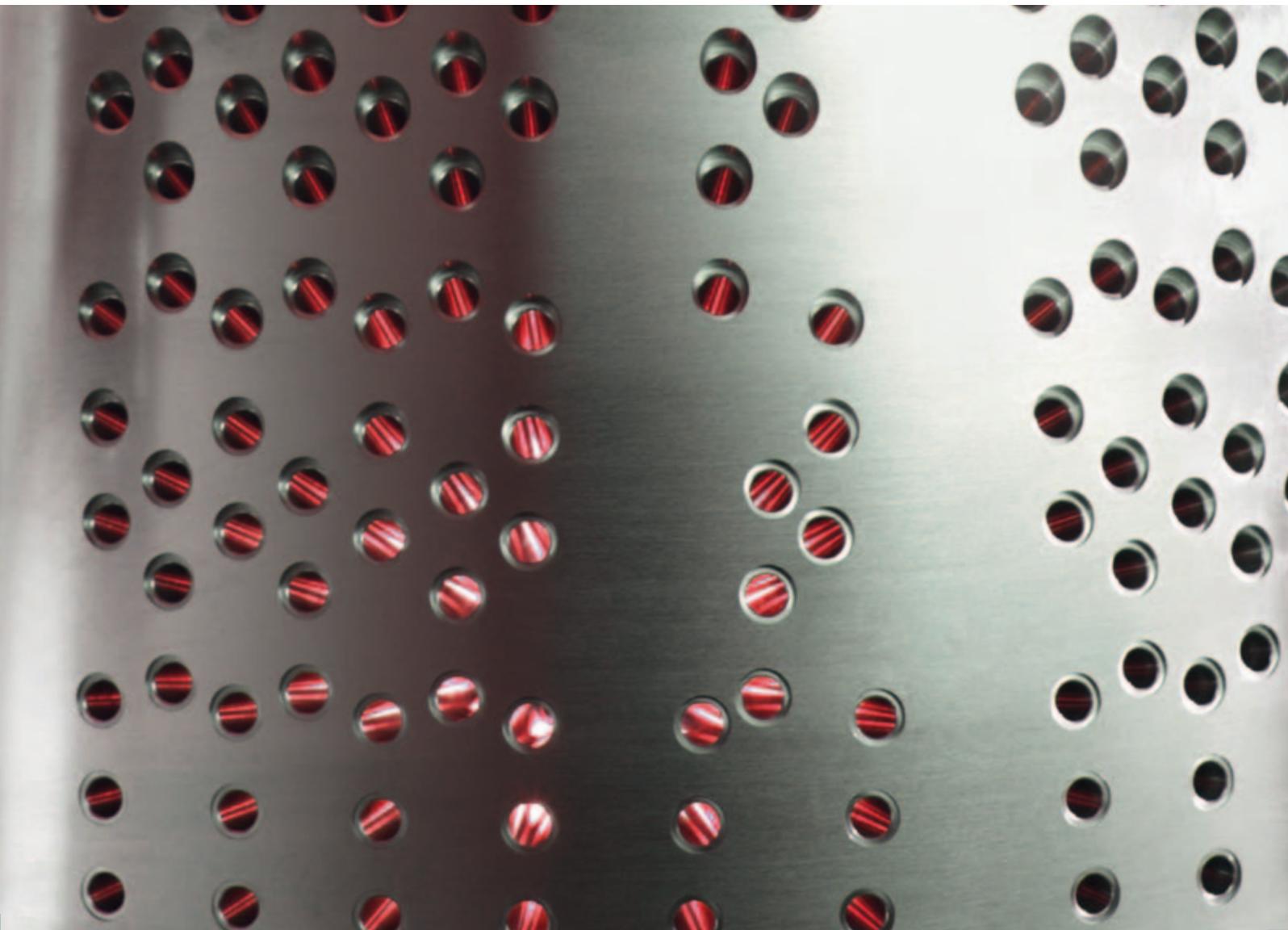


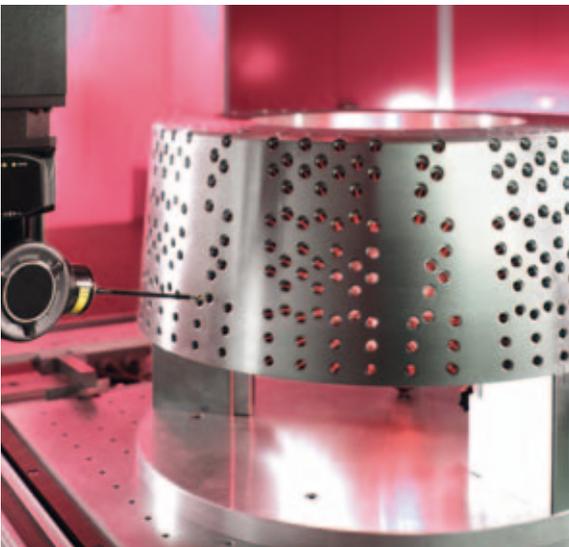
## Medical Technology – Healing with Precision

- High Voltage in China
- Sustainable raw materials supply



### **Regarding the title**

Tumors in the skull can be irradiated without scattering loss or damage to healthy tissue with the aid of a helmet with hundreds of high precision holes. The material formula for the two-ton helmet, as well as the mechanical processing of the heavy metal comes from Plansee. Learn more about this on page 10.



# Unique features

»» Our material solutions brought light and moving images into homes almost 90 years ago. We also today contribute to aid in the breakthrough of revolutionary products.«

Dear readers,

Our metals make life worth living. In the early founding years – almost 90 years ago – our material solutions brought light and moving images into homes. And today, we also contribute to aid in the breakthrough of revolutionary products. Everyone wants to live as long as possible and free from discomfort – even if they are suffering from a tumor. Our materials are contributing to a painless and effective tumor treatment.

And, everyone wants to use electricity, even if they live far away from cities and power stations. Our materials are an important piece of the puzzle for decentralized power generation using fuel cells as well as the low-loss transmission of electricity over long distances.

We don't heal human beings, nor can we supply them with power, yet we build smart mobile phones. However, we develop and produce essential materials with unique properties to make groundbreaking and forward-looking high-technology in medicine, energy,



*Dénes Széchenyi,  
Head of Internal  
Communications*

or coating techniques possible. We have summarized some examples of what we do in this booklet.

I wish you inspired reading.

Dénes Széchenyi





### **From ore to high-tech products**

The long road from ore to the high-tech tungsten product starts here: The tungsten seam in the mine is composed of white quartz rock and black wolframite. The wolframite is processed into pure tungsten powder, which range spans from carbide tools, coatings to components for machinery and equipment. Since wolframite is a scarce and valuable commodity throughout the world, the Plansee Group secures its tungsten needs from recycling and long-term supply agreements with mines.



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# livingmetals

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THE MAGAZINE OF THE PLANSEE GROUP

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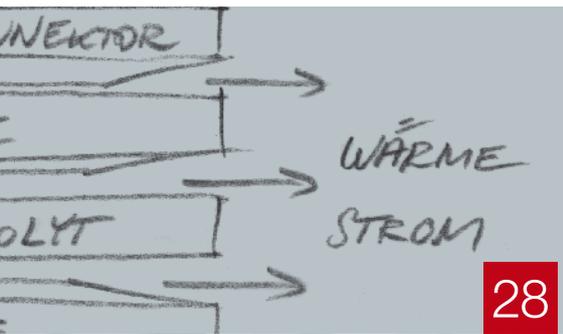
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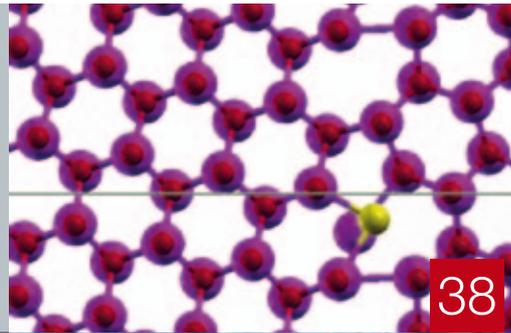
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Focused treatment of tumors in the skull

# Healing with precision

The requirement of a two-ton heavy metal colossus to be machined with the precision of a Swiss watchmaker is exactly the right challenge for Plansee: Making the impossible possible with outstanding processing and measuring technology - and thereby helping tens of thousands of patients each year to a better life. ▶





*The computer-assisted measuring program collects hundreds of data points and creates a clear target-analysis.*

► Both a Swedish medical equipment manufacturer and Plansee believed in the impossible: They wanted to develop a treatment device where any point of the diseased tissue in the cranial could be irradiated without injury to healthy tissue. In addition, the treatment area should be expanded up to the neck region. This requires the highest accuracy, such as in the irradiation of tumor tissue around the optic nerve. The jointly developed helmet for the irradiation unit is equipped with 576 high-precision holes, which lead to a single focal point (Isocenter) which has the size of a needle tip. Through these various holes (collimator openings) a

single high dose of radiation can be delivered to the affected tissue, no matter where it is located.

In order to achieve a solution, Plansee put together all of its material and technological expertise: The more than two-ton heavy blank part of the helmet is pressed in one piece from metal powder. It is then sintered at high temperatures to achieve a one-hundred percent dense body. The density of the material used is thereby approximately three times higher than steel. Finally, the highly precise holes required for the radiation beams are drilled in a specially developed machining center.

measuring machine is housed in an air-conditioned room.

The investments in these technology developments have served a single goal: To guarantee maximum security to the customer and thereby treat the patient as safely as possible.

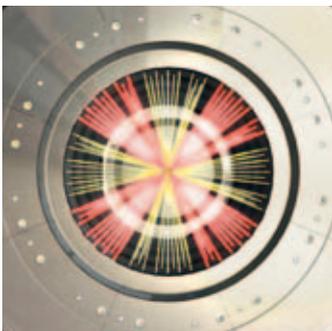
The successful partnership development has meanwhile shown results: Since late 2006, the customer was able to convince many of the world's leading clinics in the field of neurosurgery, of this new radiotherapy equipment.

And thanks to modern therapy, tens of thousands of patients enjoy a longer and much improved life every year. ■

### **Maximum security**

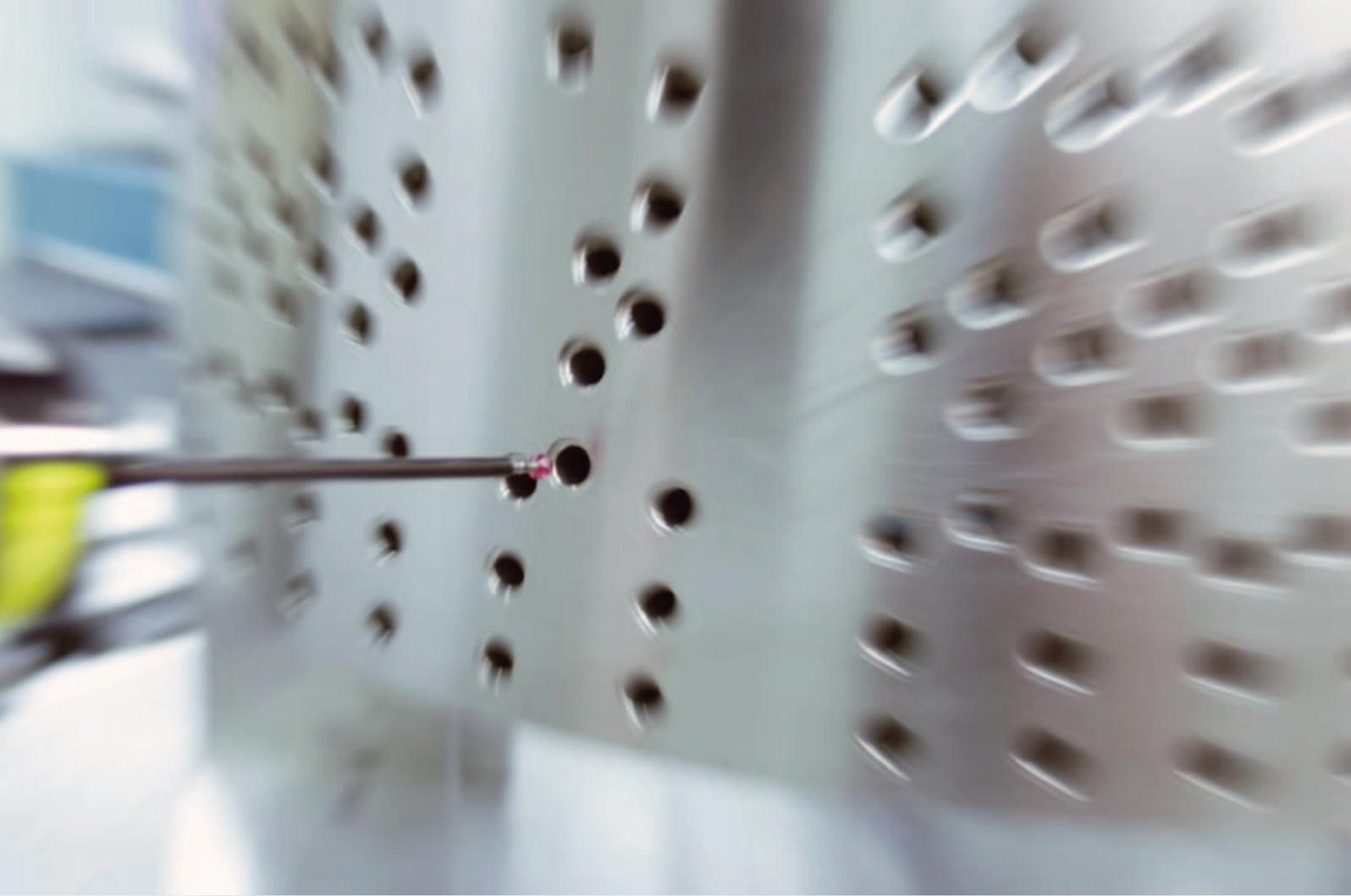
The extensive and completely traceable documentation for the quality features is made by a 3D coordinate measuring machine which has been unique in the world until now.

