Lausecker. In the past, we received the drawings and supplied the parts. While this has not changed, there are a number of products that are the result of years of joint development work. On the other hand, time is also of the essence in a growing number of instances. »The project business has grown significantly in recent years. Customers expect products we're developing with them today to be available tomorrow by the millions – and in between, we're setting up the necessary production operation,« Lausecker sums it up.

Plansee is able to supply every customer on time with the required quantity of tungsten or molybdenum. This is why many customers rely on Plansee as their sole supplier, no ifs, ands, or buts.

Customers expect products we're developing with them today to be available tomorrow by the millions – and in between, we're setting up the necessary production operation.

Karlheinz Wex | Executive Board, Plansee Group

———— And then there is the digital transformation. Bits and bytes instead of materials? No, not like that. Plansee will remain a material manufacturer, and Ceratizit will continue to produce carbide tools. But the manner in which we work with our customers and how we produce, that will change massively, according to the Plansee Group's Karlheinz Wex, a member of the Executive Board. The Plansee Group's motto is to seize the opportunities presented by digital transformation as intelligently as possible to become faster, better and more productive. But how to capitalize on these opportunities? How does one know where to find the best ideas for machine learning, robotics or the Smart Factory? An ever-growing number of new start-ups with new business ideas are entering the market. To be able to learn about, evaluate and utilize these ideas more quickly, the Plansee Group has invested in a fund that promotes and develops dozens of industry-oriented start-ups. A year ago, the materials platform Matmatch was launched, allowing developers to search for, find and, ideally, immediately order the material that is best-suited for their application. Ceratizit is diligently work-ing on ensuring that the smart tool finds its way

into the production facilities of its customers. What is the right tool for my application? What are the right cutting parameters for my machine tool? And how can I ensure that worn tools are automatically reordered? We already have a number of great answers to all of these questions, Jan Brinkhaus, Ceratizit's digital visionary, is convinced.

But let's get back to the question we started with: Have we at the Plansee Group indeed done the same thing for 100 years?

———— The first answer is: yes, because we continue to engage primarily in molybdenum and tungsten, and processing them into customer-specific products and components. The second answer is: no, because the applications and markets, as well as the approach to creating these products, have undergone massive changes, and will continue to change radically in the years ahead.

to mitte the roller coaster



Independence, price stability and sustainability – these are GTP's pillars of the tungsten raw material supply.

AN INTERVIEW WITH GTP PRESIDENT AND CEO HERMANN WALSER.

A look at extended periods shows that the prices for tungsten are on a constant roller coaster. How has the price for tungsten developed in recent years?

Hermann Walser — After reaching an all-time high of almost 40 US dollars per kilogram of tungsten oxide (it takes 1.26 kilograms of tungsten oxide to produce one kilogram of tungsten metal powder) in 2012, the price dropped more than half by 2016. Since mid-2017, though, we have seen a considerable turnaround and recovery. Ammonium paratungstate (APT), which is crucial for the price of tungsten, currently trades at about 29 US dollars per kilogram of tungsten oxide.

The low market prices have forced many mines in the West to cease operation. Why?

Hermann Walser — No tungsten mine in the West can operate profitably at the prices we saw between 2015 and mid-2017. This drove numerous mines into bankruptcy or forced them to be placed on a care and maintenance program.

Why can't these mines simply resume operations when APT market prices rise and cause raw materials prices go up?

Hermann Walser — Tungsten mines primarily extract tungsten. As a result, they are comparatively small and have high fixed and start-up costs. This distinguishes them from other mining projects. The metals molybdenum and rhenium, for example, are recovered as by-products of copper ore deposits. Commissioning often requires new investors, long approval processes, complex production equipment, and extensive production expertise.

What options does GTP have to lessen its dependence on volatile APT market prices?

Hermann Walser — We are looking to achieve greater price stability overall in the tungsten market – this will help all players: the mines, us as the processors (smelters), and our customers. We see three levers in this regard:

1. — We enter into long-term delivery agreements at fixed prices with tungsten mines that are able to produce concentrates particularly efficiently. This gives the mine planning reliability.
2. — We seek long-term price agreements with our customers, independently of the daily market price.
3. — In the future, we will rely to a greater extent on closed raw materials cycles and using different methods for tungsten recycling. And we are investing heavily in making our APT and tungsten powder production operation as productive and flexible as possible, especially for these secondary raw materials. With flexibility we mean the capability to process primary raw materials (ore) and recycled materials in varying proportions.

We are looking to achieve greater price stability – this will help all players: the mines, us as the processors and our customers.

There appears to be an inevitable cycle, not just in the tungsten business: Once the markets have become saturated with commodities or the economy is slumping, commodity prices drop. If prices decline so much that mines can no longer operate profitably, they are frequently closed. Once the economy turns around and rejuvenates demand for commodities, commodity prices recover and attract investors again, who reopen old mining projects or develop new ones. Long lead times, which are not uncommon, create a relatively long shortage period before commodities are available again in ample supply. As a result, commodity prices will remain volatile.



price increases << \$ \$ \$

The sustained boom in the commodity markets, driven by China's enormous demand, for many years created a gold rush atmosphere.

AN INTERVIEW WITH RAW MATERIALS EXPERT HUBERTUS BARDT FROM THE GERMAN ECONOMIC INSTITUTE IN COLOGNE, GERMANY.



Just a few years ago, everyone was speaking of a raw materials »super-cycle« – is it over?

Hubertus Bardt — The sustained boom in the commodity markets, driven by China's enormous demand, for many years created a gold rush atmosphere. A lot of experts refused to believe that this super-cycle could wind down. They were wrong. Even a super-cycle is a cycle that comes to an end eventually. Since the 2014 crisis when raw materials market prices declined precipitously, prices have yet to recover to pre-crisis levels.

What do companies today have to be prepared for in terms of the future supply of raw materials?

Hubertus Bardt — We will continue to experience raw materials cycles, along with the corresponding rallying prices. This is an inherent result of the long lead times and high investments, which typically only find financial backers when the commodity prices are at an acceptable level.

Long-term, is there a sensible alternative to the ups and downs on the raw materials markets, which cause mine operators and processors (smelters) to come under pressure when market prices are low?

Hubertus Bardt — Only to a very limited extent. This would require a consistently high level of demand or more flexible mining technologies. »Breathing factories«, however, which expand and contract with demand, as we know them from the consumer electronics industry, for example, have been difficult to reconcile with traditional mining.

What models do companies employ to safeguard their supply of raw materials?

Hubertus Bardt — The core problem most companies face is not so much supply shortages, but price increases. Companies that depend on a large number of different commodities have a difficult time breaking away from these trends. The situation is different for companies focused on processing just a few raw materials. For them, backward integration may be useful, which means lengthening the value chain all the way to the mine. Long-term agreements on pricing and purchase volumes between mine operators, processors and raw materials buyers (hedging) can also be an effective way to achieve greater stability in the production chain.

What role does recycling play?

Hubertus Bardt — Recycling requires that the concentration of the recyclable material quantity and value is high enough. The current commodity price also plays an important role. This makes recycling a cyclical topic as well, which is more worthwhile some times than others. Electromobility, however, very clearly demonstrates that we will not be able to cover the medium- and long-term requirements of specialty metals, such as lithium, cobalt and tungsten, with primary metals alone. Developing efficient recycling technologies is an absolute must.



raw material shortage >>>



TIKOMET

Over the past ten years, Tikomet increased the production of reclaimed hard metal grade powder eight fold. For the next expansion steps, a new facility has been built.

Hermann Walser, GTP President and CEO, said during the opening ceremony: »Over this time period, the reputation of recycled tungsten material has experienced an enormous upgrade – becoming a sought-after alternative to virgin tungsten.« With the new construction, Tikomet laid the foundation for the continued expansion of its production capacity.

Walser stated that it was the right decision to acquire Tikomet in 2015 given the company's zinc recycling expertise (see *livingmetals 2017*, page 52).

Together with the chemical recycling process in Towanda, Pennsylvania, USA, GTP is now able to cover approximately two thirds of its production from recycled material. »With this, we meet our responsibility for the environment and decrease our dependency on virgin tungsten material,« Walser added.

Opening ceremony at Tikomet: a new hall enables production expansion of recycled carbide powder.



There appears to be an inevitable cycle: Once the markets have become saturated with commodities or the economy is slumping, commodity prices drop.



declining prices

Recycling requires that the concentration of the recyclable material quantity and value is high enough.



tungsten surplus stock

RECYCLING

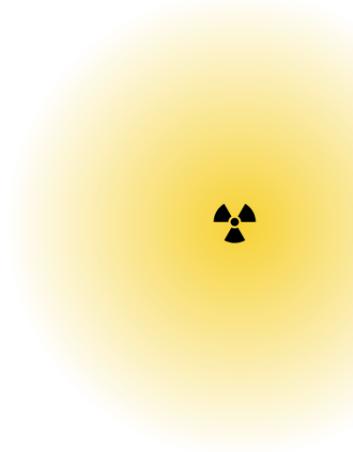
When it comes to recycling, GTP takes a three-pronged approach:

Chemical recycling: the quality of tungsten oxide produced from carbide abrasive slurries or hard metal scrap is the same as that of »virgin« tungsten produced from ore concentrate.

Zinc recycling: the hard metal scrap recycled via the zinc process (see *livingmetals 2017*, page 52) is used directly as ready-to-press powder or as an additive for »virgin powders« in the production of hard metal. The subsidiary Tikomet acquired by GTP in 2015 enjoys an outstanding position in the market when it comes to quality and recycling capacity.

Recycling of tungsten heavy metals: the objective is to use the recycled material again for the production of components made of tungsten heavy metals.

GTP works closely with Ceratizit and Plansee in all recycling activities. Given their direct access to customers, the two companies enter into corresponding take-back agreements for end-of-life hard metal and tungsten materials.



The shielding effect of tungsten heavy alloys offers protection and safety – in global freight traffic and anti-tumor therapy as much as when transporting radioactive substances.

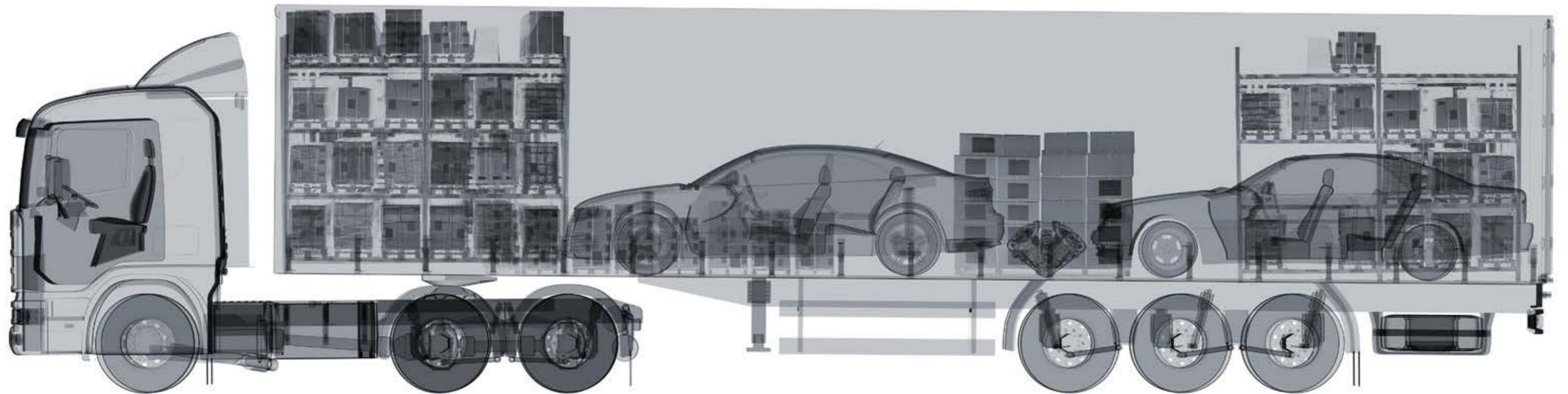
— The most distinctive qualities of tungsten and its alloys are their high density, strength and hardness, making them particularly suitable for producing wear-resistant tools. Another important, albeit lesser known property of tungsten is that it provides significantly better shielding against X-rays and gamma radiation than concrete, steel or even lead. As a result, shielding panels made of tungsten heavy alloys can help protect people and the environment wherever radiation is encountered.

Every year, 20 million shipments of radioactive material are transported on the roads, by train, plane or ship around the globe.