The computer-aided measurement program collects and computes thousands of measuring points in a very short time and transmits these in the form of a clear focal point analysis. In order to guarantee constant measurement conditions, the coordinate



*Precise irradiation: The highly precise design of the helmet guarantees accurate radiation treatment.*

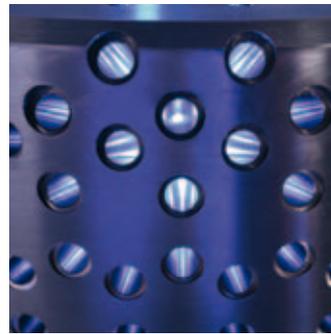
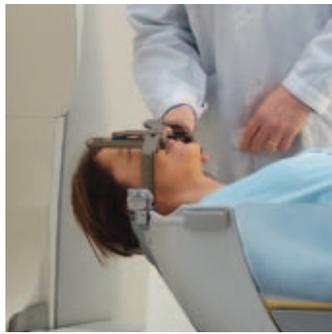
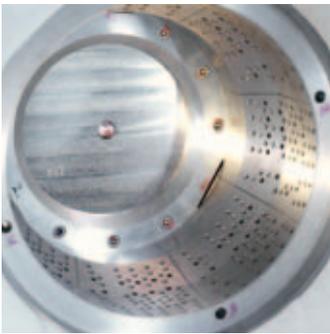




Radiotherapy

# Absolute reliability

For a quarter of a century, Plansee has been working to further develop the treatment of tumors in the skull with the aid of new medical treatment devices.



*Fast, flexible and precise:  
the future of stereotactic  
radiotherapy.*

Already 25 years ago, the idea was born to further develop the treatment of tumors in the skull with the aid of new medical devices and design an improved radiation treatment with shorter treatment times, to make it as comfortable as possible for the patient. In addition, the treatment area in the skull, down to the neck, should be enlarged and procedures in the hospital should be improved. The device that was developed for stereotactic radiation therapy has revolutionized the method and scope of the treatment. Tumors in the skull can be treated non-invasively with an extremely high accuracy and the appropriate dose of radiation. The treatment is much faster, more flexible and more precise and more patients can be treated at a much lower cost.

The benefits of micro-surgery in the skull are shorter hospital stays, no intensive care and no serious complications. After irradiation, the patient is usually capable of returning to work and meeting his

normal daily duties the next day. Each year, approximately 50,000 patients undergo such an operation. ■

## Mega trend of medical technology

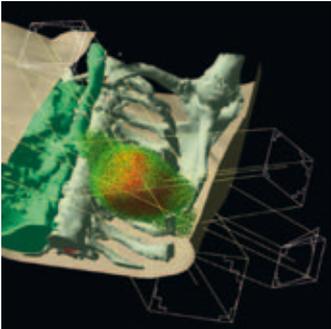
More and more medical device manufacturers rely on high technology products from the Plansee Group. Plansee develops and produces standing and rotating X-ray targets for X-ray machines and CT scanners – the key components for the safe removal of the large amounts of heat, which occur in the production of X-rays.

Plansee delivers collimators and shielding of heavy metal for the effective radiation therapy (see page 14 and 15). Rods made of hard metal are further processed into dental drills. Tools for the machining of titanium are used for the customized treatment of implants. And, Plansee manufactures products for the power module for implantable defibrillators (page 43).

Multileaf collimators

# Targeted irradiation

The idea is simple: A sharp image of a tumor, as well as the exact location of its position in the body is a prerequisite for accurately irradiating the diseased tissue and protecting the surrounding healthy tissue. And since the body is always moving, the positioning and irradiation of tumors should occur simultaneously, if possible.



*In radiotherapy, multileaf collimators precisely shape the contour of a tumor to the millimetre.*

Radiation therapy is now being applied to many tumor types and is continuously being further developed by medical device manufacturers. The basic idea of the technical implementation is always the same: The radiation needed is generated by a linear accelerator and shaped via a mask, so that the radiation precisely reaches the targeted tissue to be irradiated. Previously, these masks were simple lead forms. Later, the contour of the tumor was cut out from a lead plate – an individualized and therefore quite time-consuming and costly matter.

## Millimeter accurate image

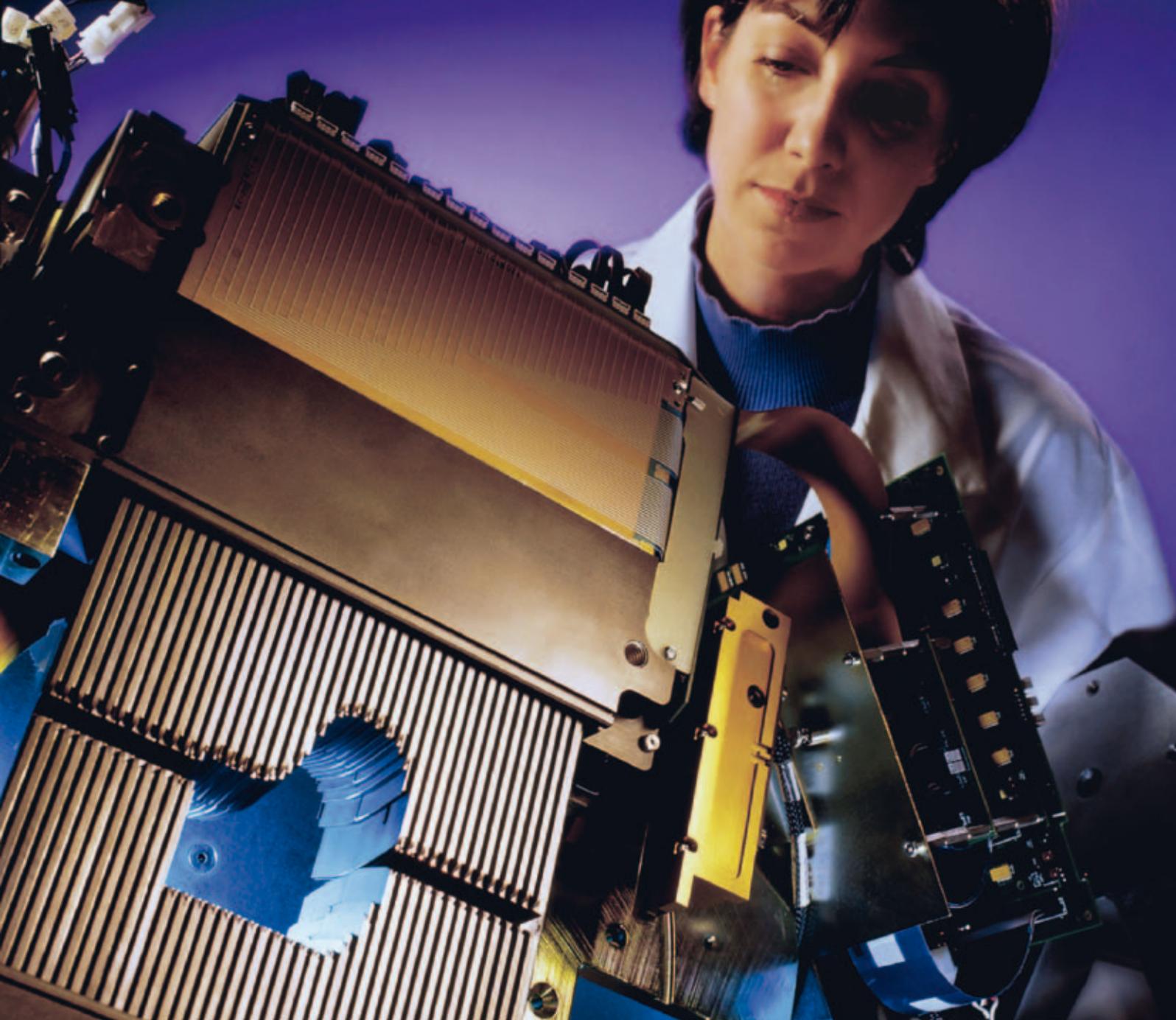
Since a few years now, the so-called multileaf collimators have been used as masks and continually developed further.

The location and dimension of the tumor is precisely determined by three-dimensional X-ray images. Each individual plate of the collimator is brought into position by a motor – up to 120 lamella present the shape of the tumor to a millimetre accuracy. Based on the three-dimensional measurement of the tumor, high-dose radiation packages can now be sent to the tumor from different directions. The radiation source thereby rotates around the patient and can irradiate the tumor from all directions. In order to provide maximum protection to the surrounding healthy tissue and the patient, the computer knows at any time where each lamella is: With multiple sensors at the leaf tip and on the motor, the position of each leaf is constantly reviewed.

## Greatest manufacturing competency

Plansee has supplied plate blanks to leading medical device manufactures for many years. The blanks can be easily processed further due to the material properties. However, with the increasing demands on the flexibility of the radiation equipment, Plansee has gradually changed into a development partner for medical equipment for the entire collimator. The reason: The absolute safety requested by the customer can only be guaranteed, if Plansee is involved in the development of the entire collimator.

Each leaf in the collimator has its individual shape and will be processed in three dimensions by 5-axis milling



machines. This requires great manufacturing expertise. Each plate must also move in the collimator almost without any friction resistance. Here, the tightest machining tolerances are required, which Plansee documents in detailed measurement reports. In addition, the interaction of the plates must be accurate in the collimator: For some customers Plansee now also manufactures the housing of the collimator, with the most accurate guide rails where the plates slide. The tightness of the tolerances and accuracy is shown by the following example: When researching the root cause in the context of a complaint, Plansee found out that the collimators were assembled at a temperature of approximately 12 °C.

However, the manufacturing tolerances are so tight that they are coordinated to a temperature of 20-22 °C.

#### **Production from one source**

Plansee therefore can also provide complete quality verification, as the entire manufacturing process is covered in-house – starting with the powder to the production of the blanks up to machining and assembling. Thereby Plansee can deliver complete collimators which are tested for quality and functionality, including driving motors, at any time. Until now, mainly X-ray procedures were used to determine tumors. In order to improve the diagnostic part of the treatment even further in the dynamic

organism, medical device manufacturers are working on the use of magnetic resonance imaging (MRI). Magnetic materials in the collimator may therefore no longer be used. In the meantime, Plansee has already far advanced the development of iron-free components for this application. Plansee thereby underlines its goal to support its clients in the development of new standards in medical technology with the most suitable material and processing solutions. ■

High technology materials manage, switch, cool ... and resist!

# Mega trend of energy technology

Whether it's the production, transformation and distribution of energy or the intelligent energy dissipation – the variety of developments in energy technology place high demands on new materials and their properties. The Plansee Group's high-tech materials allow pioneering projects.

Plansee provides a key component for the high-temperature fuel cell (SOFC) with the powder metallurgical interconnector and thus makes a decisive contribution to a clean, reliable and affordable energy source. The chrome-based alloy is characterized by a high corrosion resistance. The thermal expansion coefficient of the alloy is adjusted to the electrolyte of the fuel cell. (SOFC fuel cell, Page 28)

## Sun and wind

The growing importance of solar and wind power in the energy supply has created a multi-billion industry that is characterized by a race for higher energy yields and the lowest priced kilowatt hours. With new or improved material solutions and intelligent improvements in the process chain, products of the Plansee Group make an active contribution to make renewable energy into a competitive energy source. (wind power, page 18 , Solar industry, page 36)

## Oil and gas

Until further notice, however, much of the energy needs will be met by fossil fuels. Here, the companies of the Plansee Group support the major suppliers of the oil and gas industry with powerful tools for processing delivery pipes with special powder alloys for the production of extremely durable drill bits to open up new delivery fields. (New powder formula, Page 41)

## Electricity

Plansee has recently ventured into a new dimension in the high-voltage transmission with the world's largest switching contact. The circuit breaker developed for the transmission of large amounts of energy from the Three Gorges Dam into China's cities provides up to 1,100kV. (Three Gorges Dam, Page 20)

Plansee is also active in the high-voltage transmission of direct current (HVDC). Base plates by Plansee are needed for

thyristors, which are used in large converter systems for the direct current transmission. Despite the fact that our customers are tracking a variety of concepts in HVDC and rely on different technologies for the production, the fundamental properties of the base plates by Plansee, such as flatness, roughness and the specific coating is essential for the further development of the semiconductor power module and its function.

The specific coating provides a good connection with the semiconductor and is used to create a smooth electrical contact. In addition, an all-round metallic coating also serves to prevent the oxidation of the base plate material in air and in humid environments and thus maintains electrical contact.

The few micrometer thick layers are applied in a PVD process and the dimensions and surface characteristics of the base plates hardly change.



### Heat management

Efficient thermal management today is one of the most important criteria in the design of electronic systems for power electronics, the automotive industry and telecommunications. The dissipation of heat generated by the semiconductor is carried out by substrates with high thermal conductivity. At the same time must be ensured that the different materials are matched in terms of thermal expansion. Composites by Plansee are ideal for an efficient thermal management and contribute significantly in increasing the reliability and service life of electronic devices. Plansee is involved in several development projects with the heat dissipation of LEDs for example applications in automobiles.

### Fusion

Plansee is looking far into the future with their commitment to fusion

research. The high performance heat exchangers in the Wendelstein 7-X research reactors in Germany and France in ITER, co-developed by Plansee, will derive heat energy from the interior of the reactor and provide these for cooling and power generation. These components in ITER thereby absorb a continuous heat flux density of up to 20 megawatts per square meters and resist surface temperatures above 2,000 °C. ■

Wind power plants

# Rugged and reliable operation

The rotors rotate reliably and supply environmentally friendly generated power into the grid. Lightning strikes or salt spray cannot harm the facilities. High-tech materials from the Plansee Group guarantee that wind turbines operate safely.

The components in wind turbines, often weighing several tons, of cast iron and forged steel for the rotor, generator, slewing ring bearings and gears are subject to high mechanical stresses during the operation – and this for many years at (almost) every wind strength. For the high-precision machining of components in the production series, Ceratizit enters its expertise in milling, drilling, turning and parting the critical parts.

## Efficient energy supply

Since the weather and wind conditions are not constant, the electric current generated by wind varies continuously in frequency and quantity. The consumer network is dependent on a steady power supply. Power electronics provide the necessary balance between the power source and power grid. These electrical systems, so-called transmission stations, can be found in any modern wind farm. In these stations, the current is rectified and bundled and converted for the transmission over long distances and the feed into the consumer network. These conversion processes take over the power semiconductor modules, which play a crucial role in semiconductor base

plates by Plansee. Based on the physical properties of the material used by Plansee, such as the expansion coefficient and thermal conductivity of the plates, form a good basis for the sensitive semiconductor of silicon and provide a long service life of 30 years for the module. An additional coating of various materials ensures that the semiconductor base plates have properties such as electrical contact ability and corrosion resistance in a saline environment, an important feature for the operation of wind power plants in and near the sea.

Due to limited space requirements in the tower of a wind turbine, a special switchgear to protect the existing network was specifically developed for these applications. It must switch more frequently due to a smaller surface, to provide a consistent and efficient feed into the net. 3-pole high-performance circuit breaker were developed, that provide the switching contact the highest standards in terms of opposing properties, such as mechanical and electrical resistance. Plansee manufactures switching contacts from a composite material, the microstructure of which was adjusted so that over the powder metallurgical

production route it can be switched capacitive and at the same time increase the service life (number of cycles).

## Effective lightning protection

The greatest enemy of wind plants is lightning strikes, which result in temperatures in excess of 30,000 °C in the rotor blade and in the worst case, can burst the blade due to an explosive air expansion. The lightning protection solutions for wind turbines developed by Plansee together with their customers are extremely robust: They protect the plant effectively, even after several lightning strikes. They are also designed so that an exchange of the lightning protection system is fast and easy. Due to its good electrical conductivity and its extremely high melting point, the material solution by Plansee increases maintenance intervals and the service life of the entire lightning protection system. ■

CUTTING TOOLS

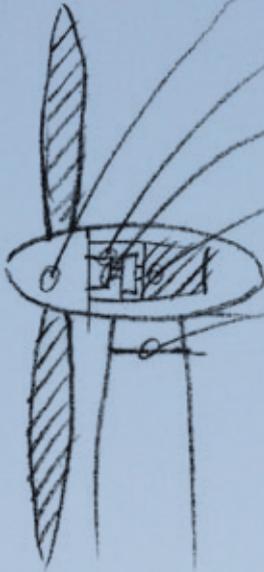


LIGHTNING RECEPTORS



E.G. FOR :

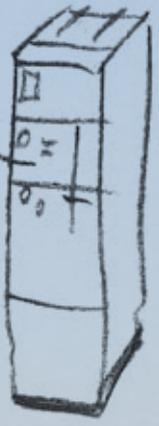
- ROTOR HUB
- GEARBOX
- GEAR
- GENERATOR SHAFT
- RIM BEARING FOR NACELLE



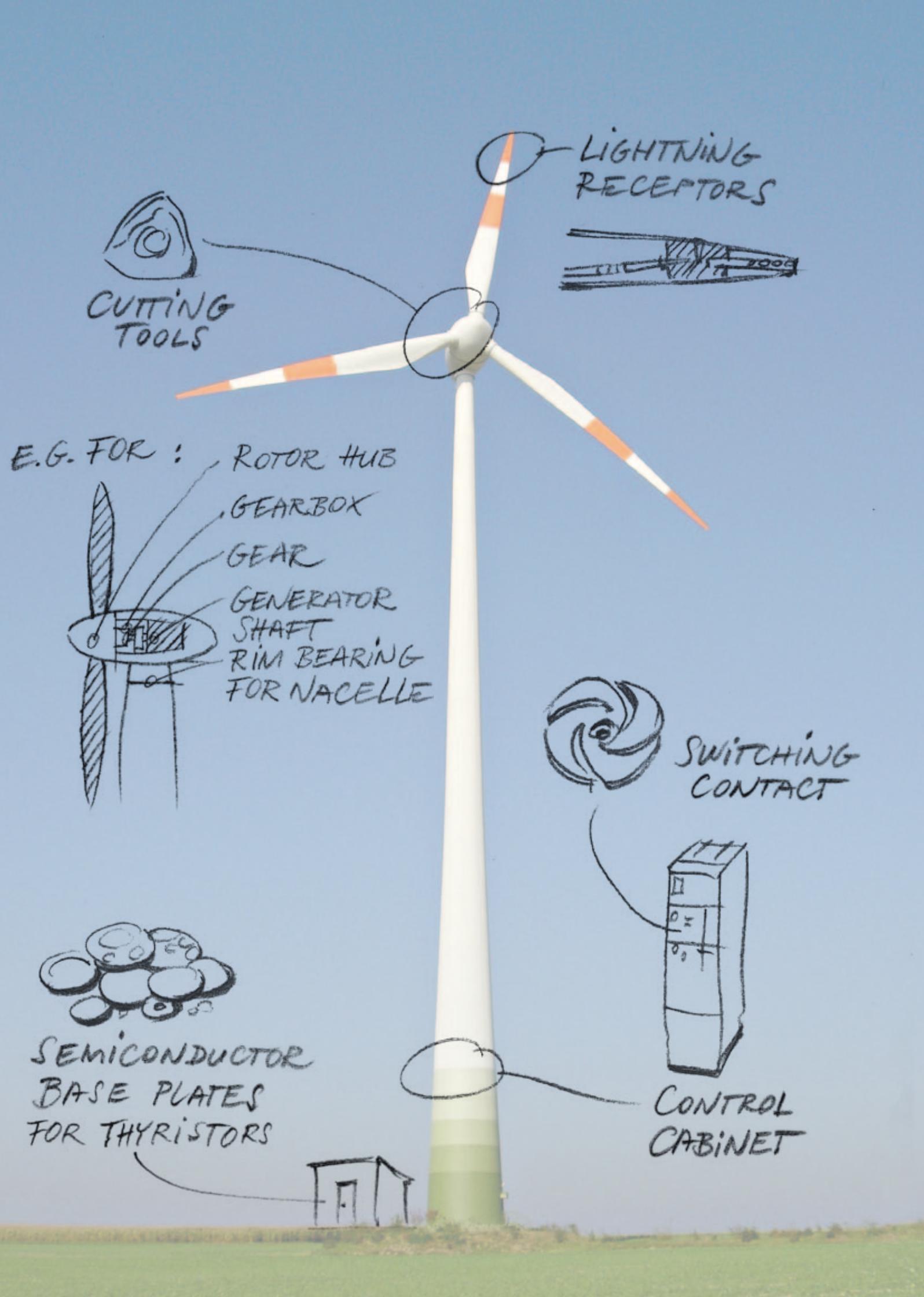
SWITCHING CONTACT



SEMICONDUCTOR BASE PLATES FOR THYRISTORS



CONTROL CABINET





New era of ultra high voltage transmission

# Revolution at 1,100 kV

Plansee Powertech has developed a new arcing contact component for the ultra high voltage transmission in close cooperation with its customers.

The construction of the Three Gorges Dam in China created the world's largest hydroelectric power station with 26 turbines and an average power of about ten gigawatts. This represents approximately 14 percent of the electricity needs of all of Germany, based on the year 2004. In order to bridge the large distances between stations in the west and the consumption centers in the east of the country with its mega cities, China is betting on three-phase transmission lines with record voltages of 1,100 kV. By doubling the voltage of the conventional 550 kV, transmission losses are reduced by a factor of four – that saves a lot of energy.

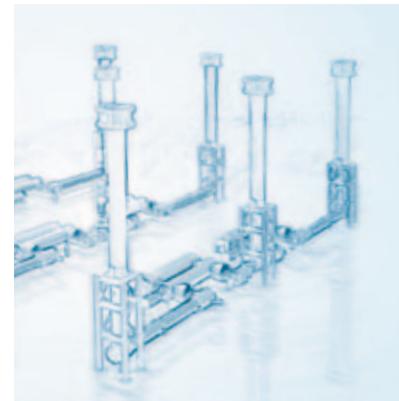
Gas-insulated switchgear resist the rigorous demands of the new stress level. A well-known energy company

has developed the first gas-insulated switchgear for 1,100 kV in a single-phase design. Plansee Powertech has designed a whole new arcing contact component with a high-performance material for the new 1,100 kV power class.

### Uniform design

The greatest challenge for Plansee was combining the cost-conscious design and high performance of the new arcing contact components.

Given the choice of material, the arcing contact components have optimal technical properties such as high wear resistance and optimum arcing properties. A homogeneous and compact design and the simplest possible integration of the arcing

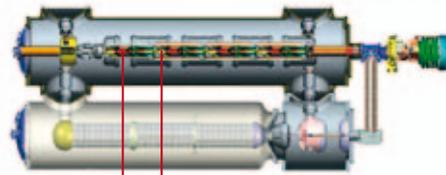


### Ultra high voltage transmission

1,100 kV system in China with a 600 km transmission line and three stations (Jingmen, Nanjang, Don Jin Nan).

*Chinese dimensions: The largest power plant in the world is being constructed at the Three Gorges Dam with 26 turbines and an average power of nearly 10 gigawatts, or about 14 percent of the German electricity demand in 2004.*

Gas-insulated switchgear developed for voltages of up to 1,100 kilovolts.



► contact component in the assembly chain were important to the customer.