Protection against radioactive materials

— Radioactive substances are common and transported every day – be it in the medical field, in research or in industrial manufacturing. Every year, 20 million shipments of radioactive material are transported on the roads, by train, plane or ship around the globe. This requires maximum protection for people and the environment. Packaging that not only reliably isolates the radioactive material, but also does not leak in the event of an accident or damage during shipping is crucial to ensure safe transport.

— Tungsten heavy metal alloys are the material of choice for vaults and radioactive substance containers, such as isotope containers for radiotherapy. They absorb radiation and ensure that radionuclides remain tightly sealed. The benefit of tungsten is that, given the material's high density, even comparatively thin metal sheets offer reliable protection against radiation. Due to the ductility and high melting point of tungsten alloy, vaults and containers withstand even extreme mechanical, thermal and corrosive environmental conditions.



In light of the sheer volume, it is virtually impossible to open every single container and reconcile its content against the commercial and shipping documents.

Safety for global freight traffic

— The World Trade Organization (WTO) estimates that some 300 million standard containers are presently in use worldwide and transported by countless vessels and trucks around the globe on any given day. The invention of the standard container was, without a doubt, an important prerequisite for global freight traffic. At the same time, it also enormously facilitated smuggling and the illegal import and export of weapons, drugs or protected animal and plant species. In light of the sheer volume, it is virtually impossible to open every single container and reconcile its content against the commercial and shipping documents.

— This is where container scanners come in, which are increasingly being used in ports and at loading station. Trucks or freight trains carrying the loaded container pass a scanner, similarly to passengers undergoing security screening at airports. As the container passes the device, the entire cargo is scanned. The analytical software automatically detects weapons or drugs. If the software identifies anything conspicuous, a manual re-inspection is required. Plansee is a supplier to the leading container scanner firms. The components made of tungsten heavy metal are used along the entire beam path – directly behind the X-ray source, where the radiation exits, as well as after the containers have been scanned, where the rays are collected and assembled into analyzable images.

Pinpoint precision: irradiation of tumors

— The diagnosis usually comes as a shock: renal, liver, pancreatic, lung or prostate cancer. Still, this does not necessarily mean major surgery or weeks of chemotherapy. For certain types of cancer, today's radiation robots are able to expose tumor cells to high-dose radiation with pinpoint precision and eliminate them, without adversely affecting surrounding healthy tissue. Additionally, patients and medical staff are optimally protected against undesirable radiation.

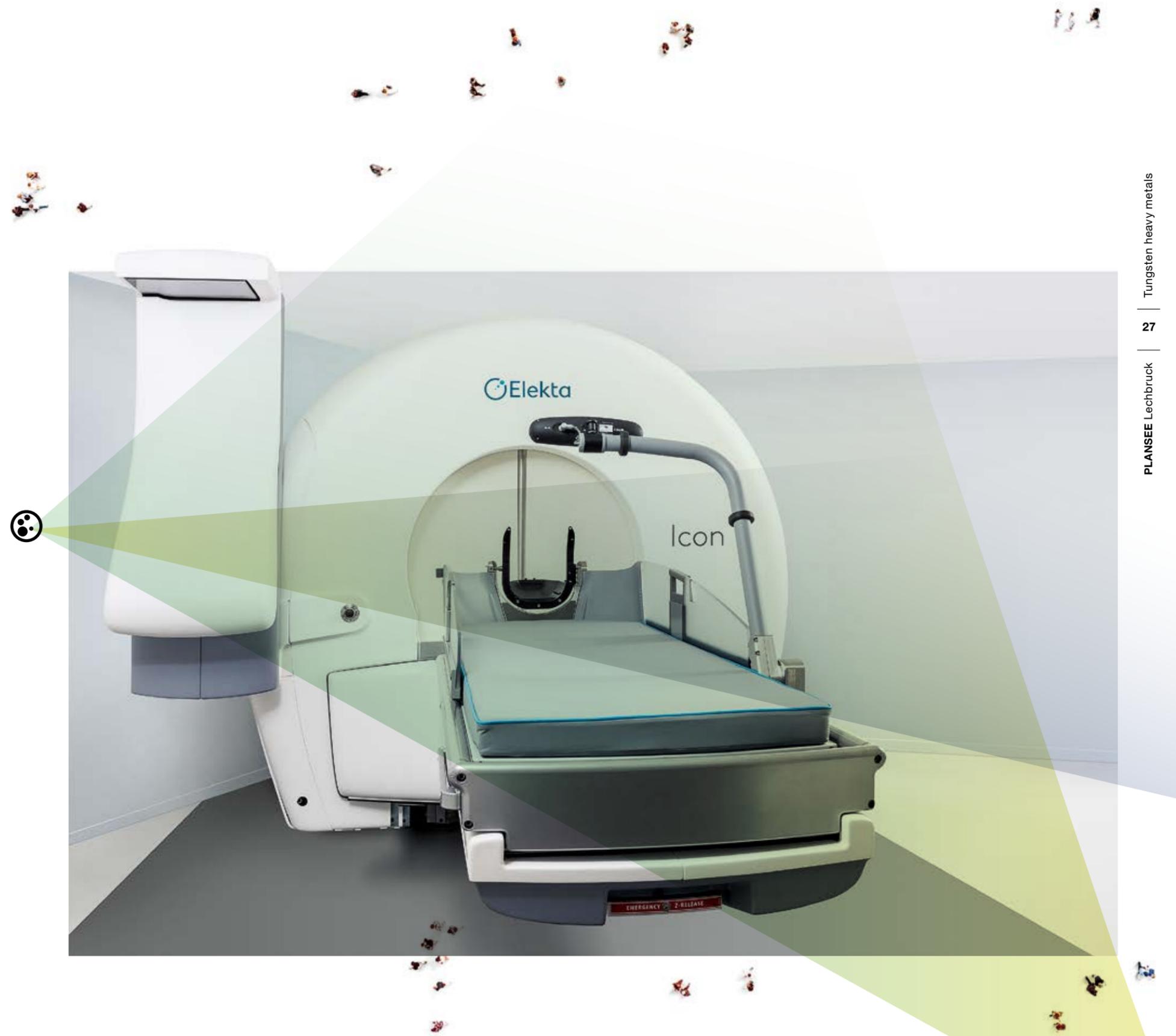
— Accurately delivering radiation to diseased tissue with pinpoint precision requires variable shielding, known as multileaf collimators. First, images are produced to determine the precise position and contour of the tumor. After the three-dimensional measurement, an electric motor moves each individual leaf of the collimator to the correct position – as many as 160 leaves are used to map the shape of the tumor with millimeter precision. Afterwards, high doses of radiation are delivered to the tumor. The gantry containing the radiation source rotates around the patient, irradiating the tumor from a number of directions.

— To ensure maximum protection of the surrounding healthy tissue and the patient, the computer knows the position of each leaf at all times. Multiple sensors at the leaf tips and the motor continuously monitor the position of every single leaf. Maximum accuracy ensures that each leaf in the collimator is able to move virtually without frictional resistance.

— Precise irradiation is particularly important when treating the sensitive head and neck area. In cooperation with the Swedish medical equipment manufacturer Elekta, Plansee developed a helmet-shaped collimator block made of the tungsten heavy alloy Densimet® for this delicate application.

— Hundreds of beam channels direct the gamma radiation accurately at a focal point the size of the point of a needle, allowing maximum precision during radiotherapy. Over 50,000 patients are treated every year with this particularly gentle method.

For certain types of cancer, today's radiation robots are able to expose tumor cells to high-dose radiation with pinpoint precision and eliminate them.



Focus on digitization

Dozens of projects at Plansee and Ceratizit are aimed at seizing the opportunities of digital change. This is how we plan to digitize the Plansee Group.

What remains

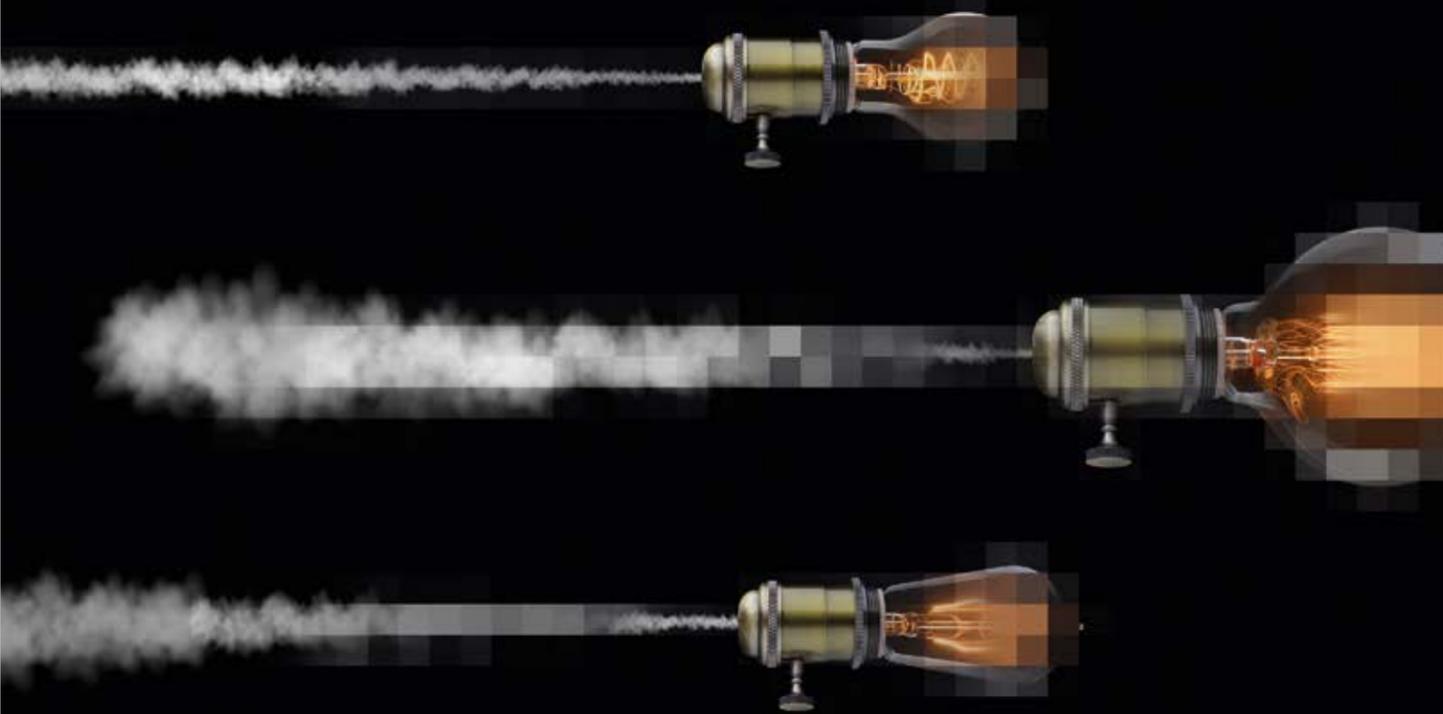
- **Molybdenum and tungsten:** the Plansee Group will remain a material and tool manufacturer for the high-tech world. All manufacturing steps will come from a single source – from the tungsten and molybdenum powder to the end product.
- **Digitization is not an end in itself:** in all digitization initiatives we launch, we ensure that the bond with the customer is strengthened.



We are developing the appropriate software for more intelligent production control.

What will be added

- **Digital searches:** we are building the matmatch.com platform, which can be accessed from anywhere around the world and helps developers and buyers find all sorts of materials, including molybdenum and tungsten, of course.
- **Digital purchases:** our materials and tools can be located anywhere on the net. Ordering a product from us must be a particularly simple process for the customer, be it by telephone, e-mail, chatbot or by having systems communicate with each other.
- **Digital production:** we are developing the appropriate software for more intelligent production control: from numerical simulation, through paperless manufacturing, to machine data collection and evaluation.
- **Digital administration:** our administrative processes and procedures must become faster and better.
- **Digital services:** we are developing offerings that will allow our customers to better utilize our products.
- **Learning from data:** based on past and current production and customer data, we are developing new solutions and business models for the future.
- **Investing in digitization:** we always ask: are we able to handle the project on our own, do we buy expertise, or do we cooperate with existing firms?



Digitization

Inspiring ideas

Using data
Fund for start-ups from all over Europe
Start-ups in the industrial domain

Plansee has participated in the funding of the »Speedinvest Industry« fund and become one of its core investors.