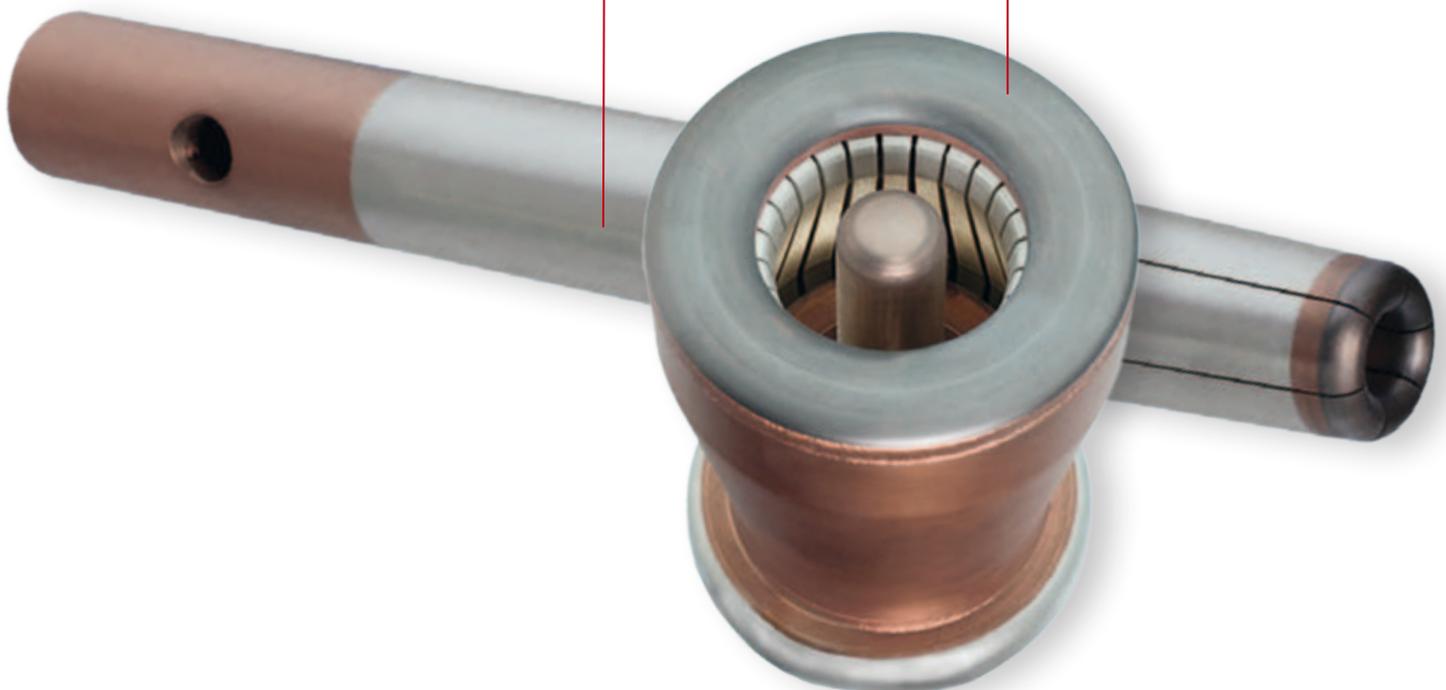
**Permanent link**

The arcing contact components delivered by Plansee are combined of various composite materials. In order to permanently connect the metals with very different properties, Plansee is technologically betting on electron beam welding. The components are finished on automated processing machines to ensure a high process stability and high product quality.

The following numbers express how long and sustainable the connections of

the arcing contact components should be: Voltages of up to 1,100 kV, short circuit currents of up to 50 kiloampères, temperatures at the arc-over of up to 20,000 °C, switching speeds of up to 25 milliseconds, and a service life of more than 40 years. ■

Innovative high-performance material from Plansee Powertech is used in the 1,100-kV switchgear facility.





From ore to powder

## Sustainable supply of tungsten

Global Tungsten & Powders guarantees its customers a sustainable supply of tungsten powder. This is assured in two ways: First, by long-term supply contracts with mining operators. Second, by recovering and recycling secondary raw materials containing tungsten.





► Several times a day, heavily loaded trucks approach the GTP plant in Towanda. They are loaded with tungsten-containing ore of up to 20 tons. Approximately 50 percent of the delivered material consists of iron, manganese, calcium, silicon and other elements, the remainder is pure tungsten. The incoming tungsten-containing ore is obtained by GTP from tungsten mines in the entire Western Hemisphere – from South to North America to Europe. GTP has signed strategic supply agreements with all of these mines to ensure the long-term supply of the precious resource and be able to guarantee a safe supply to its customers. Tungsten is contained in rock layers of white minerals (scheelite) and also black minerals (wolframite). Scheelite and wolframite are rare in the earth's crust and can be mined

economically and logically in only a few places in the world. Typically, these layers of rock contain 0.2 percent of tungsten. In “rich” mines the ore delivers up to two percent of tungsten. That is, one kilo of extracted ore supplies between 2 and 20 grams of tungsten. In order to separate tungsten and other minerals from each other, the size of the extracted ore is initially reduced in a processing plant and mixed with water. The variable weight of the minerals is used for the separation of the tungsten-containing minerals. Subsequently, the tungsten is further refined by various physical process steps and by magnetic separation.

**Lucrative excavation reprocessing**  
The thereby resulting tungsten concentrate is dried and delivered at

GTP. The remaining rocks from the processing is piled up around the plants as so-called tailings. Since the separation of tungsten and other minerals did not work as well in the past as it does today, these tailings often contain large amounts of tungsten. These tailings are reprocessed in some places again today – high commodity prices thereby provide the best use of this rare commodity.

#### **Closed raw material cycle within the Plansee Group**

GTP has been recycling tungsten returns since the early 60s and is therefore one of the pioneers of the chemical and physical processing of tungsten waste of any kind. GTP has expanded recycling further since 2008. Meanwhile, GTP covers a significant part of its tungsten demand by recycling. Based on the enormous



*There are two methods of producing tungsten powder: on one hand, ore extraction, on the other hand, the recycling of scrap.*

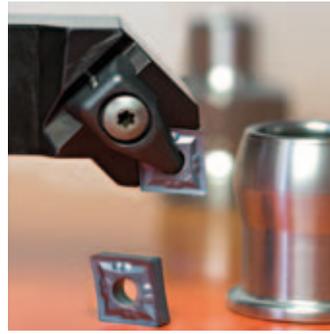
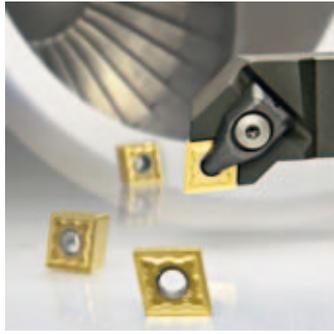
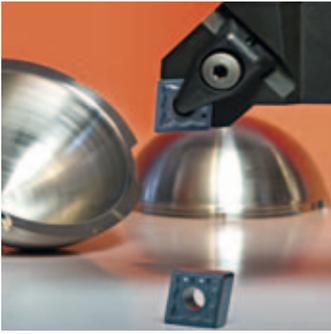
price fluctuations in the commodity markets, the increasing expense of mining tungsten-containing ores and the worldwide uneven distribution of tungsten (about 80 percent is located in China), GTP is committed to return tungsten-containing secondary raw materials of all types to the raw materials cycle as comprehensibly as possible. These include sintered hard scrap materials of tungsten carbide, such as disposable inserts, tools, parts subject to wear, chips, soft scrap, such as powder and water or oil-based grinding sludge and other secondary raw materials that contain at least 60 percent of tungsten. GTP has developed and implemented suitable recycling processes for all these secondary raw materials. Alloys and other materials such as cobalt, nickel or tantalum can also be recycled. The

objective of all of these processes is that recycled powder has identical quality characteristics as fresh powder.

#### **New recycling processes**

In order to reprocess as much waste as possible, GTP has signed long-term take-back agreements with many of its customers. Increasingly, the agreements cover the acceptance of the entire tungsten waste, which thereby results in a closed recycled material loop between GTP and the customer, in which almost 100 percent of tungsten is recycled. In order to process the increasing amounts and comply with all environmental requirements of ISO14001 in the future, GTP has invested in the proper equipment and technology. In addition, GTP has hired a team of scientists to improve or redevelop the recycling

process. The focus is on difficult to separate composite materials, such as copper infiltrated tungsten components or tools that are used in materials handling. ■



## High Tech Alloys

# From super alloys and other exotics

It has not been so long ago that materials such as titanium, super alloys and stainless steels were described as very exotic materials. They occurred infrequently, were focused on a few areas of application and processing provided some producers with almost impossible challenges.

Although these materials continue to be quite expensive, more and more are now used and rapidly gain in importance due to their properties: In the power plant construction, in defense technology, the aerospace industry as well as in medical technology.

### **Titanium machining with hot strength tungsten carbide substrate and more efficient cooling**

Exotic materials such as titanium are classified more difficult by about a factor of ten than traditional steels in

processing. One of the main reasons is its very poor thermal conductivity. Thus, in the processing of titanium, only about a quarter of the heat is dissipated by the chips, the rest goes directly to heating the tool.

In order to pass these requirements, you need a refractory carbide substrate and an efficient cooling during the machining process. This means the use of refrigerants in large quantities, preferably at a high pressure by the spindle directly to the cutting edge of the tool, which

also favors the removal of the chips. For this reason, support tools with internal cooling are therefore the first choice for the machining of exotic materials.

A further consequence of the poor thermal conductivity, for example, of titanium alloys are the high temperatures in the cutting tools, resulting, inter alia, chemical reactions such as oxidation and diffusion at the surface of the cutting edge. The HyperCoat coating developed by Ceratizit acts as an efficient protection.

*The key theme of the campaign. Ceratizit stands for competence in processing exotic materials such as titanium.*



### High elasticity

In massive cold forming, titanium is prone to cold hardening, with the tensile strength tripled and reduces the elongation up to 90 percent. This hardening tendency opposes the cutting process with a significant resistance, which brings the cutting edges to break easily, or causes disruptions in the cutting material. A reduction of cutting forces by providing a remedy only up to a certain point by possibly positive and sharp inserts. And therefore, as the inserts are too sensitive for this application, if the design is too positive. The high elasticity of the material constitutes a relaxation of the material, which results directly to a relaxation of the titanium after the cutting process, which places special demands on the geometric exemption of the cutting edge.

### Time-consuming processing of exotic materials

Due to the extreme properties of exotic materials, only a slow process, i.e., at low to moderate cutting parameters is generally only possible. The processing is very time consuming. Another feature is the high processing safety, which must be ensured. First, these are primarily very large workpieces

in the aerospace industry, processing can take several days and, secondly, the very high cost, when large parts of the expensive material are no longer usable.

### Ceratizit as a partner in the processing of exotic materials

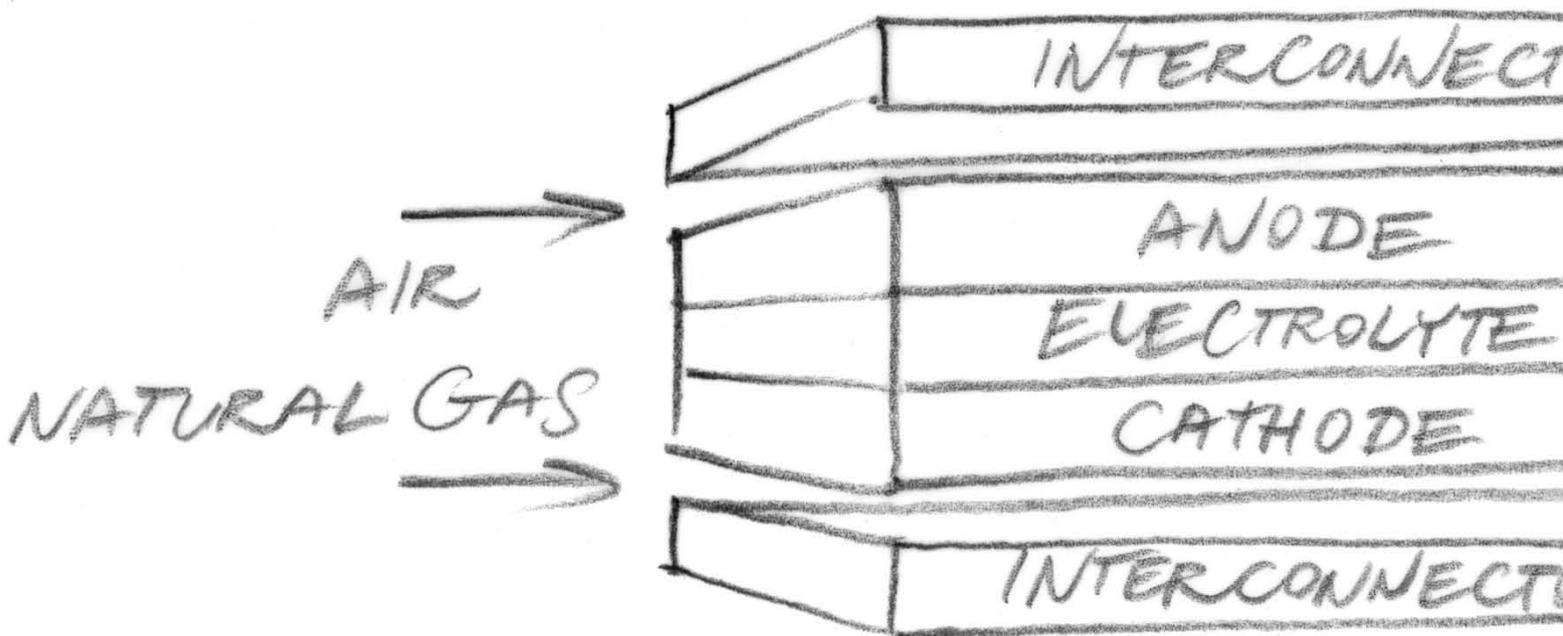
The long experience in the field of materials science, the very good contacts in the industry (even with the OEMs) and the deep know-how of the development and applications, Ceratizit has established itself as a specialist for machining demanding materials. Ceratizit engineers are developing solutions together with the customer. The Tooling Academy at Ceratizit is therefore a solid market-oriented basis for research and development. The Tooling Academy is designed to check the machinability of the latest materials and alloys in the customer's applications.

The success agrees with Ceratizit right, because the hard metal solutions by experts, for example, in the manufacture of titanium turbine blades makes it possible to double the processing speed. ■

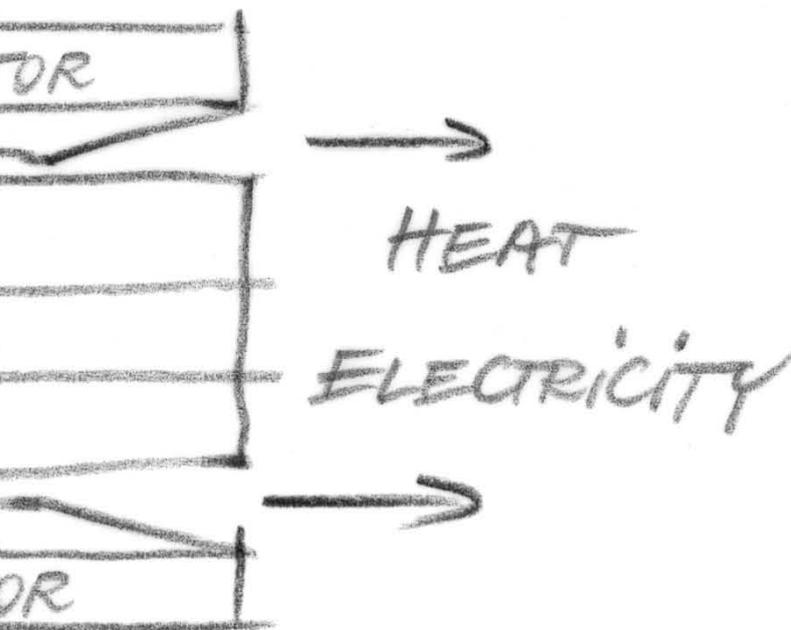
The energy supply of the future

# Technology standard for the SOFC fuel cell

“Breakthrough in the U.S.: Competitive power from the SOFC fuel cell. Soon also in Germany?” At the Hannover Fair in April 2010, Plansee invited to a panel discussion on the subject. *livingmetals* summarizes the discussion key points.



The stack, the core of the fuel cell, decides service life, but also costs.



**livingmetals:** Since 2007, you have placed nearly 50 units into field tests, which take over the energy supply of single family homes.

What experiences have you accumulated in the market?

**Dr. Alexander Schuler:** With an availability of over 95 percent, our fuel cell systems already operate very reliably on the basis of the high-temperature fuel cell. In close cooperation with the installation companies, we gain valuable experience on how we can optimize the periphery of our equipment further, in particular on the interface to the heating system in the house.

**livingmetals:** The AVL makes the high-temperature fuel cell mobile. Where is it used?

**Jürgen Rechberger:** We focus first on the power supply for trucks. Here a lot of electricity is needed for air conditioning, the TV, refrigerator or microwave, which the main engine produces extremely inefficiently. The 3 kw fuel cell systems for trucks, which are developed by AVL, are operated on diesel and cover the entire comfort zone of the driver. We also focus on metallic interconnectors for our mobile fuel cell.

**livingmetals:** The stack is a major component of the fuel cell and decides on service life and costs. Do we need a technology standard here?

**Dr. Mihails Kusnezoff:** The heating device manufacturers are off to a start in front of everyone. They rely on standardized and ready to use stack modules. So that the standard stack module succeeds in a breakthrough,

the value chain in our opinion should be structured as follows: Component suppliers are focused on the efficient mass production of electrolytes, cells, and interconnectors, of which the stack module is largely composed. The application and performance of the fuel cell system determines the number of stack modules, which are needed in a device. If the standard is established, everybody will use this.

**livingmetals:** Plansee isn't only working on the development of metallic interconnectors?

**Klaus Rissbacher:** Our core competence is the cost-effective production of metallic interconnectors. With ready to install fuel cell stacks, Plansee also offers a technology platform for the SOFC fuel cell that is independent of the application and can be developed according to the customer's requirements.

**livingmetals:** The NOW promotes fuel cell projects in Germany – to what end?

**Kai Klinder:** The NOW promotes the development of the mobile, portable and stationary fuel cell. We open up funding to bring together partners and forge technological consortia to assist in the fuel cell breakthrough. We thereby mainly focus on building confidence in the technology, both with the future users as well as at the component and system manufacturers. If we succeed, the fuel cell will be a standard in the near future.

I believe that the cooperation between IKTS and Plansee in order to establish an open ►

► stack system, is a good way to establish confidence in the market for a high-temperature fuel cell.

**livingmetals:** *When do you expect the commercial breakthrough for the SOFC and how big is the market potential?*

**Kai Klinder:** We are in the stage of development and market preparation and see great potential for home heating devices and for the decentralized power supply. I expect that enough house-

holds decide on 1 kW systems by 2015, so that we can speak of a commercial launch. Cogeneration plants within the performance class of 10 to 100 kW will then follow at an interval of two to three years.

**Dr. Mihails Kusnezoff:**

However, in order to get there, we must still do our homework: The systems must be significantly more cost-effective and more durable. 60,000 operating hours is the intermediate target. For the stack production, this means: Less degradation, reproducible quality, high efficiency and a compact design.

**Jürgen Rechberger:** Each year, 150,000 to 250,000 heavy trucks are sold in the United States. The market potential is therefore very great. The first prototypes are already in the laboratory and we expect the series to start in 2015/16. These cost savings are thereby very well represented by the mobile SOFC: Based on the significantly higher efficiency of the SOFC compared to the power supply from the engine, the investments already pay off after 1.5 years – and that in an average service life of a truck of approximately six to eight years.

**Dr. Alexander Schuler:**

Approximately two million heating devices are installed annually in central Europe. Although there is a high competition of technologies and providers, the market potential for SOFC devices is large enough. Moreover, the importance of climate-friendly equipment will

»» The fuel cell systems must be significantly more cost-effective and more durable. 60,000 operating hours is the intermediate target.«

further increase. The CO<sub>2</sub> savings from a fuel cell device is substantial – compared with electricity from the grid and the heat from the boiler, it is between 20 and 50 percent. ■

*Dr. Alexander Schuler is the CEO of the Swiss Hexis AG.*

*Dr. Mihails Kusnezoff manages the research field for micro and energy systems at the Fraunhofer Institute for Ceramic Technologies and Systems (IKTS) in Dresden, Germany.*

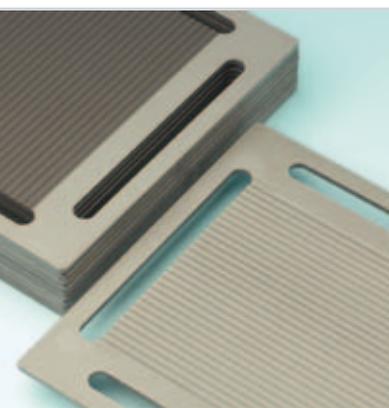
*Kai Klinder is Managing Director of the German NOW GmbH and is responsible for Stationary Applications.*

*Jürgen Rechberger is project manager for fuel cell systems at AVL List GmbH in Graz, Austria.*

*Klaus Rissbacher is responsible for the Profit Center Fuel Cell Technology at Plansee SE, Reutte, Austria.*

## Interconnectors by Plansee

Plansee has supplied interconnectors for several years for a power server that provides several Fortune 500 companies with decentralized generated electricity – an important contribution to a clean, reliable and affordable energy supply. In order to meet the worldwide demand for interconnectors, Plansee is continuously expanding its production capacity.



# Did you know that ...

... there are special carbide grades for cutting wood with nails?  
That would be impossible with steel saw blades.

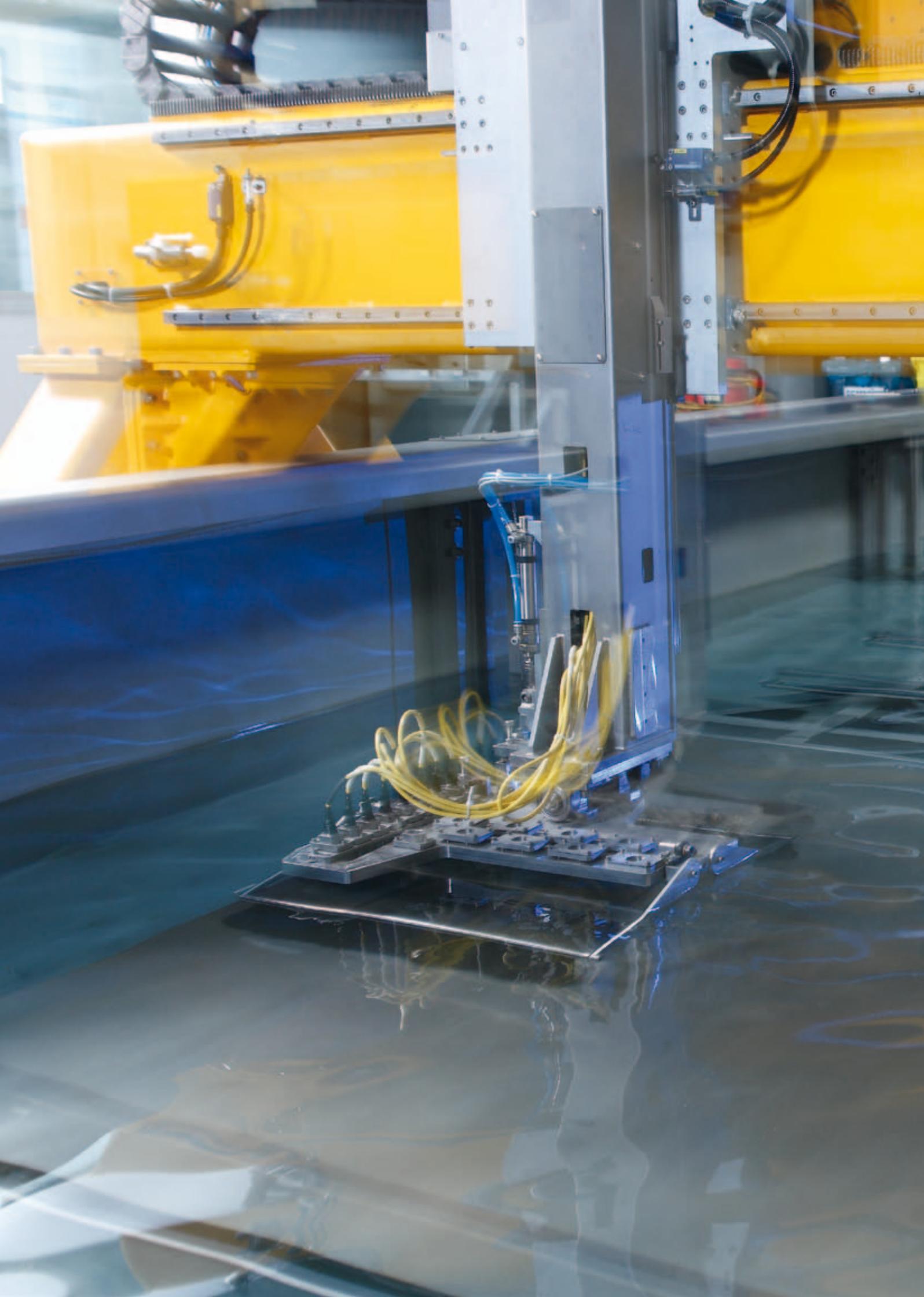
... our lightest product is an electronic component for medical technology of 0.0004 grams and the heaviest of our products is a plate for coating flat panel screens of approximately 1,000 kilograms?

... hundreds of thousands of diapers for babies and adults are punched out hourly by Ceratizit wear resistant mills? The production method provides cost-effective products at high comfort.

... Ceratizit manufactures carbide drills for the electronics industry of a diameter of only 0.15 millimeters? Printed circuit boards are drilled with these, which are practically used in all electrical appliances.

... many computer tomographs worldwide are equipped with X-ray targets by Plansee, a key component for the thermal management? The X-ray targets absorb temperatures of up to 2,500 °C at the moment of the X-ray imaging.

... Plansee also manufactures nozzles for civilian use of space rockets, with five units per year produced in highly sensitive single manufacture, such as light electrodes for xenon lamps for the automotive industry with 200 million units per year in a fully automated mass production?