«We are investing because we want to see, assess and ideally further develop new ideas for digitization in the industrial environment at a very early stage,» said Karlheinz Wex, a member of the Plansee Group Executive Board. The participatory interest was a cornerstone in the endeavor to complete the group's digital transformation by 2021, Wex added.

«The intelligent use of our data is a prerequisite for simplifying the working relationship with our customers and for controlling our production operation more intelligently,» Wex stated. The fund is expected to provide financing primarily to companies focusing on areas such as Big Data & Analytics, the Smart Factory, and new business models in the industrial domain. The fund is aimed at founders from across Europe, but places special emphasis on Germany, Austria and Switzerland as a result of being based heavily in industry.

Why is Plansee investing in the Speedinvest Industry fund?

Karlheinz Wex — We expect the investment in Speedinvest to give us immediate and direct access to the latest ideas on digital topics in the industrial environment.

What are the advantages for Plansee's core business?

Karlheinz Wex — At the core, we are a material and tool manufacturer, and this will not change. At the same time, we must update a number of our processes with smarter and more productive designs, such as through intelligent data analysis, automation, robotics and machine learning. We want to look at ideas on these topics at a very early stage and then decide as to whether we will develop them further.

How can these ideas be further developed?

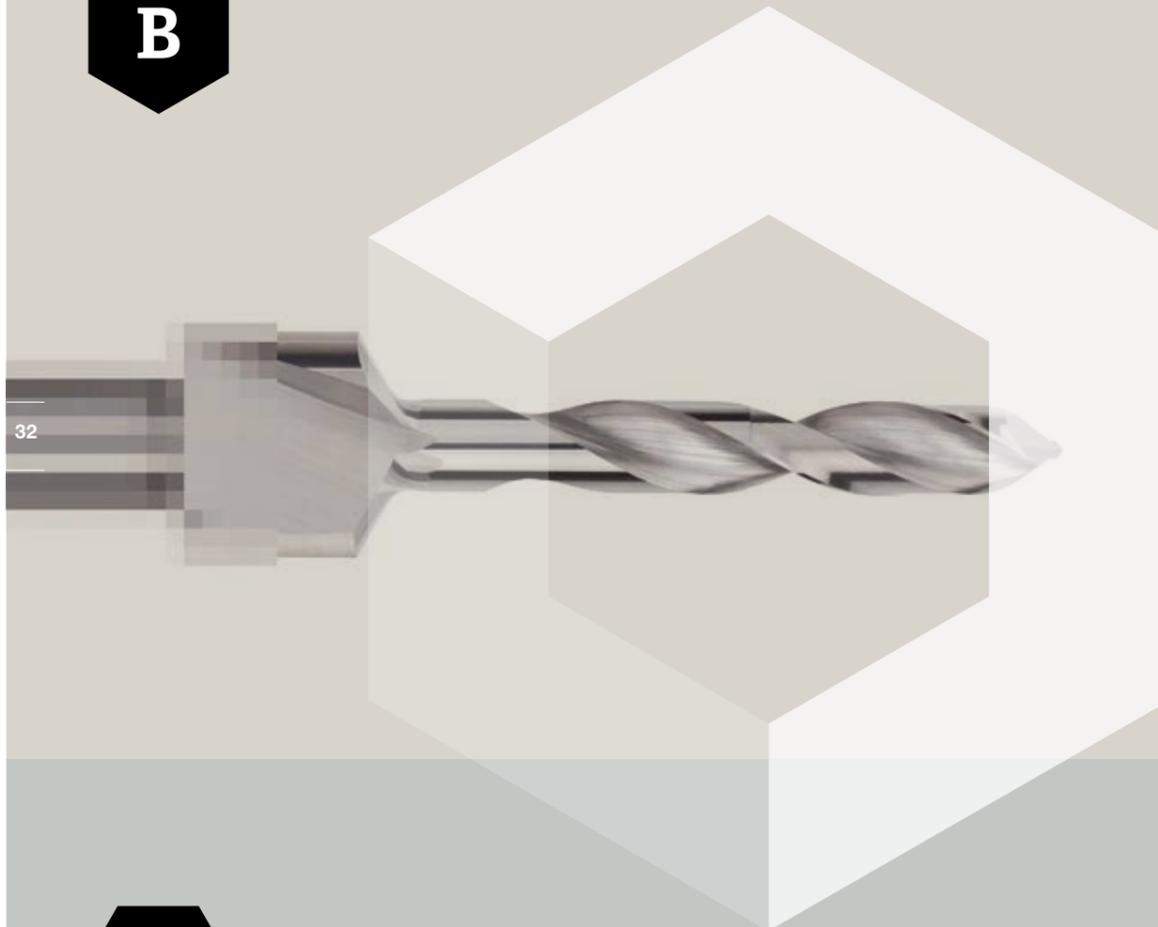
Karlheinz Wex — A number of avenues are conceivable: further developing an idea in-house, making a larger investment in a start-up or acquiring one of these start-ups. Employees from different departments will be integrated in the evaluation and decision-making process.

Why is the Plansee Group working specifically with Speedinvest Industry?

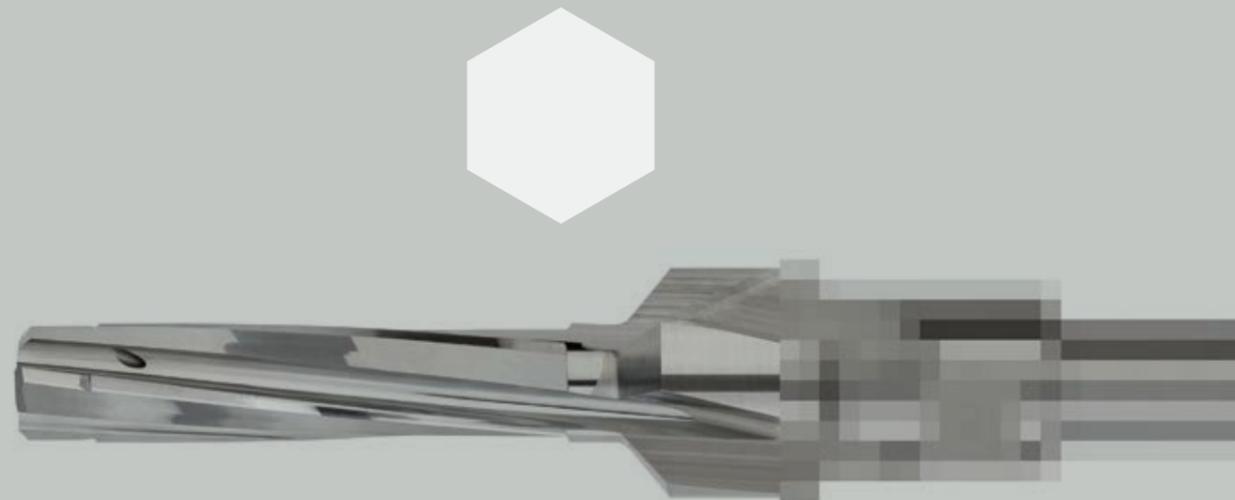
Karlheinz Wex — Speedinvest not only provides growth capital for first-rate start-ups in the industrial environment, but also offers entrepreneurial expertise and management experience, which are indispensable for creating great companies. This distinguishes the fund from traditional venture capital funds.

Speedinvest → Growth Capital for start-ups
↓
Know-how
↓
Management Experience

The growth capital is available for developing and subsidizing industry- and technology-centered start-ups.

B

32

H**Tools supply 4.0**

Is drill B really the best tool for my application? Or would H serve me better? How can I optimally use drill H in production? And what happens when H approaches its wear limits?

It's a scenario that has been frequently portrayed at trade shows and in the media for well over 20 years: the refrigerator that automatically reorders milk and butter. Whether this vision is even still attractive to the average consumer, and when it will actually be widely available, remains to be seen.

The fact is that what milk is to people, the tool is for the machining business. And while self-reordering milk continues to make for a nice story, the self-reordering tool has long been a reality. But let's not get ahead of ourselves.

Selecting the right tool is a tough choice

It all starts with the question: what is the right tool for my application in the first place? Some customers know exactly what they need and waste no time ordering their tool – as quickly and easily as possible. But then there is also the machine operator who has a piece of steel lying in front of him, wondering whether turning or milling is the best method to achieve the required contour. One thing is certain: he needs a solution to his task quickly. There are different avenues to get there: while one machine operator will pick up the phone to have someone advise him on the best solution, another prefers to use an online chat, and still another searches the Internet for comparable user experiences. »Regardless of whether it's a conversation in person, a chat or online – we want our online knowledge and sales platform to provide every customer with information that makes them the most successful,« says Michael Blank, who is in charge of the Cutting Tools e-business at Ceratizit. This includes information about products as much as application knowledge and advice.

There is still wiggle room for the tool during use

After the tool has been sold, one would think that the tool manufacturer has every reason to be pleased and can sit back and wait until the customer orders again. »You wish,« says start-up founder Jan Brinkhaus, who today is part of the core team of the new Digital Solutions segment of the Ceratizit Group. »We want to help our customers in ensuring that the tool does a great job in the machine.« Will the tool be run at overload or underload? Is there a risk of the tool breaking? Is the tool approaching its wear limits? Should the optimized cutting parameter settings be applied to other machines? How should the recorded machine and operating data be displayed and evaluated? An inconspicuous box termed »ToolScope« (see »Talking shop« info-box) can provide answers to all these questions. It is connected to the machine tool and equipped with a host of helpful apps.

The tool has reached the end of its service life – what now?

And then the unthinkable happens: sooner or later, even the best tool reaches its wear limit. The first priority is to swiftly provide a replacement. A tool is replaced quickly with the tool dispensing system Tool-O-Mat, which allows the business to stock in excess of 800 tools. With just a few taps on the touchscreen, the machine operator selects the required tool and removes it from the Tool-O-Mat like a snack from a vending machine. At this point, Ceratizit already knows whether the tool has to be ordered and restocked.

One last question that remains is whether the old tool should be sharpened or scrapped. Regardless of whether the customer decides in favor of the sharpening service or to dispose of and recycle the tool, either way Ceratizit sees to it that the customer is taken care of.

ToolScope is a monitoring and control system for machine tools.

INTERVIEW | JAN BRINKHAUS

General Manager of Ceratizit Hannover and in charge of Digital Solutions in the Ceratizit Group

livingmetals: What is ToolScope?

Jan Brinkhaus — ToolScope is a monitoring and control system for machine tools. We equipped it with a host of apps that provide machine tools with additional functions. The user decides which of these functions he needs and activates. The most widely used functions include breakage and collision monitoring and Adaptive Feed Control.

livingmetals: What benefits does ToolScope offer?

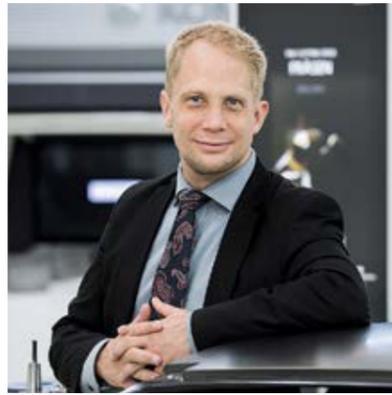
Jan Brinkhaus — Often times tools are not used optimally in the machine. They are operated too quickly or too slowly, or replaced too soon or too late. All these factors result in lost production, which ToolScope helps avoid. Experience has shown that the investment in ToolScope generally pays for itself in less than a year due to improved process reliability, higher equipment uptime, and faster machining times.

livingmetals: How do customers obtain ToolScope?

Jan Brinkhaus — Through our specially trained salesforce all across Europe. They consult our customers, conduct test runs with them in our Technical Centers, and assist them with the on-site commissioning.

livingmetals: Can ToolScope be connected to any machine tool?

Jan Brinkhaus — In principle yes. In an ideal setting we would have the chance to work with the manufacturers. Our developer teams in Hanover, Germany, and Bengaluru, India, handle the installation and programming of the connection and interfaces.



livingmetals: What other applications are possible with ToolScope?

Jan Brinkhaus — It is already possible to analyze and evaluate the machine data. This data, in turn, can be used to further optimize machining processes and tools.

It allows us to provide our customers with tailor-made quotes.

INTERVIEW | MARKUS MÜLLER

Head of Plansee's Job Shop Production

livingmetals: You used ToolScope on the first machine tool. What were your experiences with ToolScope?

Markus Müller — The surface finish of the machined parts improved drastically as a result of changed parameters. Previously we replaced the tool after every workpiece, just as a precaution. Today, we manufacture four to five parts with the same tool.