PLANSEE

*A Step ahead in Technology.*

Coatings for displays

# World record with tungsten target

3-D television, touch panels, ultra-high resolution screens and large-scale outdoor advertising: The technical demands on the TFT-LCD display technology is increasing. Accordingly, Plansee has further developed its coating solutions. ▶



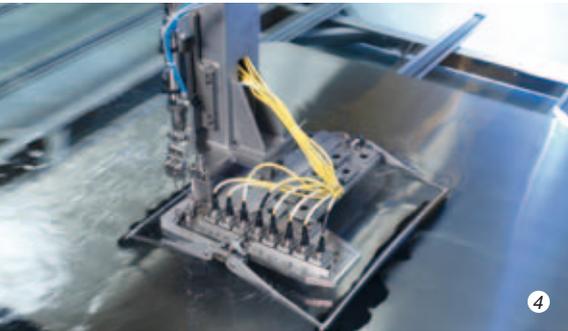
► Larger screen sizes, the use of displays for outdoors in daylight, and a greater image sharpness and optimized contrasts require one thing: The fact that the thin-film transistors are becoming more powerful because they control the individual pixels. A thin film transistor consists of a number of metallic layers and Plansee, in close cooperation with its customers, contributes in optimizing the layer structure for screens with appropriate coating materials. Layers are manufactured and analyzed in the in-house coating center. This continuously results in new recipes for the necessary coating materials, which are produced by Plansee in a powder-metallurgical production. Plansee therefore recently produced the largest single-piece tungsten sputtering target. The coating material is used in all applications where extremely sharp, high-resolution monitors are required,

such as game consoles, smart phones and camera monitors. The screens of these devices are characterized by high pixel densities and therefore a much better resolution. The transistors are smaller and the connecting lines are thinner. In addition, the screens are brighter and have more contrast than the conventional TFT-LCD screens.

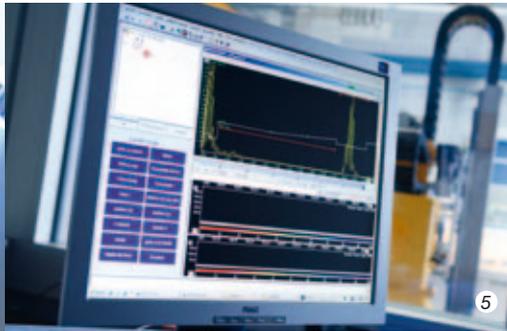
### **Material innovations for new challenges**

The production of the tungsten target was made possible by the new hot rolling mill at Plansee, which can process significantly larger sizes than previously. Large-scale sputtering targets support the productivity for the customer. The coating process is more stable, the quality of the coated materials is better. A significant product improvement has also been recently developed by Plansee for touch-screens (touch panels).

Since salty sweat on hands attacks the screen surface, corrosion develops. To prevent this, Plansee has developed an improved coating material. The resulting deposited layer is proving to be extremely resistant to corrosion. The rapid development in the display industry provides more and more new challenges for Plansee. This is clearly demonstrated by relatively new technologies such as 3D TV, or the introduction of organic LEDs as a direct light source of flat panel displays. If small fluorescent tubes were still used in the first-generation flat-screens as a backlighting, a growing number of manufacturers today share in the LED technology. However, a new technology is already emerging: The trend now is in the direction of organic LEDs (OLEDs). In the future, three OLED light sources produce a picture element that is composed of the three primary colors



4



5



9

Here, the coating materials for the display industry receive their final touch: The powder metallurgical manufacture of the sheet is followed by mechanical processing: 1) The surface of the sheet is machined 2) and grained smooth. 3) Then the machined target is cleaned. An extensive quality control follows 4, 5) by ultrasonic testing 7, 8) and a dimensional inspection.

red, green and blue, which requires completely new concepts for the power supply. In close cooperation with its customers, Plansee also develops new material solutions for these applications

to increase especially the electrical conductivity in the system and therefore the efficiency of the entire screen. ■

### How do individual pixels develop?

The individual pixels in the LCD flat panel display are controlled via thin-film transistors. These transistors control whether red, green or blue light will pass through each image pixel – the various colors thereby develop. A thin film transistor consists of numerous layers, which are applied and structured in a multi-coating process. Up to four molybdenum layers exist in the layer system of the TFT screen. The first molybdenum layer therefore has the important task of bonding agent on the glass substrate. Molybdenum is therefore particularly suitable due to two material properties: Significantly better adhesion to glass in contrast to

other metals. And due to the very similar thermal expansion coefficients of molybdenum and glass, which minimizes the expansion stress at occurring operating temperatures. Sputter targets of high purity molybdenum are needed for the TFT-LCD panel production, which contains virtually no contamination by other metals or gases. The molybdenum delivered by Plansee has a guaranteed purity of 3N7. Only this guarantees that every pixel of the screen is working properly.





Plansee develops and optimizes individual coating solutions.

Coating competence for solar applications

# For the energy of the future

Thin film solar cells already have a stake of just over ten percent of the total solar cells market with a strong increasing trend. Plansee provides several coating materials for this dynamic industry.

The key for the customer is a working layer structure in which a maximum of sunlight is converted into electrical energy. Plansee is actively involved in this performance increase with their coating solutions. But not only the energy yield counts. In order to be competitive over the long term with other energy sources, such as nuclear power, coal or gas, the solar industry is under great cost pressure.

## Tubular coating materials

In order to increase the productivity in the coating process, Plansee has developed monolithic, tubular coating materials. These up to four meter long tubes are made of nothing but coating material. The tubular coating materials therefore no longer have to be bonded on an additional backing tube. Customers thereby not only save the

effort to connect the tubes together and the resulting quality problems – the yield of the coating material also increases considerably. And based on the material purity, the discarded residual materials are recycled much easier.

## Monolithic rotary targets

Plansee supplies sputtering targets of high purity molybdenum for the layer of the electrical back contact of the thin-film solar cell, which is mainly used due to the following characteristics: Layer adhesion, electrical conductivity and reflection. In order to serve its customers in the future in sufficient quantities, Plansee invested in a complete production chain for such a monolithic manufactured rotary targets. The market potential for the coating materials by Plansee is great: The manufacturers of solar thermal power

plants therefore rely on the coating material molybdenum. They thereby coat the absorber tubes, i. e. where daytime temperatures above 900 °C develop. The solar thermal power plants, within the context of the Desertec project, are supported to generate huge amounts of electricity in the deserts of North Africa. The electricity will be exported to Europe via high-voltage transmission. However, the electricity generation can also be installed in our immediate living environment: Solar cells on stainless steel foils for the application on all facade geometries for buildings and for all kinds of outdoor applications and the integration into clothing offer a great potential for coating solutions. And under the slogan “The power outlet in the window”, translucent solar panels should also use glass surfaces in the foreseeable future. Suitable developments of coating materials are in full swing at Plansee. ■

Great strain on the materials used:  
Absorber tubes of solar thermal power plants.





*Plansee develops, tests and analyzes materials for the coating of tools.*

Coatings for tools

## New hard coatings

New methods in materials processing such as dry machining or high speed cutting increase the demands on the tool dramatically. In order to provide the required power, frequently new hard coatings must be developed.

Extremely thin, wear-resistant hard coatings are widely used to prolong the service life of cutting tools and to optimize processing. These coatings are specifically applied today by a vacuum-based coating processes or thin film technologies (physical vapor deposition PVD). A variety of requirements and trends mean that always new, metastable and nano-structured coatings are developed with new and unique property profiles. More and more tool vendors differentiate themselves on a customized tool coating with properties that are tailored exactly to the final application. The customer requirements of the tool manufacturers to a powerful and highly productive coating material is correspondingly high. Moreover, the relatively low processing temperatures during coating of less than 500 °C open a broad range of applications.

### Powerful machines

The development of hard coatings and machine tools runs parallel: The more

powerful the machine, the higher cutting performances are needed. The performance is guaranteed for example by a nano-structured layer architecture. In this state, especially high hardness and wear resistance are achieved for specific applications. These coatings are understood, developed and built at the atomic level.

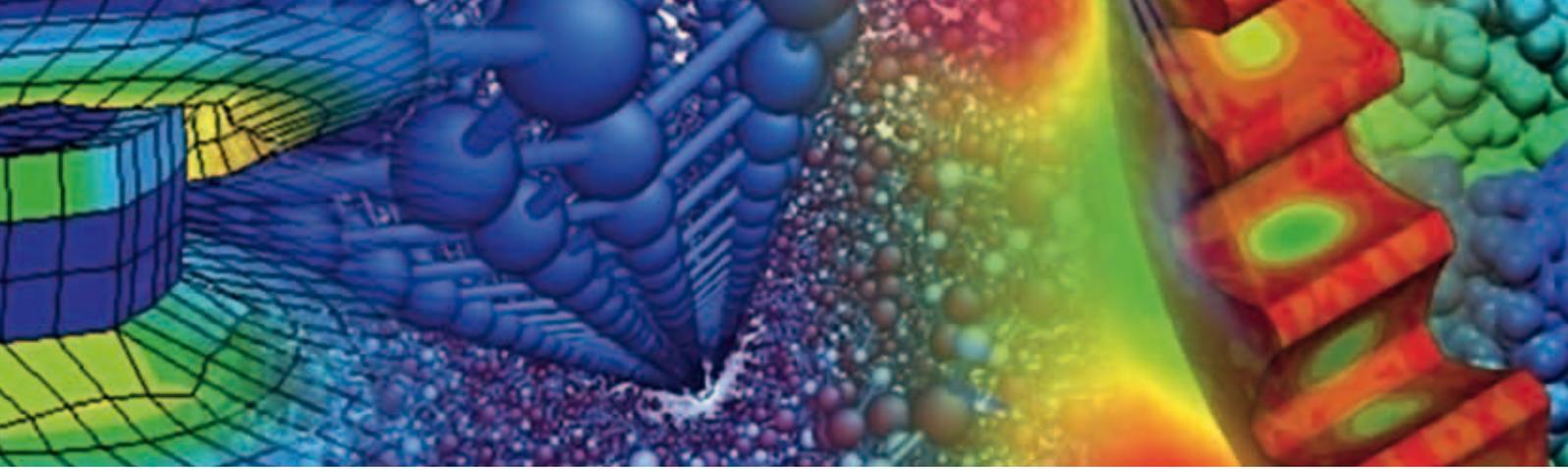
Due to increasing demands on the precision of the tool, the coating dimension and contour may not change. Wafer-thin PVD coatings of a few micrometers meet these requirements. Advantage: The uncoated tool can already be produced precise to the end form, costly rework is omitted.

### Hard coatings from a single source

Plansee develops coating materials for these demanding hard coatings and can therefore draw on a complete infrastructure – from development laboratories to the coating center with analysis equipment to the production.

While the coating systems of our customers must be proven in the series, Plansee can simulate the use of the sputter targets under the process conditions of their customers, test specific new coating materials, improve existing processes and assist their customers with various analytical methods.

Plansee has thereby created the conditions to dramatically accelerate the development and optimization of new coating products. In addition to the much higher flexibility in customizing the materials, the powder metallurgical production of coating materials enables a much higher performance of the coating material in the process of the tool manufacturer and a greater utilization rate. Plansee provides coating materials in all dimensions (flat, round, tubular), as well as in all sizes, also bonded at the customer's request and other special solutions for the fixation. ■



# From the atom to customized material

High demands on the material properties and complex production processes – the simulation contributes significantly to allow excellence in powder metallurgy. An interview with Prof. Dr. Hermann Riedel, who has been involved for more than 20 years with the simulation of powder metallurgical products and the necessary manufacturing processes.

**livingmetals:** How would you outline your work areas?

**Prof. Dr. Hermann Riedel:** We are service providers for the industry. We support our customers, including Plansee, with computer models to reach the objective quickly and systematically in three key areas: In the design of systems and processes. In the development of components. And in the development of new materials.