Our platform has to perform like a good field representative who is intimately familiar with his regular customers.



INTERVIEW | MICHAEL BLANK

He is in charge of the marketing of the Ceratizit business unit Cutting Tools

livingmetals: Why is an online shop no longer sufficient today to sell tools?

Michael Blank — The shop-only approach focuses on product presentation and sales. This definitely makes sense for standard applications. Many tool users need assistance and advice though, to find the tool that suits their application the best.

livingmetals: What does this kind of enhanced online shop look like?

Michael Blank — We are talking about a platform where we combine products with content that helps customers choose the right tool. This content includes explanations, graphics, animations, videos, application examples and lots more. At the same time, it provides the option to contact application experts directly by phone, in a chat, or by e-mail.

Many tool users need assistance and advice, to find the tool that suits their application the best.

A universe of 80,000 materials



Search



The online platform Matmatch is revolutionizing the search for suitable materials. This is the story of a start-up whose business model was conceived by Plansee employees in California, USA, which matured in the »incubator« of BCG Digital Ventures in Berlin, Germany, and was launched in September 2017 as a wholly owned subsidiary of Plansee in Munich, Germany.

— The distance between Reutte, the Plansee Group's headquarters, and Munich, the registered office of the materials platform Matmatch, is barely 110 kilometers (68 miles). Entering the modern office in Munich's north, though, is like stepping into a different world. There is no trace of the spirit of a manufacturing company. Instead, one is greeted by the vibrant dynamism of an extremely agile software firm.

— Matmatch's goal is ambitious: it plans to become the platform to give materials experts or buyers around the globe access to vast information about currently more than 80,000 known materials, and directly connect them to potential suppliers. As a first in the market, the use of Matmatch is free of charge for buyers and end customers. The platform is expected to be financed by materials suppliers, who will pay a fee for their materials entries.

— Still, Matmatch's mission goes far beyond connecting materials suppliers and buyers. Rather, it plans to create an ecosystem where users and vendors are able to research materials data that has been extensively reviewed and, consequently, allows a comparison. CEO Melissa Albeck comments: »The greatest challenge for any engineer, materials scientist and product designer is to find reliable information about the material that is best-suited for their application.«

— Yet, current reality is quite different. In many instances, materials scientists are still living in the digital stone age when it comes to sourcing a material that fits their problem. Painstakingly they pore over reference books or what are usually subscription-only databases. Often times they also conduct Google searches, but the results are rarely useful. Finding their material of choice does not necessarily mean that they are also able to locate a provider able to supply this material exactly as specified or in the required quantity.

— Admittedly, Matmatch is strictly a software firm. Its leading staff, Melissa Albeck and COO Heiko Wildner, though, worked for Plansee and Ceratizit for many years and are intimately familiar with the DNA of an established materials manufacturer. This background helps them understand the customers' true needs – both on the searcher side and on the provider side.

A platform that gives materials experts or buyers around the globe access to vast information about currently more than 80,000 known materials, and directly connect them to potential suppliers.

— The day for the 25 employees officially starts with the daily stand-up meeting. All important topics for their work are addressed during the 15-minute team meeting. Matmatch, like any software firm, operates based on assumptions and expectations, which are formulated with the greatest possible precision before the code for the database is written. Then, it's time to get down to business. Will the user understand the new feature and embrace it? If not, the reasons must be explored. Is the new feature not needed or does it have to be modified? The consequence is: remove it or improve it. And this brings us to the first major difference compared to a manufacturing company, where long-term investments in machines and equipment are a must. At Matmatch, everything is digital, nothing is cut in stone. Anything that does not work is changed. This happens every day, until the customer is excited about the solution.

At Matmatch, everything is digital, nothing is cut in stone. Anything that does not work is changed. This happens every day, until the customer is excited about the solution.

— Matmatch learns on a daily basis that it pays off to listen closely to the customer. Initially, it was assumed that customers would search primarily for material properties. It turned out relatively quickly that information about available forms, such as sheets, rods or bars, is very important to customers – now, this aspect is given significantly more attention. Expertise in the sector has also been found to be vital for materials searches. For example, there is almost no aluminum or titanium manufacturer that covers the entire market. It can be enormously helpful to specifically point out one's extensive experience in the bicycle industry, for example. Comparability of the materials and their essential properties helps end customers find alternatives to previously used material. Suppliers benefit from this function because it offers them an option to tap new markets. This holds especially true for new, advanced or rarely used materials.

HOW EMPLOYEES AT MATMATCH OPERATE

- **ALL MATMATCH EMPLOYEES** meet at 9:30 am for the daily stand-up.
- **SALES PREPARES** presentations about industries and typical materials groups as a basis for contacting leads.
- **THE MATERIALS SCIENTIST** takes the data supplied by the customer / materials vendor or other sources, checks it according to specified standards and makes it available in the database.
- **THE SOFTWARE EXPERT** sees to the continual enhancement and programming of the website.



- **THE USER EXPERIENCE MANAGER** is in constant contact with the users and, based on their feedback, develops ideas on how to improve the website.
- **THE DATA ANALYST** draws conclusions from the data collected about the website and user behavior and develops assumptions for the improvement and continued optimization of the business model.
- **THE PRODUCT MANAGER** controls a lot of the activities: the product manager further develops the products and services of the website in close cooperation with the data analyst, user experience manager and sales.

THEY HELPED CREATE MATMATCH

CAREER JUMPS

Five Plansee employees from Production, Sales, Marketing and Research & Development devised the concept for Matmatch.

Two years ago in California, they explored the intriguing issue of how a materials manufacturer, steeped in tradition with decades of success, should evolve to continue to impress and appeal to its customers in the digital world (*livingmetals 2017*, p. 4). After the 3-month adventure in California, all five agreed: »We want to apply our experience to take the next step in our professional development.«

AND THEY DID SO SUCCESSFULLY:

Patent engineer Elisabeth Eidenberger-Schober today heads up Plansee's test laboratories.

Marketing specialist Nadine Kerber utilized her maternity leave to pursue the continuing education program »Innovation and Entrepreneurship« and learn about the development of new business models in the digital age. Starting in October, she will support Corporate R&D in the creation and implementation of new, agile working methods in the innovation processes.

Simulation expert Arno Plankensteiner became the Head of Corporate Research & Development at Plansee a few months ago.

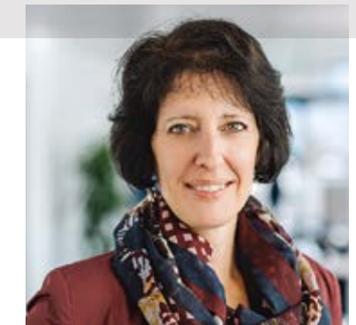
Process Engineer Balaji Ravi has been appointed Global Product Manager for the Power T/D Business Unit.

Salesman Tony Feng has become a training coach for the entire Plansee sales team.

PROFILE | MELISSA ALBECK

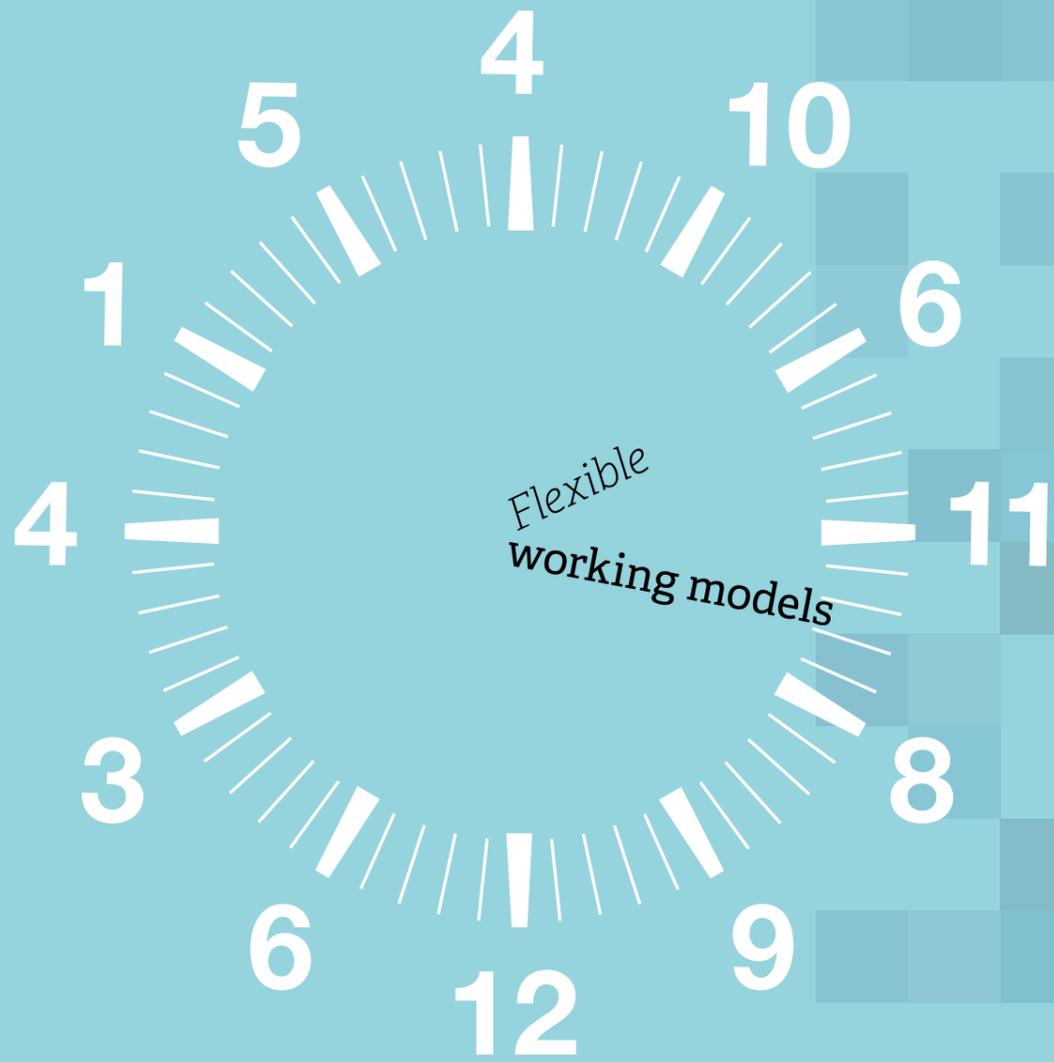
Melissa Albeck joined Plansee's Marketing Department in 1994. She worked in Sales at Plansee USA for ten years, and in 2007 became General Manager of Plansee's UK sales office.

In 2012, Melissa Albeck assumed responsibility for the corporate development of the Ceratizit subsidiary WNT, opening subsidiaries for WNT in China and India. She has been the CEO of Matmatch GmbH since mid-2017.



Nadine Kerber, Balaji Ravi, Elisabeth Eidenberger-Schober, Arno Plankensteiner, Tony Feng





The workplace is undergoing profound changes. What is known as the Fourth Industrial Revolution is also heralding a new era for Human Resources (HR). HR will not only have to support the digital transformation, but make it possible and actively shape it.

Not everything will change – but almost everything.

AN INTERVIEW WITH UDO FICHTNER | Head of Group Human Resources



What changes will we see in how we work in the future?

Standard tasks will increasingly be performed by intelligent systems. At the same time, companies will be ever more dependent on the employees' experience and creativity. Additionally, it will be important to adequately balance analytical and social skills, and to responsibly and sensibly use the available data for the company. There are tremendous opportunities in terms of how we will manage human resources in the future. This is not just about the amount of data, but above all about linking, analyzing and processing the information in real time to be able to make strategically relevant decisions for the business.

man + machine

4 social + analytical skills

4 You work from home one day a week. Will this become the norm?

New technologies make flexible and mobile working methods possible and are more compatible with individual family and personal needs. We, the companies, need a wide range of flexible work models, both in terms of time and location. Unfortunately, employees in production will still not be able to manufacture our parts in their home office, and shift work will not allow the flexibility everyone may desire.

WORK MODELS

flexible + mobile
No. 1
fixed times of physical presence + shift work
No. 2

For many other jobs, though, worthwhile possibilities exist today to combine physical time spent at the company with working from home. In a growing number of applications, candidates explicitly inquire about this option.

How do legislators feel about this?

Doesn't this new form of flexibility successively undermine employee protection rights?

Today's employees largely want to work on their own. This is what they expect from us. We can no longer force them into a one-size-fits-all mold. One person may be an early riser, but has to take care of the children in the afternoon and can't become really productive again until the children have gone to bed. Another may have to take care of a parent in the morning or needs time in the afternoon for the construction of their home.

What working hour model will cover these situations?

If we're honest, ultimately only trust-based working time. In many respects, however, the legal framework has not been updated to reflect the digital age. This model also presupposes a culture of trust in the company. I don't expect my staff to answer their e-mails on the weekend. At the same time, I also don't want to strong-arm them if doing so fits their lifestyle better. Why don't we let employees decide for themselves how they want to handle it and to what extent they want to be »protected?« We rate them based on results, and no longer based on physical presence. We treat them like adults, like self-determined people. I'm very confident that this will increase the company's productivity just as much as the employees' quality of life.

Speaking of quality of life: what role will health management play in the future?

A truly major role. Companies will increasingly have to focus also on their employees' mental health and prepare both the staff and senior managers for the new demands that come with digitization. Only companies that preserve and promote the wellbeing of their staff through an integral approach will be successful in the long term. We already offer a host of initiatives at the large locations. The key is to focus on the health of the entire organization. A healthy organization will be a successful organization.

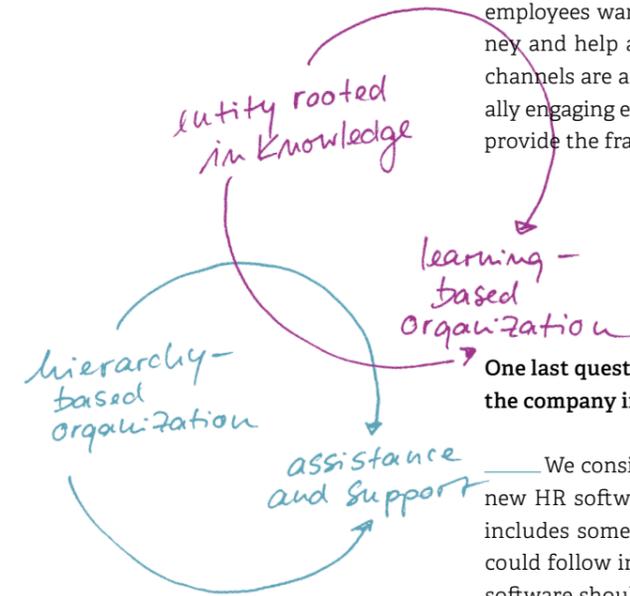
How will digitization impact the employees' attitude toward learning?

To start with, we will have to make sure even during the hiring process that a candidate is teachable and willing to learn. Nobody can predict whether the job I'm filling today will still exist five years from now in this form, or any other. This makes a candidate's willingness to learn and change a key criterion during hiring. It is then up to HR to make the necessary training programs and the entire range of learning methods available to enable individual, lifelong learning. Classrooms are becoming increasingly less popular, while interactive learning and mutual learning online are on the rise. We need to transform from an entity rooted in knowledge to a more dynamic learning-based organization. This will be a complex process, but a genuinely worthwhile exercise that will ensure our long-term success.

early riser night owl

And what role will the managers play in this?

During the time of digitization, leadership will transform from a hierarchy-based management approach into a supportive guide and mentor function. A new leadership understanding is necessary to anticipate and appropriately implement changes in job profiles in recruitment and training. The new leadership guidelines of the Plansee Group provide the necessary guidance in this regard. HR will need to support the managers on this journey and train them. Additionally, employees want to participate in their company's journey and help actively shape it. Agile decision-making channels are a prerequisite for attracting and emotionally engaging employees. Our leadership guidelines also provide the framework for this.



One last question: what will change fundamentally in the company in terms of HR's work?

We consider introducing and using a completely new HR software worldwide. The pilot phase already includes some of Ceratizit's locations, the Reutte site could follow in 2019, and if everything works well the software should be rolled out worldwide by 2020. This would be an enormous change process – not just for HR, but for all managers and employees. The project would keep the organization busy for about two years, and it is likely to be a bumpy road. But it will be the right answer to the challenges of the future. I'm proud to work for a company that has recognized that the shortage of appropriately trained employees could prevent us from implementing our strategy. With the introduction of this modern HR software, the course for the future would be set.

CULTURE OF TRUST SUCCESS



of the country that is the subject of c
**Scientists on the Trail
 New Element**
 HE announcement was made a
 weeks ago that three Ger
 chemists, Drs. Walter Noddack, I
 Tacke, and Otto Berg, have discovered two
 of the remaining unknown elements of
 the periodic system, Nos. 43 and 75,
 and have named them "masurium" and
 "rhenium." Both elements are exceed-
 ingly rare and constitute one-billionth
 of the earth's crust. Hafnium, No. 72,
 was discovered in 1922, and is dis-
 covered about a year ago. Number 61,
 promethium, is believed to be a rare
 earth metal. Dr. G. E. Hevesy, an
 American chemist, has been
 working faint lines of

RHENIUM

... a rare metal



As the world's largest producer of rhenium, Molymet supplies all major jet engine, gas turbine engine and catalyst manufacturers. At Plansee, Rhenium is used for X-ray anode production.

MANUEL GUZMÁN | Vice President Research & Development at Molymet

It was in Berlin, in the mid-1920s, in a laboratory of the German Imperial Physical Technical Institute that the chemists and researchers Ida Tacke, Walter Noddack and Otto Berg embarked upon a quest for the elements with atomic numbers 43 and 75. In 1925, they were able to announce the successful discovery of the last known refractory metal, element number 75. Ida Tacke gave it the pleasantly sounding name rhenium – an affectionate tribute to the River Rhine, where she had spent her childhood in the city of Wesel. Incidentally, it comes as no surprise that rhenium had been eluding researchers for so long: it is contained in the Earth's crust in extremely sparse amounts and has been found to occur naturally only in a volcano on the Kuril Islands in Southeast Asia. Rhenium is a third-row transition metal on the periodic table and is considered a refractory metal, which is also listed as an element of the platinum group metals. Rhenium was first industrially produced in the late 1920s in Leopoldshall, Germany.

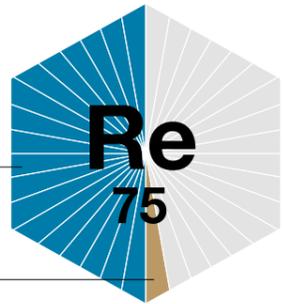
Rhenium may be rare – but is indispensable for our high-tech world

Rhenium has a melting point of 3186 °C, which is the third highest melting point among all elements, after carbon and tungsten. In terms of the boiling point, it ranks at top positions with 5627 °C. Rhenium is able to show its superiority in applications that are subject to very hot temperatures and require stable structures.

RHENIUM-PRODUCTION

Primary production
 as by-product of molybdenite concentrate
50–52 tons/year

Secondary production
 through recycling
10–15 tons/year



Ida Tacke gave it the pleasantly sounding name rhenium – an affectionate tribute to the River Rhine, where she had spent her childhood in the city of Wesel.

By comparison, molybdenum was isolated in 1781 for the first time, and its commercial use began in the early 1900s in structural steel.

To this day, the worldwide market for rhenium has remained very manageable. Primary rhenium extraction as a by-product of molybdenite concentrate derived from copper ore processing is 50 to 52 tons per year. Secondary rhenium production through recycling is 10 to 15 tons per year.

It is a very dense metal, has very high strength at high temperatures, and offers good cold working properties. It has a hexagonal close-packed crystal structure, which it retains to its melting point and consequently does not undergo a transition from ductile to brittle behavior. It is highly resistant to corrosion and oxidizes rapidly at moderately high temperatures, forming volatile oxides such as ReO₄ and Re₂O₇.

	RHENIUM	MOLYBDENUM	TUNGSTEN
Density	21.0 g/cm ³	10.2 g/cm ³	19.3 g/cm ³
Melting point	3,180 °C	2,623 °C	3,422 +/-15 °C
Boiling point	5,627 °C	4,625 +/-15 °C	5,700 +/-200 °C
Abundance in the Earth's crust	0.0007 g/t	1.2 g/t	1.25 g/t
Annual requirement	60 tons	235,000 tons	95,000 tons

As an alloy addition, rhenium enhances the tensile strength, ductility and weldability of molybdenum and tungsten, lowers the

ductile-to-brittle transition temperature, and reduces the degree of recrystallization embrittlement. Additions range between

10–26% rhenium for tungsten-rhenium alloys, and 11–50% rhenium for molybdenum-tungsten alloys.

Rhenium has a melting point of 3186 °C which is the third highest melting point among all elements, after carbon and tungsten.

First industrial applications

— In the early 1950s, molybdenum-rhenium and tungsten-rhenium alloys were developed. The first industrial applications of tungsten-rhenium alloys included high-temperature thermocouples and vacuum tubes used in electronic devices. Due to its favorable creep resistance and ductility at high temperatures, adding rhenium to tungsten wires enhances the performance of filaments in vacuum tubes and in high-temperature applications, such as flash bulbs, electron sources and X-ray anodes.

— The metal's wide use in these applications has created high demand for rhenium produced from the molybdenite fraction of porphyry copper ores. Kennecott in Salt Lake City, Utah, USA, was the first to process these ores on a large scale.

— For a while, rhenium was also used to produce darts («rhenium darts») to positively influence flight characteristics, although this application arguably uses more of a tungsten alloy and just a small amount of rhenium.

Rhenium tunes jet engines

— Today, the production of superalloys for jet engines represents the largest single use for the element rhenium. These nickel superalloys contain 3–6% rhenium and are used in combustion chambers, turbine blades and propelling nozzles of jet plane engines.

— Rhenium improves the alloys' creep resistance, resulting in more durable components that ensure greater fuel efficiency at elevated temperatures – an important contribution toward lowering fuel consumption in the aerospace industry.

— The second most frequent use of rhenium is that of a catalyst. Platinum rhenium catalysts are used to produce high-octane lead-free gasoline. Additionally, rhenium is needed in the form of molybdenum-rhenium alloys in the aviation and electronics industry for reactors, semiconductors, electrical contacts, filaments and ignition wires. Molybdenum-tungsten-rhenium alloys are particularly well suited for use at very high temperatures or applications subject to high wear.

— Tungsten-rhenium alloys are also used in X-ray anodes in high-resolution X-ray equipment – for example in mammography, angiography and computed tomography. Luminescent rhenium complexes have been used in intracellular bioapplications because of their efficient cellular internalization and attractive photophysical properties. The radioactive rhenium isotopes ¹⁸⁶Re and ¹⁸⁸Re are used to treat liver and pancreatic cancer, and ¹⁸⁸Re is utilized to treat most non-melanoma skin cancers.

The chemist and researcher Ida Tacke has discovered together with Walter Noddack and Otto Berg the last known refractory metal Rhenium.

64% Nickel-based superalloys for the aerospace industry

24% Catalysts

3% Automotive

4% Oil and gas

5% Other industrial applications, e.g. production of X-ray anodes

Rhenium

MOLYMET Santiago

47

RHENIUM EXTRACTION SITES AND PRODUCTION

Molybdenite (MoS_2) concentrate, which is a by-product derived in the processing of porphyry copper ores, represents the most important commercial source of rhenium. Since both rhenium and molybdenum have small atomic radii (135 pm and 145 pm, respectively) and the elements' ionic radius is identical (68 pm), rhenium replaces molybdenum in the molybdenite crystal lattice.

When subjected to roasting, a pyrometallurgical process, molybdenite concentrate is the raw material that yields molybdenum trioxide (MoO_3). Roasting results in the oxidation of molybdenite in air at temperatures between 400 °C and 700 °C. In the roasting process, rhenium is oxidized to rhenium heptoxide (Re_2O_7), which is a gas at temperatures above approximately 400 °C and is recovered in roaster flue gases. Rhenium is recovered by way of gas scrubbing and wet electrofilters, solvent extraction and crystallization of ammonium perrhenate (NH_4ReO_4), a white

powder that represents the most common form in which rhenium is marketed. Ammonium perrhenate is then reduced to rhenium metal powder or briquettes through direct reduction with hydrogen at temperatures of 800 °C – 900 °C.

Molybdenite concentrates from primary sources (molybdenum mines) do not contain rhenium. This type of concentrate is found primarily in the United States. Aside from Chile, Poland is another supplier of rhenium. There, rhenium can be found in Kupferschiefer («copper shale»).

Small amounts of rhenium are recovered from sand-stone-type copper ore deposits in Kazakhstan. The only indication of a natural rhenium mineral was discovered in 1994 in the Kuril Islands between Russia and Japan.