**livingmetals:** Quickly and systematically reach the objective. What precisely does that mean?

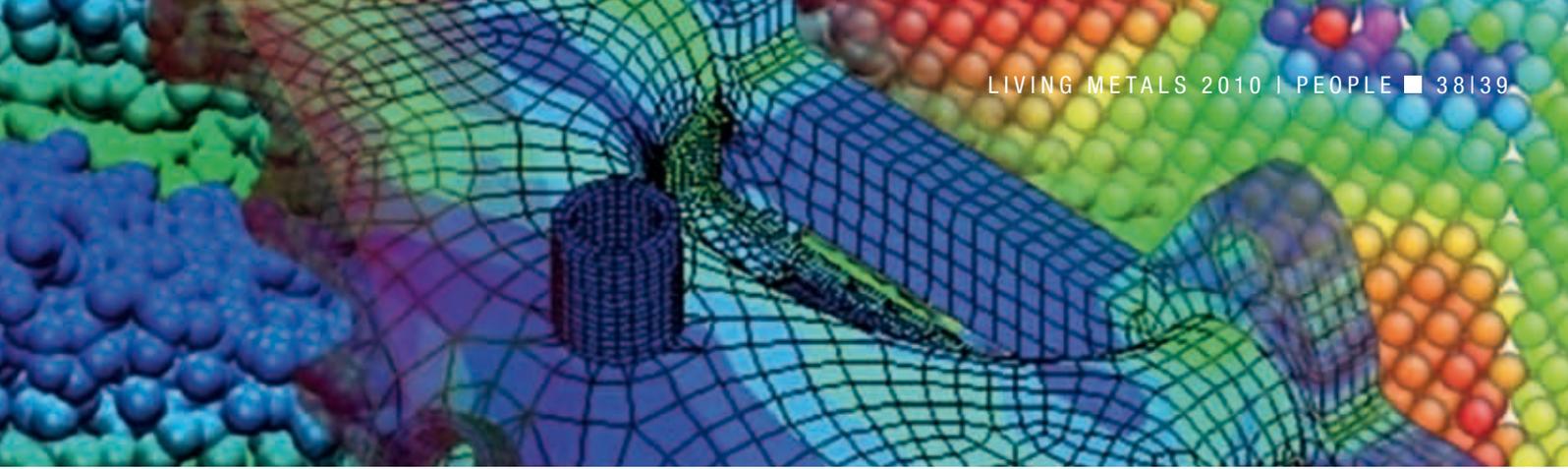
**Prof. Dr. Hermann Riedel:** Even without the computer models, your problems will somehow be solved. However, they generate no fundamentals, that is, systematic and transferable knowledge. This is precisely the goal of numerical simulation. We receive a physically reasonable idea of the response of materials down to the atomic level. In the area of thermo-mechanical fatigue, we investigate, for example,

according to which laws microcracks increase in a material during the expansion and contraction of the material during operating and rest periods. In order to show an actual example: Solar thermal power plants to be constructed in the Sahara under the Desertec project are exposed to extreme temperature fluctuations. The collector is heated to over 900 °C during the day. And at night, the temperature can quickly drop below zero degrees. We are pursuing the question: Which characteristics must the molybdenum of Plansee have that is used as an electrical back contact in the absorber tubes?

A huge and relatively new success story from our perspective is the simulation of tribological properties, the question of friction and wear, and how this, for example, can be reduced in the power train. The results can be used to minimize gear noise produced by powder metallurgical manufactured gears, which automotive supplier PMG produces.

**livingmetals:** The Plansee Group stands for excellence in powder metallurgy. How do you assist us in achieving this claim?

**Prof. Dr. Hermann Riedel:** Powder metallurgy was the nucleus of our activities 20 years ago. And even today it is an extremely interesting and challenging part of our work. This underlines not least the Plansee Seminar, at which regular contributions of this discipline are presented. We therefore make sure that powder metallurgical production processes are well understood and function effectively. And our most important tool is the numerical simulation. I always say: Our clients love us for the fact that we spare their nerves. But joking aside, if production is running smoothly, utilization, yield and quality increase. And material use, energy consumption and the total cost can be reduced significantly. This can lead to significant competitive advantages.



### About Prof. Dr. Hermann Riedel

Early on, Prof. Dr. Hermann Riedel recognized the importance of simulation as an engineering tool and implemented basic knowledge of materials research in industrially useful simulation tools. Not only his work on the simulation of powder metallurgical processes and high-temperature responses of metals enjoy worldwide recognition. With his overall approach and industrial simulation, he has inspired many new application areas and decisively marked the position of the Fraunhofer Institute for Mechanics of Materials as a key player in the field of materials-based processes and device simulation. Prof. Dr. Riedel has received many awards and honors for his pioneering work.

**livingmetals:** Why, in your opinion, does the significance of the simulation increase?

**Prof. Dr. Hermann Riedel:** The rising demand comes from industry. Because more efficient and powerful systems must be operated closer to their load limits. To understand these precisely is not really possible without simulation. The development of new products and processes allows for increasingly fewer trial-error loops. In order to meet the higher requirements of the practice, simulation approaches are needed that allow to continuously expand the calculable. A trial is just too expensive! And that due to several developments: The requirements for testing are constantly increasing – as is the need for long-term predictions. There is also a growing complexity of production systems and manufacturing processes. And finally, materials are processed in the field of powder metallurgy that are very expensive.

**livingmetals:** Where will the simulation be used in the future?

**Prof. Dr. Hermann Riedel:** It is increasingly about making long-term predictions for microstructures and their properties: First and foremost it is about developing materials with specific properties due to the atomic structure of materials. And then there is the question of how the atoms respond to their subsequent material life: In the production/processing – for example, when pressing, sintering and forming – as during the entire phase of their use in the final application. Here we are working on models for microelectronics as well as magnetic materials – two important applications of Plansee HPM and PMG.

**livingmetals:** What are the essential conditions for good cooperation?

**Prof. Dr. Hermann Riedel:** We can operate especially successfully if we know the strategic objectives of our customers and also know the end customer in

the best case. This is one of the reasons why I appreciate the cooperation with the Plansee Group very much: We are involved in the deliberations of the company and we work long term and with passion. And you know your partner, sometimes for decades. ■



High-performance machining of aluminum wheels.



Bimetallic coin with niobium core.

# Significant savings potential

High performance cutting is an extremely effective way to achieve significant savings in machining.

Several examples show how Ceratizit developed innovative tooling solutions for high performance cutting by observing the entire process chain. Lead times are reduced, efficiency increased and overall costs are reduced.

*Optimization of the clamping mechanism:* Quickly and easily replaceable cutting inserts, especially for ceramic and c-BN cutting inserts, provide low tooling times, such as in the C-clamp tool solution.

*More powerful tools:* The High Feed Cutting tool solution (HFC) provide low cutting forces and stability even at extremely high speeds.

*New coatings:* Through the development of coatings, particularly demanding materials such as titanium

or superalloys can also be machined easily and economically.

*Observation of the entire process chain:* Ceratizit developed the OvalFlex-HubStar tool solution for machining the aluminum wheel. OvalFlex-HubStar is a multifunction tool – all the steps for processing a hub can be accomplished with a single tool. This cuts the machining time in half. The consumption of refrigerants has been greatly reduced, the cooling and lubricating process becomes more effective. It is only cooled, where cooling is really needed. In an economical observation, a customer receives savings of up to 70 percent as compared to conventional manufacturing when using OvalFlex.

## Incredibly light and bright blue

It weighs exactly 6.5 grams, and is bright blue: The niobium core made by PLANSEE for the new bimetallic coin of the Münze Österreich. On the value side, a tree symbolizes the cycle of nature and the resulting energy. The other side is devoted to the most important forms of renewable energy such as hydro-power, wind power or solar energy and geothermal energy. The color of the coin is the result of anodic oxidation, a unique process in the world in the production of coins, developed by Plansee. A very thin and transparent layer of oxide is formed in a chemical process during the anodic oxidation. It is a few nanometers thick, so that interference colors caused by light refraction develop on the surface, which let the niobium appear colored. Various colors come about, depending on the thickness of the oxide film.



*Powder mix for drill bits.*



*Balancing weights for large crankshafts.*

## New powder formula

Polycrystalline cutter (PDC) are needed for the oil and gas production. The cutter usually consists of two parts: A shaft that is made of steel or a hard metal like tungsten, as well as lamellae and blades of extremely hard diamonds that are attached to the outside of the shaft.

The PDC cutters are designed so that the blades drill into the ground at the moment when the cutter starts to rotate. This extremely high forces thereby are acting on the cutter. In addition, all elements of the cutter are

exposed to high abrasive forces.

In some cases, shock, vibration, or erosive forces result in a failure or the loss of one or several blades or by a broken lamella.

To remedy this situation, GTP has developed a new powder mixture for the manufacture of the cutter body. Drill heads are produced from the powder that are characterized by high durability and strength. This results in cutting blades and lamellae having greater support, while other necessary characteristics such as wear and erosion resistance are maintained.

## Heavy metal dampens vibrations

Whether copper ore in the Andes or oil sands in Canada – dump trucks provide essential work in surface or on construction sites. Up to 15 meters long and 10 meters wide with 18-cylinder transport vehicles provide up to 3,500 horsepower, take up to 400 tons of cargo and drive at 60 km/h. All assemblies, from the transmission and chassis, to the axles and suspension must be designed to provide maximum reliability for these intense loads.

Counterweights supplied by Plansee for large crankshafts make a substantial contribution to the stability of the vehicle. The balancing weights dampen any unwanted vibrations from a heavy metal. This results in a great running smoothness and a much longer life span for the up to ten-ton motor and the entire vehicle. The balancing weights have a density of nearly 19 grams per cubic centimeter, and are supplied ready for installation according to the customer's drawing.



Tools for the nail production.



Fittings as radiation protection.

# Much radiation protection in a small space

## Plansee supports the secure major overhaul of a reactor

The Dutch reactor operator NRG produces Technetium 99, a radioactive isotope for diagnostics, pain relief and tumor treatment. The reactor had to be shut down and repaired due to corroded coolant lines. A prerequisite for this was the shuttering of the entire reactor, to protect the workers from radiation during the repair work. While the cover and cylinder of the reactor were covered with a thick stainless steel bell, protecting the soil was much more demanding. There are many pipes, hard to reach areas, and especially little

room for thick steel plates. The solution: Plansee produced about 480 shielding elements in the shape of blocks, rods and fittings from a heavy metal alloy, which were fitted at millimeter accuracy. The main advantages of the material solution: Much radiation protection at a minimum volume and high dimensional accuracy of the total of 4.5 tons “puzzle elements”. Finally, a special coating provides maximum corrosion protection for the components.

## Hit the nail on the head

A nail is far from being a nail. Shape and length of the nails must be very consistent when fully automatic pneumatic nailing in the pallet industry, or in assembly lines, otherwise machine downtimes results quickly. Anyone that wants to play in this league must provide the required quality in daily manufactured millions of nails. ITW Air Hammer in the Czech Republic also knows this. The nail manufacturer relies on carbide grades by Ceratizit for the equipment of their tools for holding and cutting wires. The tool not only guarantees the highest quality, it also allows much longer and shorter set-up times than the use of tools made of alloyed tool steels.



*Implantable defibrillator.*



*Online shop for standard products.*

## Tiny life savers

An implantable cardioverter or defibrillator is a device like a pacemaker that is used in the human body. It is designed to prevent a sudden cardiac death due to ventricular fibrillation by targeted power surges.

A power module in which the shocks are generated in case of trouble, Plansee products support the function significantly by their material properties of the power module, and thereby, they guarantee its service life.

## Ordering by mouse click

Whether in the Toolingcenter, in the E-Techstore or the PLANSEE Express: The companies of the Plansee Group have successfully offered their standard products for many years in online stores. Refractory metals such as wires, rods, plates, sheets and strips can now be ordered even more easily from the newly designed online shop.

The world's largest assortment of wires, rods, plates, sheets and strips of molybdenum, tungsten and tantalum and their alloys are available at [www.plansee-express.com](http://www.plansee-express.com). Also in the online shop: TIG welding electrodes in a proven quality. PLANSEE Express products are delivered directly from stock and arrive quickly at the customer's location. You can always get prices

and delivery dates of all standard products online. The online shop also provides for small order quantities at an attractive price. Anyone that wants extra dimensions, can click back to the PLANSEE Express configuration tool and immediately purchase the many standard products. The store was initially released for the German-speaking countries (Germany, Austria, Switzerland).



23 young talents at the "Plansee Group Experience" presented their work.

# Living the employer's brand

"The Plansee Group is large enough for the top tier of the powder metallurgy and small enough that the success of any dedicated employee is immediately visible." The key message runs like a thread through all the communication activities of the Plansee Group – in the worldwide employee newsletter and in the group-wide Intranet as well as at recruiting fairs, the career page on the Internet or in job advertisements.

Four divisions belong to the Plansee Group that appear in the market as their own brands: Plansee High Performance Materials, GTP Tungsten & Special Powders, PMG PM-Products and Ceratizit Hardmetals & Tools.

"Internally, the divisions are working closely together and realize synergies, where appropriate: In the joint purchase of raw materials, recycling, in the development of technologies or in the use of shared service functions," according to Dr. Michael Schwarzkopf, chairman of the Plansee Group, who has anchored the topic of employer attractiveness in the strategic objectives of the Group. The establishment of an employers' brand with which all employees can identify was just as important. On the inside, it should

strengthen the solidarity within the Group, on the outside on one hand, it should create a unified image as an attractive employer, but also include the brands of their respective divisions.