Rhenium is a very rare and unique material. It is important to recycle rhenium to ensure continued supply.

Are the best years still ahead for the super material rhenium?

Being a relatively »young« element, researchers and developers still see great potential for rhenium in future applications. One of the most promising properties of rhenium alloys is their favorable biocompatibility, making them very attractive for the production of medical products. Specifically, molybdenum-rhenium alloys have performed better in implants than conventional titanium alloys. Another promising field for new uses is the rhenium isotope ^{186}Re , which is being explored as a radiopharmaceutical for the treatment of metastasized prostate, breast, colon, lung and bone cancers.

Its extensive molybdenite concentrate conversion capacity using both a pyrometallurgical process (roasting) and a hydrometallurgical process (high pressure oxidation), which are used to extract rhenium, presently make Molymet the largest primary producer of rhenium in the world.

Molymet has sustainably and consistently developed high purity rhenium products (metal briquettes, metal powder, perrhenic acid and ammonium perrhenate).

Recycling

Rhenium is a very rare and unique material. It is important to recycle rhenium to ensure continued supply. Almost all rhenium in petrochemical catalysts today is recycled, maintaining a closed cycle. Some of the rhenium used in metallurgical applications is recycled, especially tungsten-rhenium alloys and nickel superalloys. Due to the complex composition of superalloys, recycling processes are complex and not very efficient

Today, the production of superalloys for jet engines represents the largest single use for the element rhenium.

Additionally, researchers have examined the properties of rhenium diboride as a material for hard coatings and found that its hardness is almost equivalent to that of cubic boron nitride.

Rhenium processing at Molymet

Today, Molymet is the world's largest processor of rhenium. The facility in Nos, Chile, started to produce rhenium in the early 1970s when it was part of Sociedad Carburo y Metalurgia S.A., the parent company of Molibdenos y Metales (Molymet) founded in 1975. Initially, ammonium perrhenate was the company's only product. A few years later, a plant for producing rhenium metal briquettes and perrhenic acid was added.

for smaller alloying elements such as rhenium. Jet engine manufacturers have developed ways to reuse superalloy waste in order to recover the entire alloy, avoiding separation of the different elements. This significantly increases the availability of rhenium for new jet engines.



The rare metal rhenium is extracted from molybdenite concentrate, a by-product derived in the processing of copper ores. During roasting, molybdenite concentrate gives off a rhenium-containing gas, which Molymet recovers and processes into rhenium metal powder.





Nadine Führer

Nadine Führer works at Ceratizit Logistics as a procurement and production logistics expert.



What do you do?

I work at the Central Distribution Center in Kempten which offers a wide range of logistic services as well as consulting for supply chain processes to Ceratizit and Plansee Group. My focus is on the group-wide standardization of production planning and control.

Why is your workplace special?

It is special because I'm often not here. I have the great opportunity to travel a lot and to work with many people across the company. I have the great opportunity to travel a lot and to work together with colleagues from different areas of the company. This allows me to collect best practices and distribute them in the Ceratizit Group. This helps us not to reinvent the wheel again and again.

Things I'm packing in my suitcase include the determination to make the company better day by day, together with my colleagues.

Why do you like to work there?

Primarily because of our work culture. I am part of a very collaborative and dynamic team where we share our ideas for improvements and support each other to quickly implement solutions. This gives me the feeling of genuinely contributing to the company's success, which fortunately reflects in the results.

Seize the opportunity when a door opens. Christophe Carrié practices this motto with enthusiasm. The sales expert has headed the Business Development / Mergers & Acquisitions Development of the Plansee Group for just over a year.



Not mincing words, Christophe Carrié declares that the Board knowingly »gave him a lot of latitude« in the beginning. After all, he didn't join the company to manage the factors on which Plansee built its success over the past 100 years, but to look into the future. Carrié's vision for the Plansee Group centers around the digitization realm which is the company's to conquer. He is not short on ideas, having worked closely with major customers for many years. He helped them globalize their production operations and introduce new manufacturing processes.

Things I'm packing in my suitcase are a lot of experience with customers and sales, openness, and cooperation.

CHRISTOPHE CARRIÉ is a materials scientist who joined Plansee in 2007. Starting out in Technical Sales in France, he became Product Manager in 2010, and later Key Account Manager for Plansee Powertech in Switzerland.

And to achieve competitive overall manufacturing costs. He learned how to listen to the customer, deriving ideas on how to grow the company's business for the benefit of the customer. One approach is to develop new business models that cover a product's entire life cycle: from the design, through production, to recycling. Carrié says that the Plansee Group's focus on molybdenum and tungsten represents a solid foundation to build on. The key now is to utilize the tools of digitization as smartly as possible to sell the company's capabilities and skills faster, better, more effectively and more creatively for the customer's benefit.

Peter Zahedi completed a lathe machinist apprenticeship in Reutte. In 2016, he went to Seon, Switzerland, initially for training to become an automation technician. Today, he is the Machining Team Leader.



What appealed to you about going to a different location?

As a young person, it was a great opportunity for me to develop, see new procedures, and explore a country with mountains being the only thing in common with Austria.

What's new for you? What do you have to learn?

The bureaucratic procedures and the working environment in the plant are different, that's something I had to get used to.

Which of your skills are appreciated the most?

I believe that I'm very flexible and a team- and deadline-oriented person.

Things I'm packing in my suitcase include curiosity for new things.

What is the most fun for you?

I got to know new colleagues and make new friends – my circle has grown. And work is fun, of course. Otherwise I wouldn't still be here two years later.

What was completely different than expected?

Unlike my apprenticeship, I had to take charge of and decide a lot of things myself for this secondment. One of these decisions was also that I'm no longer on assignment, but now work permanently in Seon.

Karin Laursen joined GTP in 2005 as a Research Scientist in R&D. In 2009, Karin was promoted to Strategic Raw Materials Purchasing Manager for GTP, responsible for the procurement of tungsten and molybdenum.

What was your main reason for relocating to another country?

It was a combination of a personal desire to move back to Europe and expanding the collaboration between Ceratizit and GTP in the procurement of tungsten raw materials. In early 2018, I transferred from Towanda to GTP Europe S.A., which is located on the premises of Ceratizit in Mamer, where I am responsible for GTP's strategic tungsten purchasing.

What's new for you?

Working in an open-plan office with twelve colleagues who speak seven different languages – French, German, Luxembourgish, English, Portuguese, Arabic and Danish!

Things I'm packing in my suitcase include the flexibility to work where it is best for my colleagues, customers and myself.

What do you enjoy most?

Being in the heart of Europe – close to so many great locations – and closer to my family. When you're working with colleagues from all over the world, it's good to be half way between Asia and the US – time is finally on my side!

What was different than you expected?

The country of Luxembourg. I never realized how rural it is here, even though I had visited it several times. In so many ways it reminds me of the area around Bigum in Denmark where I grew up, with lots of fields and beautiful beech forests. I was so happy when I realized that they have the same black & white (Holstein) cows. They were always grazing on the pastures where I grew up in Denmark, on the fields near my house in Towanda – and now they are here on the fields close to my apartment in Luxembourg.



Maxime Houpert is a Quality and Process Engineer in Ceratizit's ceramic manufacturing plant in Livange, Luxembourg. High demand for silicon nitride has the plant humming with work.

What do you produce at your site?

We produce silicon nitride rollers, balls, rings, inserts and rods for a variety of markets – either as blanks or ground parts. Silicon nitride (Si₃N₄) is a high-tech specialty ceramic that is distinguished by its impressive service life – a standard feature of all products from Hard Material Solutions by Ceratizit. In addition to outstanding hardness, which guarantees wear resistance, the material is incredibly light and offers exceptional mechanical stability. Additionally, silicon nitride products can be readily used in applications which are subjected to drastic temperature fluctuations. With ceramics, corrosion is not an issue either.

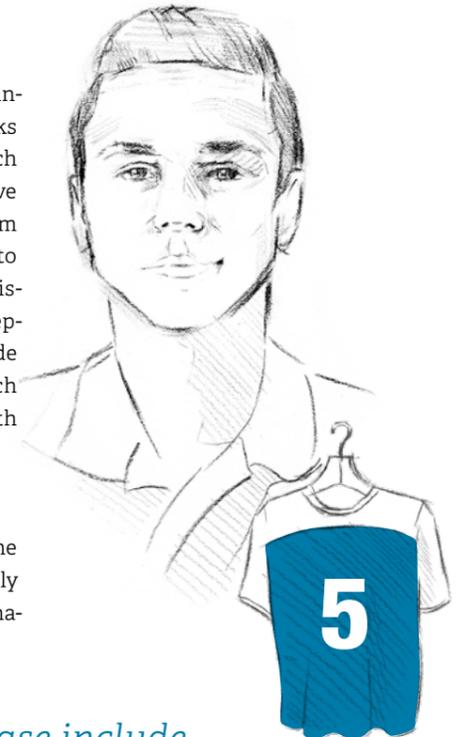
Why is your workplace special?

Our production is growing very fast, driven by the hybrid and all-ceramic bearing market, which is literally exploding. It's incredibly exciting to be part of this dynamic trend!

Things I'm packing in my suitcase include the dedication to do my best to ensure that we achieve our growth and expansion goals.

Why do you like to work there?

The dedication of all employees is amazing, everyone is aware of the challenges, and all do their best to ensure that we achieve our growth and expansion goals. Next year, we plan to become certified according to the aerospace industry standard (EN 9100) so that we can tap new markets.



David Friedl

Since the time line for the project is extremely ambitious, everyone on the project team is working feverishly. This must not come at the expense of diligence, though – despite the record pace, the design, installation and start-up of the equipment and machines must be done correctly. This requires a great deal of advance planning and very close collaboration on the project team.

Getting things accomplished as a team and acting quickly in a foreign, international environment are experiences I was seeking. This was also the reason why I wanted to relocate my place of work for a while – from Reutte to Shanghai. I recognize my contribution in the rapid decisions and the project’s on-time progress; this motivates me to work a lot to achieve the best-possible outcome.

It takes assessments and recommendations from experts, of course, to make good progress. Many problems had been addressed before, in-house and externally, you just have to know who to ask. It is helpful to know qualified people and to have worked with them before. This constant communication with people in different locations is a major part of my work, and it’s a lot of fun.

It is fascinating how all the suppliers and service providers in China are accustomed to working under enormous time pressure, and to deliver quickly.

The Chinese and the country, which initially was foreign to me, turn out to be very western, especially close to the city, and have made it relatively easy for me, as a foreigner, to find my way around. I didn’t quite expect this.

I am excited to have seen, experienced and learned a lot. Thanks to everyone who made it possible and supported it!



Things I'm packing in my suitcase include the expectation of fast-paced, rewarding work on a dynamic team.

Tobias Kumpf

Tobias Kumpf and David Friedl work as engineers on a project team in charge of installing a brand-new mass production line for Plansee Shanghai. They share their impressions.

The possibility of growing my skills and getting to know a new culture appealed to me the most about this project. I also wanted to improve my knowledge of English and meet new people. My focus in the development of the new production line was to further develop the grinding processes.

Initially, the cultural differences were very peculiar to me, but over time I grew used to them. I believe that they appreciated my flexibility and friendly nature very much. My ability to grasp issues quickly and my technical understanding were also welcome.

Things I'm packing in my suitcase include the willingness to abandon notions and expectations.

What I liked the most was the contact with people and the politeness with which I was received.

Shanghai turned out to be very different from what I expected. The city has a very western flair. The food was also quite different from what I had imagined; it bore no resemblance to the Chinese food as we know it from Austria.



Just as soon as their second child was born, Michael Weirather and his wife packed their bags and moved to Franklin, Massachusetts, USA, for one year.



— Sure, Michael Weirather could have continued to do his sales job from his desk in Reutte, taking the occasional business trip to the US. To him, though, spending the year in the USA is an opportunity to gain some new perspectives – to trade the daily routine for new experiences.