## Jobs and Careers Online

All roads run together on the new career page: The divisions of the Plansee Group jointly use the new online platform [www.jobs.plansee-group.com](http://www.jobs.plansee-group.com), whereby the concept and structure are equal for all divisions. Individual information on divisions, on career opportunities and the branding are adapted to the respective division. The new career site thrives on original quotations of dedicated and motivated employees – from trainees and trainee to Chief Executive and the Board – bringing the

key message to potential employees next to the restrained and emotional design as a credible expression: The Plansee Group is large enough for the top tier of powder metallurgy and small enough that every employee can be effective.

"The word 'Forge' stands for the philosophy of the Plansee Group and the type of employees, which is valued here: People who want to make a difference and put their skills to the test," said Dr. Schwarzkopf.

The design of the word "Forge" symbolizes the great value depth of the Plansee Group – from ore to powder on through to the final product produced by powder metallurgy.

It is important for Plansee that the employer brand is also lived in the company, that is, above all, the employees



*“Forge” stands for the philosophy, and symbolizes the great value depth of the Plansee Group.*

are convinced of the employer brand and become the ambassadors of the company: Therefore, the brand was first made known internally through a worldwide Job Intranet, brochures, T-shirts and posters. Although the main word of the brand identity is “forge”, but the divisions and departments are increasingly using other words that are also designed in the powder metallurgy logo. The subsidiary PMG, an automotive supplier, therefore uses the word “Drive”, the IT department uses “Do It”, the apprenticeship, the verb “learn” and the personnel development department bets on “qualify”.

#### **In the spirit of the Plansee Group**

And for the Introduction Seminar, held under the term “The Plansee

Group Experience”, 23 young talents from around the world have presented themselves personally to top management with their personal image. The results were impressive: Whether the Plansee Group is now presented as a transformable chameleon, as a magnificent tree with deep roots or a spaceship in search for new markets – the pictures showed that the participants at the Introduction Seminar had internalized the spirit of the Plansee Group.

The diverse program contributed to this: The exchange of information took center stage for guided tours and discussions with top management. Presentation training and intensive coaching made the participants fit for their final presentations. A walk, a musical jam

session as well as the sweaty climb to a rustic mountain retreat ensured physical and mental balance. ■

► [www.jobs.plansee-group.com](http://www.jobs.plansee-group.com)

# Focus on increasing innovation and flexibility



*Dr. Michael Schwarzkopf,  
chairman of the Plansee  
Group.*

The 2009/10 fiscal year saw the Plansee Group implement a range of initiatives in response to the drop in demand triggered by the global economic crisis. These included structural changes and a range of measures to improve liquidity and competitiveness. The Group's sales fell by 22 percent compared with 2008/09, to 852 million euros, while its equity ratio increased to 47 percent.

The effects of the global economic crisis had already started to impact the Plansee Group's sales back in autumn 2008, and this continued into 2009. "While the first half of the 2009/10 fiscal year saw a low business level in almost all of our markets, sales began to pick up slightly in the second half," commented Dr. Michael Schwarzkopf, chairman of the Plansee Group's executive board. At times, orders dropped by over 50 percent in certain business areas, leading to a 22-percent decrease in the Group's consolidated sales – from 1.1 billion euros in the 2008/09 fiscal year to 852 million euros. "In the last fiscal year, we implemented a range of initiatives to ensure that the Plansee Group can remain viable in the long term and increase its competitiveness," said Dr. Schwarzkopf. The structural changes introduced aimed to improve the Group's competitiveness and make processes more customer-oriented, by cutting lead times and reducing time to market for new products.

## **Employer of choice**

"By using predominantly 'soft' measures to manage headcount and make full use of the flexible working practices available, we ensured that we retained our reputation as an employer of choice throughout the crisis period," commented Dr. Schwarzkopf. The total number of people employed by the Group dropped to around 6,000 (from 6,350 the previous year). As part of its systematic efforts to improve its liquidity position, the Plansee Group also reduced its investment budget for the last fiscal year. "Between 2006 and 2008, we invested over 400 million euros in new technology – so last year, we only needed to make investments which were essential or would deliver an immediate return," explained Dr. Schwarzkopf. The total amount invested in the 2009/2010 fiscal year was 39 million euros. The amount of money invested in innovations remained unchanged at around 27 million euros (3.2 percent

of sales). "During the economic crisis, sales of new products (under five years old) were much more stable – a clear indication that our strategy to increase the amount of sales from new products is the right one", Dr. Schwarzkopf says. Currently, new products account for 30 percent of sales, and the aim is to increase this further. According to Dr. Schwarzkopf, key growth markets are the energy technology, consumer electronics, lighting and mining industries.

## **PMG is 100-percent owned**

Since December 1, 2009 the PMG division has been wholly owned by the Plansee Group, marking the end of the Group's joint venture with Mitsubishi Materials. Both companies decided that going their separate ways would enable them to react more quickly to the challenges brought about by the worldwide economic crisis. However they continue to use common technologies and patents.

Dr. Schwarzkopf said: “Since the end of the joint venture, we have successfully restructured PMG. Now we are looking at whether PMG could become even more successful if it was more global in scale.”

#### Outlook for the current fiscal year

All in all, Dr. Schwarzkopf believes that the Plansee Group is well prepared for the future: “80 percent of our sales come

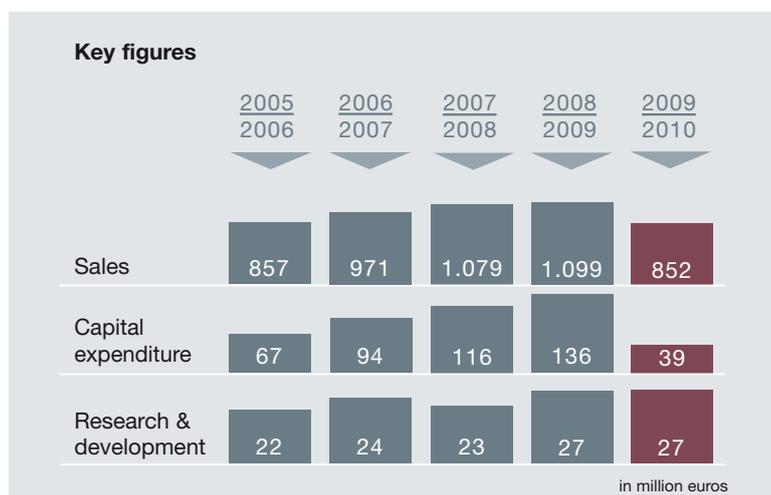
from activities where we are one of the three leading suppliers in the world.” All four divisions of the Plansee Group achieved an increase in sales in the first quarter of the 2010/11 fiscal year. This was driven by an increased demand from customers, sales of products aimed at new growth markets, and increased market share.

For the 2010/11 fiscal year as a whole, Dr. Schwarzkopf anticipates considerably

better figures than in the last year. However, he believes that the Group should remain cautious: “There is still a lot of political and economic instability – and so we need to proceed with caution and continue to increase the flexibility of our company structures. This will ensure that we can react even more quickly to future fluctuations in demand.”

Key investments in the current fiscal year include the installation of the first production line for high-temperature fuel cell components in Towanda, Pennsylvania, and the opening of a new facility for automotive components in Shanghai, China.

Dr. Schwarzkopf also announced that the Group is set to increase its activities in China and India to profit from the dynamic growth in Asia, either through organic growth or acquisitions. Activities are also planned to further secure raw materials supply. ■





Of metals that move the world

# The right tone

For almost the past 90 years, the Plansee Group has been busy with art, with the aid of powder metallurgical production technology to constantly produce new products for the high tech world of today and tomorrow. And for over 60 years, employees at the site of the Plansee Group in Reutte in Austria maintain the brass arts with great passion. One focus: The brass instruments that give the Plansee wind orchestra its distinctive character. Recently, the newest album by the Plansee wind orchestra, a "musical journey around the world," was released on CD. The CD contains many familiar melodies from around the world and some pieces composed by the staff. Samples of the CD are available at

► [www.plansee-group.com](http://www.plansee-group.com)



The Plansee Group at a glance

# Everywhere near our customers

Carlsbad (California, USA)  
San Diego (California, USA)

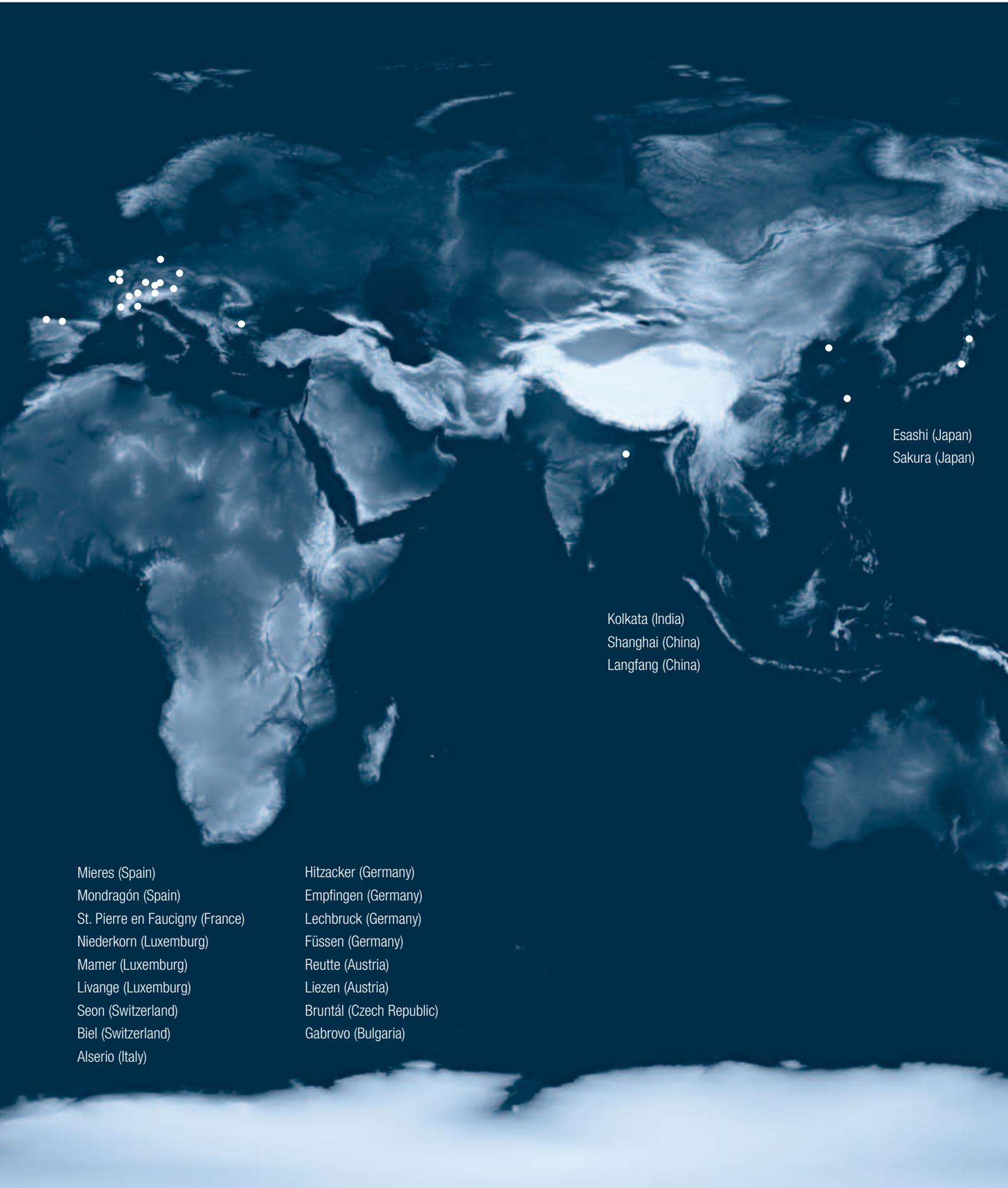
Franklin (Massachusetts, USA)  
Columbus (Indiana, USA)  
Warren (Michigan, USA)  
Philipsburg (Pennsylvania, USA)  
Latrobe (Pennsylvania, USA)  
Towanda (Pennsylvania, USA)

The Plansee Group is present worldwide with competence centers, focused on the needs of markets and located near the customers.

► Worldwide, 30 production sites  
on three continents

► Sales offices and representative offices  
in 49 countries

► 6,000 employees



Esashi (Japan)  
Sakura (Japan)

Kolkata (India)  
Shanghai (China)  
Langfang (China)

Mieres (Spain)  
Mondragón (Spain)  
St. Pierre en Faucigny (France)  
Niederkorn (Luxemburg)  
Mamer (Luxemburg)  
Livange (Luxemburg)  
Seon (Switzerland)  
Biel (Switzerland)  
Alserio (Italy)

Hitzacker (Germany)  
Empfingen (Germany)  
Lechbruck (Germany)  
Füssen (Germany)  
Reutte (Austria)  
Liezén (Austria)  
Bruntál (Czech Republic)  
Gabrovo (Bulgaria)

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