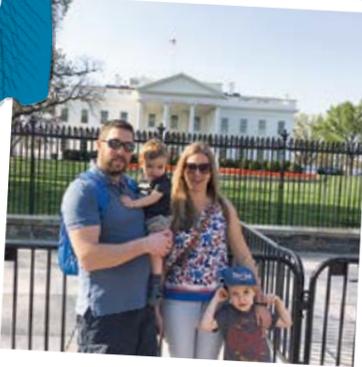
— Having worked at Plansee's headquarters in Reutte for 18 years, he is familiar with the company and its strong sense of community. Now, he is learning first-hand about the US market and its customers. He is spending a lot of time with customers and his sales colleagues working in the aerospace industry and resistance welding field, both on-site and at trade shows. Speaking directly with the customers, he learns what it means to sell solutions: »Elsewhere, our customers would have to coordinate »five« sub-suppliers for the tungsten or molybdenum rods we machine with micrometer precision. Plansee offers them everything from a single source.«

— He took the initiative for the stay abroad himself. He does not consider it a career move. Instead, he was motivated by »experiencing the day-to-day sales setting from a different perspective and broadening his horizon, and getting to know the country, together with the family.« And that's exactly what they're doing. On the weekends, they often travel along the East Coast. Their 4-year-old son attends kindergarten twice a week and already speaks English very well – slang and everything, of course.

— At the same time, Michael Weirather knows that it is very important to support the colleagues in Reutte and Franklin, and that this time abroad is a success for him personally, but more importantly for the company – and it serves as an example to other colleagues who have similar plans.

MICHAEL WEIRATHER. After attending the Fulpmes Technical College, Michael Weirather started at Plansee in 2000 as a technician working in the furnace and plant engineering department. In 2001, he joined the mechanical engineering department, while studying process and environmental technologies part-time at the Management Center Innsbruck. After his MBA, which he also earned while working full-time, Michael Weirather joined the sales department in 2010. He taught at Plansee's vocational college for four years and is a fireman with the Plansee plant fire brigade

Things I'm packing in my suitcase include my family, my laptop, along with all my previous responsibilities, and the readiness to try a different life and a different culture.



In Franklin, he was a designer; today, in Reutte, he is a programmer.

— After a five-week trial stay in Reutte, Austria, Erik Macchi had no doubt that this is where he wanted to stay long term. And in the Group's IT department there was no doubt that they needed someone with manufacturing experience, who would coordinate the programming tasks of group-wide IT solutions for the design of components and management of product life cycles.

— A designer from Franklin, Massachusetts, USA, Erik Macchi was a perfect fit for this job. Macchi is convinced: »Even the best programmer in the world will not deliver an acceptable solution if he doesn't understand the needs that the day-to-day business brings with it for designers, sales and product managers. And conversely, IT solutions must be carefully crafted and technologically useful.«

— Personal life offers many challenges for his language skills: buying a car, going to a doctor's appointment, filing the first tax return, all in another language!

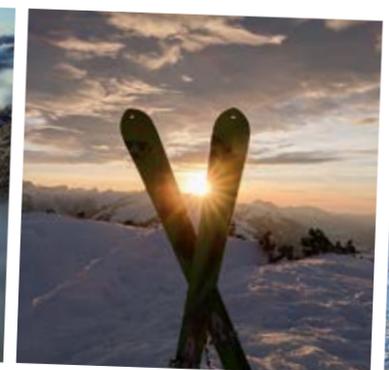
— He couldn't enjoy living in the foothills of the Alps more: mountain biking, skiing, swimming, glider flying – all these activities are available just minutes from his apartment.

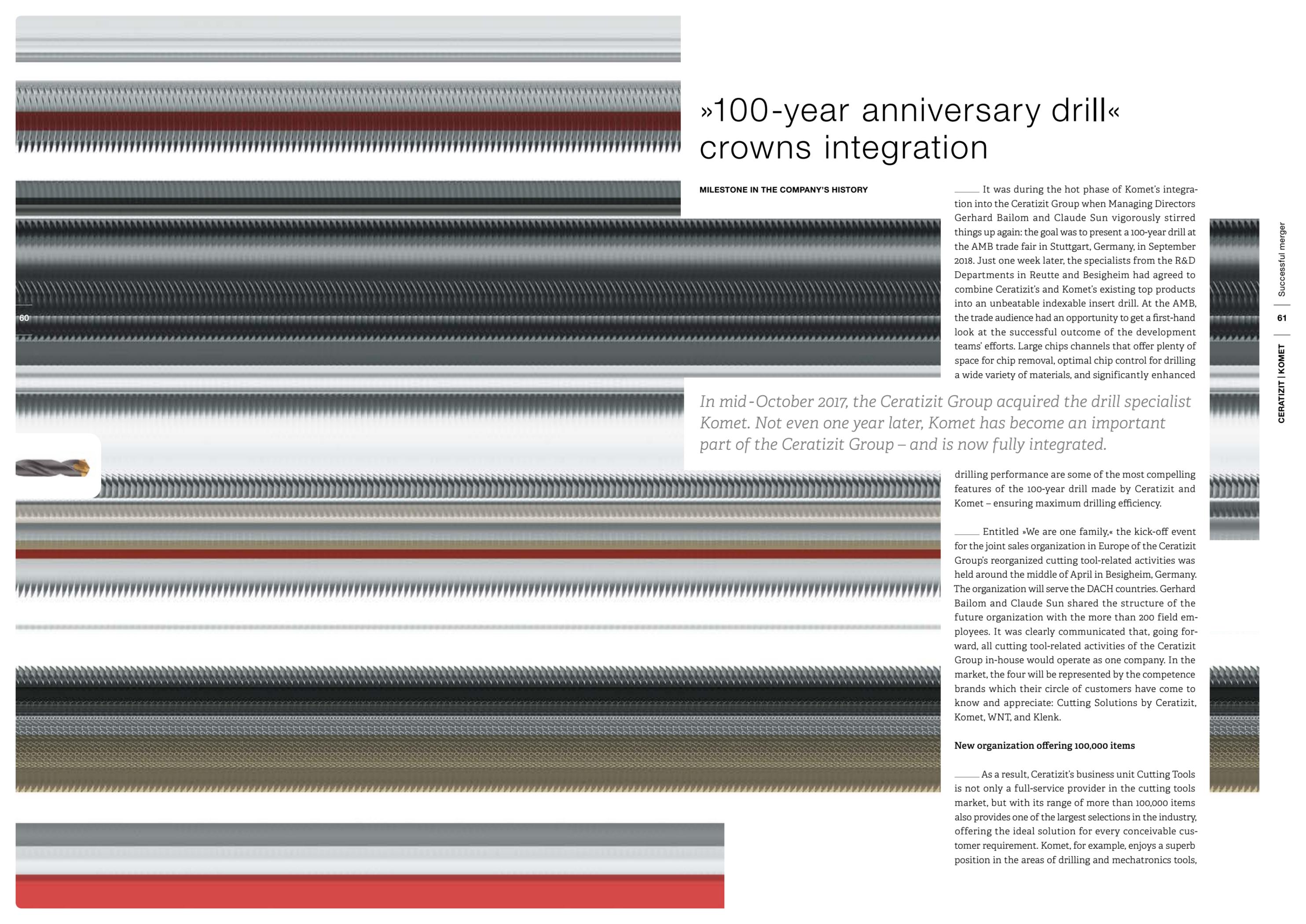
— And after some time there comes the realization: »When everything is new, you are under the illusion that everything is perfect. After a while, then, you notice that traffic or domestic policy issues are the same all over the world.«



Things I'm packing in my suitcase include curiosity and an open mind to get to know the people and culture first hand.

ERIC MACCHI. After attending a vocational college for his CAD design education, Erik Macchi studied manufacturing engineering. Since 2004, he interned at Plansee USA on several occasions, and in 2008 he joined the Design Department. Macchi became the Coordinator for CAD and PLM solutions in the Group's IT department in Reutte in 2014.





»100-year anniversary drill« crowns integration

MILESTONE IN THE COMPANY'S HISTORY

In mid-October 2017, the Ceratizit Group acquired the drill specialist Komet. Not even one year later, Komet has become an important part of the Ceratizit Group – and is now fully integrated.

It was during the hot phase of Komet's integration into the Ceratizit Group when Managing Directors Gerhard Bailom and Claude Sun vigorously stirred things up again: the goal was to present a 100-year drill at the AMB trade fair in Stuttgart, Germany, in September 2018. Just one week later, the specialists from the R&D Departments in Reutte and Besigheim had agreed to combine Ceratizit's and Komet's existing top products into an unbeatable indexable insert drill. At the AMB, the trade audience had an opportunity to get a first-hand look at the successful outcome of the development teams' efforts. Large chips channels that offer plenty of space for chip removal, optimal chip control for drilling a wide variety of materials, and significantly enhanced

drilling performance are some of the most compelling features of the 100-year drill made by Ceratizit and Komet – ensuring maximum drilling efficiency.

Entitled »We are one family,« the kick-off event for the joint sales organization in Europe of the Ceratizit Group's reorganized cutting tool-related activities was held around the middle of April in Besigheim, Germany. The organization will serve the DACH countries. Gerhard Bailom and Claude Sun shared the structure of the future organization with the more than 200 field employees. It was clearly communicated that, going forward, all cutting tool-related activities of the Ceratizit Group in-house would operate as one company. In the market, the four will be represented by the competence brands which their circle of customers have come to know and appreciate: Cutting Solutions by Ceratizit, Komet, WNT, and Klenk.

New organization offering 100,000 items

As a result, Ceratizit's business unit Cutting Tools is not only a full-service provider in the cutting tools market, but with its range of more than 100,000 items also provides one of the largest selections in the industry, offering the ideal solution for every conceivable customer requirement. Komet, for example, enjoys a superb position in the areas of drilling and mechatronics tools,

IDEEN-FORUM

With the Ideen-Forum, Komet established an event for experts that is held in high regard and valued by decision-makers and experts of leading companies in the metal working, mechanical engineering, automobile and automotive supplier industries as well as in medical and energy engineering. This year, the Tenth Ideen-Forum themed »Menschen-Ideen-Werkzeuge (People-Ideas-Tools)« was held on April 26, 2018 with 250 attendees in Besigheim.

while Ceratizit's strengths have been milling and turning. Looking to the future, Komet also brings with it valuable knowledge in areas such as additive manufacturing and digitization. The information event held in Besigheim, where the competence brands showcased their focal areas at various information booths, left no doubt that the individual product portfolios ideally complement each other. Komet, for instance, provided interesting insights into the mechatronics field, and the new colleagues from Hanover demonstrated the ToolScope system, a groundbreaking digitization solution for machine tools.

— Cutting Solutions by Ceratizit presented its heavy duty machining expertise. Klenk featured innovations for the aerospace industry, and WNT unveiled its comprehensive range of products for regional distribution. At the latest after these presentations, all participants knew: »Together we are unbeatable.«

100-day marathon finish line

— At the end of May, the integration team took stock of what they had achieved during the 100-day marathon: the two formerly independent companies Ceratizit and Komet have evolved into a well-integrated expert and full-range provider in the cutting tool market – not just on paper, but first and foremost in everyone's minds.

Accomplishments so far

- Established competence centers in Manufacturing and Research & Development – from powder production to the finished product.
- Defined global Key Account Managers to provide customer support for competence brands.
- Reorganized the product portfolio according to the philosophy »only the best solutions for the customer.«
- Optimized the warehouse and logistics.
- Consolidated the R&D teams.
- Newly developed marketing activities for the business unit Cutting Tools and its four competence brands.
- Standardized the reporting and financial systems.
- Consolidated the IT infrastructure of Komet and Ceratizit.
- Integrated Komet's purchasing department.
- Provided regular updates of progress made during the integration in the PMI newsletter.

DIGITAL ASSISTANCE FROM TOOLSCOPE

ToolScope is one of the leading solutions in the portfolio of the Ceratizit Group for monitoring and controlling machines and tools. In addition to the traditional version, where special hardware is connected to the machine, ToolScope also became available late last year as a standalone software solution, which offers almost all the functions of the traditional solution. Without the need for additional hardware, it is easier to install, and the option to connect ToolScope to the cloud within the corporate network also allows entire machinery pools to be monitored, controlled and analyzed. Customers additionally benefit from improved service since process issues in the cutting operation can be analyzed more easily.

ToolScope and similar systems are not just used to create the productivity of the operation as well as avoid damage to the machine, tool and workpiece, but are also utilized to record and evaluate process data to optimize production.

In addition to a number of Ceratizit locations, Plansee is also utilizing ToolScope in Reutte. Thanks to ToolScope's Adaptive Feed Control module, a processing time of four hours or more for certain large components was reduced by half an hour. At the same time, use of ToolScope has also improved the components' surface finish.



100 YEARS OF SUCCESS IN THE MARKET

It was pure coincidence that Komet was acquired just before its 100th anniversary. Komet's long success story, though, is anything but a fluke and has been a tale of ideas, people and tools from the very start. Founded by the Swabian inventor Robert Breuning, the company initially produced remote igniters for gas lamps as well as tool holders and turning tools. In the 1930s, Breuning quickly recognized the potential that hard metal held in the tool industry and developed tool holders with carbide-tipped steel tools for turning and planing.

In the 60s, carbide indexable inserts were added to the product range. In 2011, Komet acquired rho-BeSt coating company, which developed the nano-diamond coating technology.

In 2012 then, the acquisition of Brinkhaus followed, a company specialized in the development of monitoring and control systems for machine tools. A number of apps for ToolScope in recent years made Komet the first tool manufacturer to offer a genuine Industry 4.0 solution. The roll-out of the ToolScope monitoring and assistance system will continue under the umbrella of the Ceratizit Group.



From top to bottom: Participants in the Komet kick-off event, company founder Robert Breuning, Komet Forum of Ideas

Social responsibility

*Give a girl the right shoes,
and she can conquer the world.*

64 Yoga

International Day of Yoga, which was proposed by India's government and adopted by the United Nations General Assembly, took place on June 21. This year's motto was »Yoga for Peace.« Plansee India celebrated International Yoga Day with a one-hour yoga session in the plant premises' courtyard, which was attended by 80 employees.

Unexpected powers

There is arguably no girl that symbolizes this sentence better than Marianne. It was the red rubber boots that imparted unexpected powers to the girl who is neither able to walk nor use her arms and hands. The child with the thick blond braided pigtails realized early on that her body was different. But why not seek adventures?

Published in early September, the children's book »Marianne und die roten Zauberstiefel (Marianne and the magical red boots)« tells the story of Marianne, a much-loved child who holds a prominent place in the family. The family acknowledges her disability, and at times this disability is impractical, but nobody dwells on her supposed deficits. She learns to live with her disability, accept herself, and love herself just the way she is. With its heart-warming tale, the



book demonstrates that children, first and foremost, are all equal and want the same thing: to grow up happy and healthy.

The book is published by the Roll-On Austria organization. RollOn advocates for the interests and needs of disabled individuals in Austria. The Plansee Group has supported the organization since 2018.



The steps had rubber edges. Rubber on rubber. Marianne propped the soles of her shoes against the floor and felt how her bottom lifted up. She climbed the first step. Her belly was bubbly with elation. This gave her strength. She then reached the second step. And the third. She had never made it this far on her own.



A coin with a message

*The footprint of humanity
on the Earth has become
long and deep.*

Will we be able to take gentler steps in the future?

This issue is addressed by the new silver- niobium coin, which was produced for the sixteenth time in collaboration with Plansee. The coin illustrates the impact of modern humanity's activities on planet earth.

Are we perhaps no longer in the Holocene, the most recent geological epoch that began some 12,000 years ago, after the end of the last glacial period? Are we already in the Anthropocene? It is a fact that human activities are causing enormous changes to the Earth, prompting many scientists to argue that the age of the Anthropocene has already begun. The term was coined by Paul Crutzen, Nobel Laureate in Chemistry, as a warning regarding the global changes that are caused by mankind, such as climate change, sea level rise and environmental pollution.

Foot prints on the globe (Europe and parts of Asia and Africa) are depicted on the niobium core, symbolizing the marks that we, humans, have already left on our planet.

On the reverse, man forms the focal point on the niobium core and is flanked by two deciduous trees. The globe (Americas) forms the background.

Starting on the right, the ring depicts the following clockwise: a factory (denoting industry), rows of plants (monocultures), a nuclear reactor and utility pole (energy), and the logo PET01 (polyethylene terephthalate plastic and recycling code).

As the ring continues, climate change is addressed: drops of water (flooding, sea level rise and glacial melting), snow crystals (melting of the polar caps), thermometer (global warming), a withered tree trunk, CO₂ (carbon dioxide emissions), and parched earth.

Like every year, the Plansee Group purchases a supply of silver- niobium coins for in-house use, giving employees and retirees the opportunity to acquire this coveted collector's item. All the proceeds from the sale of the coins go to the Paul Schwarzkopf Private Foundation, which offers financial assistance to adolescents from the Reutte district for vocational training and continuing education.



Ammonite | Triassic



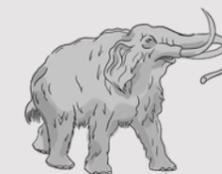
Tarsophlebiidae | Jurassic



Triceratops | Cretaceous



Saber-toothed cat | Tertiary



Mammoth | Quaternary



Human | Quaternary

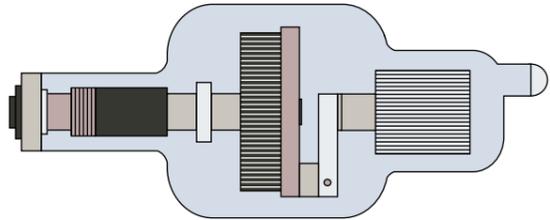
Investments

+++&€&Y+++&€& &+++&& +&€&Y

+++++++& €&Y+++&€& &+++&& \$Y€ €+++€ +
 &€&Y+++&€& &+++&& \$Y€ €+++€ +

+++ +++++&€&Y+...+++ +++++

66 Hydraulic spindle press



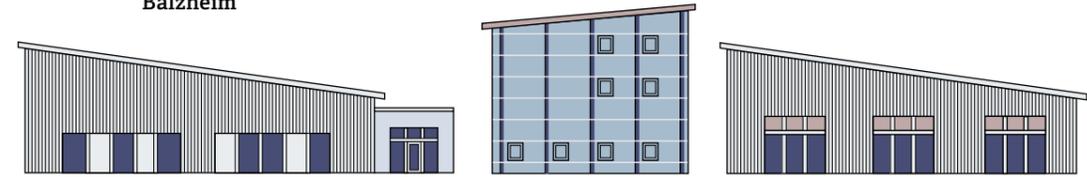
Even after almost 40 years in operation, Plansee's hydraulic spindle press in Reutte is anything but obsolete, thanks to comprehensive reconditioning. The 175-ton press and the entire production periphery underwent an electrical and mechanical overhaul and are now automated. In addition, new, highly energy-efficient induction furnaces were installed for heating the materials. The spindle press is used, among other things, to press blanks for rotating anodes.

New rotating anode manufacturing operation

Plansee invested ten million euros in a new production line for medical engineering products. Reutte, Plansee's largest production site, has manufactured medical engineering products for over 60 years. The components are needed to generate X-rays and are used in X-ray machines and CT scanners. The highly automated, networked production line was installed over the course of 12 months. »We want to continue to competitively produce medical engineering products in the heart of Europe without limitations and expand our global market position,« said Andreas Lackner, Executive Vice President Operations at Plansee SE. Intelligent interfaces, end-to-end product coding and streamlined processes will enable considerably shorter delivery times.

+++++++&€&Y+...+++ +++++ +&€&Y+++&€& &+&€&Y+++&€&Y+++&

Balzheim



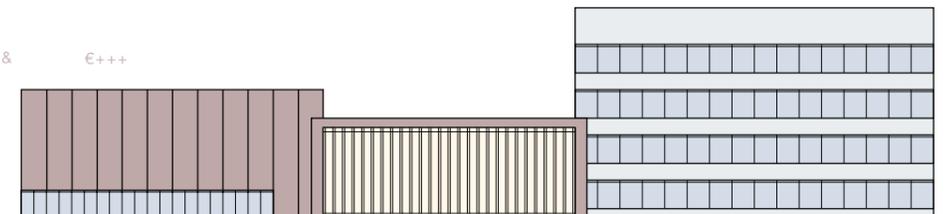
Klenk and Günther Wirth closed ranks in Balzheim. The location is now Ceratizit Balzheim, undergoing a vigorous expansion.

Two production and logistics buildings have already been constructed, with a third one scheduled to follow. The total investment of 35 million euros in tool production will enable future growth of the site that is focused on solid carbide tools.

The new building doubled the existing manufacturing space of approximately 5,000 square meters (almost 54,000 square feet). Aside from additional warehouse and logistics space, the core includes the manufacturing area with new coating equipment as well as grinding and measuring machines. Also a new cafeteria and training rooms were build.

The carbide rotating cutting tools manufactured by the 470 employees in Balzheim are used predominantly in the aviation, the automotive and other key industries.

+++++++&€&Y+...+++ && +&€&Y +++&€& &+&€& Y+++&€&Y+++& €+++



Kempton

The planning is well underway: by 2020, Ceratizit and WNT will leave the current location in Kempton and take occupancy of the new and expanded building.

Initially, Ceratizit will build on approximately one third of the property in Kempton measuring a total of 65,000 square meters (approximately 700,000 square feet). The eastern portion of the plot still offers ample space for a potential expansion later on.

The new building will be broken down into three sections. In the office building, the first-floor entrance area featuring a foyer and an atrium will be open to public use, while offices for 300 employees are planned

on the second floor. The use of the third floor, which could house coworking spaces, is still under development. The second building will accommodate the testing and training center for customers and employees. The third section of the building, a wooden structure, will be home to the entire logistics operation, including a warehouse equipped with automated high-tech shuttle technology, high-bay racking, and incoming goods and shipping department. A photovoltaic system is planned to be installed on the roof of the building, which is expected to cover large parts (or alternative: the entire base load) of the building's power requirement.

€+++€ + +++&++++&€&Y+++&€& &+++&& \$Y€ €+++€ +

IMPRINT**EDITOR**

Plansee Group Service GmbH
6600 Reutte, Austria
plansee-group.com

CONTACT

Dénes Széchényi
Group Communications
T +43-5672-600 2243
living-metals@plansee.com

CONTRIBUTIONS FROM

Melissa Albeck, Michael Androsch,
Hubertus Bardt, Michael Blank,
André Bosse, Jan Brinkhaus,
Christoph Carrié, Parwez Farsan,
Udo Fichtner, David Friedl, Nadine Führer,
Tom Glesener, Thomas Granzer,
Manuel Guzmán, Robert van Helden,
Maxime Houpert, Tobias Kumpf,
Heinrich Kestler, Josef Langenwalder,
Karin Laursen, Ulrich Lausecker,
Teemu Liukkonen, Eric Macchi,
Kathrin Müller, Markus Müller,
Gerhard Munz, Bernhard Schretter,
Hermann Walser, Michael Weirather,
Karlheinz Wex, Heiko Wildner,
Peter Zahedi

TRANSLATION

Maintal Translations, Inc.,
Virginia Beach, VA, USA

CONCEPT & DESIGN

jäger & jäger, Überlingen
jaegerundjaeger.de

PRODUCTION

rwf-media.com,
6111 Volders, Austria

PHOTO CREDITS

Plansee Group, Richard Pürcher

Title, p. 44 | Maciej Noskowski, iStock
p. 4 | XiXinXing, iStock
p. 8 | Lukas Kühlechner, kuehlechner.at
p. 10 | pzAxe, iStock; jäger & jäger;
Collage jäger & jäger
p. 16 | Juergen Sack, iStock
p. 23, 27 | Orbon Alija, iStock
p. 24 | PhotoTalk, iStock; cherezoff, iStock;
idealistock, iStock; Sauliakas, iStock;
Collage jäger & jäger
p. 28 | Ceratizit
p. 29 | from2015, iStock
p. 30 | choness, iStock; alenaohneva, iStock;
Collage jäger & jäger
p. 34 | Kai R Joachim (BFF)
p. 36 | jltruong, iStock
p. 39 | Ishtar Najjar
p. 47 | dpa/picturedesk.com
p. 51 | Tinieder, iStock;
Drepticr, Shutterstock
p. 52 | Tatsuo115, iStock; Denis Linine, iStock
p. 53 | Denis Linine, iStock; histrus42, iStock
p. 54 | carterdayne, iStock;
IlonaBudzbon, istock; RossHelen, iStock
p. 55 | Xantana, iStock
p. 57 | ansonmiao, iStock; zhudifeng, iStock;
chuyu, istock; ansonmiao, iStock
p. 58 | DenisTangneyJr, iStock;
Dee Browning, Shutterstock;
Amy Trotter Hillman, Shutterstock
p. 60 | Ceratizit
p. 64 | RollOn Austria
p. 65 | Michael Stelzhammer

We attach great importance to protecting your personal data. As a result, we will use your data solely for shipping the *livingmetals* magazine. If, at any time in the future, you are no longer interested in receiving our magazine, please send us a message at living-metals@plansee.com, providing us with your address. Simply note the keyword »Unsubscribe« in the subject line. We look forward to continue counting you among the readers of our magazine.

