2/2006

livingmetals

EXCELLENCE IN POWDER METALLURGY

plansee GROUP

Ceratizit Tooling Academy opens

High performance heat exchangers for nuclear fusion

Happy birthday PMG

Focusing on profitable niche markets

Dear reader,

As the year draws to a close, the Plansee Group looks back on challenging 12 months. On 1 December 2006, PMG Group, our joint venture with Mitsubishi Materials Corporation, celebrated its first anniversary as a globally integrated supplier of PM-Products for the automotive industry (p. 5).

It is over four years ago since we consolidated our expertise in hard materials and tools into the Ceratizit division. Now Ceratizit is focusing on growing its sales in defined market segments (p. 12).

An important and successful part of the Group's strategy is to focus on profitable niche markets. During an interview with an Austrian private bank, Michael Schwarzkopf discussed globalization of the Plansee Group, and explained how we manage that by applying our segment strategy (p. 6).

Focusing the business in this way adds value for our customers. The recent expansion of the ion implanter component facility operated by Vacs Precision, our Japanese subsidiary, is just one example of the strategy's success (p. 17).

This success is closely linked to our aim to develop attractive growth industries. The global energy requirements and rising prices of traditional energy sources need solutions for tomorrow and beyond, and we are contributing to the ITER fusion reactor by developing high-performance heat exchangers – a huge challenge and a great opportunity (p. 8).

By developing the DensiForm® technology, the PMG Group has taken a significant step in strengthening its competitive edge in producing highly robust PM powertrain components (p. 15).

Actually, we are working hard to achieve our goal to be an attractive employer. We have drawn up a code of conduct, which will be introduced to all employees worldwide from January 2007. And in order to reach our goal of filling most managerial positions internally, we have set up a global Management Development Programme (p. 19).

As a supplier of powder metallurgical products and components, we are part of the process chain of many global conglomerates. For this reason, we need to adapt our processes to fit in with our customers' requirements – which we are currently doing by expanding the site in Reutte, Austria (p. 14).

Wishing you an enjoyable read,

Dénes Széchényi
Editor of Living Metals

CONTENT

Title:
One-way clutch of PMG
see article page 15

IMPRINT

Produced and distributed:

Plansee Holding Aktiengesellschaft
6600 Reutte, Austria
www.plansee-group.com

Editor: Dénes Széchényi
Photos: Plansee Group

Design and production:
Markenwerke AG, Stuttgart
www.markenwerke.com

New booth design at Semicon trade show

Plansee High Performance Materials' new booth design made its debut at the Semicon trade show in Taiwan, and was very positively received. Visitors to the booth showed a keen interest in the new company logo and the event further strengthened the company's relationships with its key customers.

new design

Best powder metallurgical development

A mass-produced drill bit developed jointly by Ceratizit and Hilti recently received an award from the European Powder Metallurgy Association (EPMA) as the best powder metallurgical development of 2006. The award was presented at the Euro PM trade show in Ghent, Belgium. The drill bit, which is designed for use on reinforced concrete, is extremely hard-wearing, and is notable for the strength of the weld that connects the tip to the steel shaft.

Proud winners of the EPMA award: (left to right) Olaf Koch (Hilti), Thomas Kompein (Hilti), Michael Magin (Ceratizit), Wolfgang Böhlke (Ceratizit) and Steven Moseley (Hilti).

The opening of the new Tooling Academy in Reutte, Austria. Uwe Schleinkofer (right) heads up the central test and training centre.

Ceratizit Tooling Academy opens

The start of October saw the opening of Ceratizit's Tooling Academy, a training and test center for cutting-tool applications such as milling, drilling, turning, parting and grooving, in Reutte, Austria.

The Tooling Academy has been set up to:

- Carry out thorough evaluations of new cutting tool products
- Map out all the stages in the machining process, from adjusting the tool settings, through the machining of the part, right up to the final quality control
- Teach employees and customers about new and existing products
- Work in partnership with sales staff and customers to optimize processes and test new and unusual materials.

The Tooling Academy is located in a 6,500-square-foot hall, which contains six machining tools as well as a range of analysis machines, operated by four highly trained machining engineers.

anniversary

Happy birthday PMG!

It is now one year since the PM operations of Plansee and Mitsubishi Materials were merged to create the PMG Group. This is now one of the leading supplier of PM products to the automotive industry, and is seen by customers as a trustworthy global supplier with a sound and clearly defined strategy.

The Group's philosophy is summed up in the line "Driving PMG" – meaning that each and every employee is committed to achieving the goal of becoming the global leader in PM components for the automotive industry, and establishing the company as its customers' strategic partner of choice.

'V' for victory: a sign at the main gate of PMG's Japanese headquarters.

Growing step by step, year after year

The Plansee Group opened its first international subsidiaries just a few years after the company started trading, with the aim of developing alongside its biggest customers and serving them locally. It's a strategy that has proven highly successful, and with a total of 62 companies in 22 countries around the world, the Group today is among Austria's best-represented companies internationally.

The chairman of the Plansee Group's executive board, Michael Schwarzkopf, explained in an interview with an Austrian private bank how the organization approaches different markets – either directly or working alongside partners – to deliver the best possible results.

interview

How has the Plansee Group developed globally up until now, and what are the next steps?
We've had a presence in established markets for decades, including the USA (75 years), Japan (25 years), the UK, France and Italy. The challenge now is to move into developing areas such as Taiwan, Korea, India and China.

A few years ago, we set ourselves the objective of becoming one of the world's leading suppliers in the powder metallurgy industry. To achieve this, we've undergone two mergers, forming the Ceratizit division in 2002, and the PMG division late in 2005.

If a medium-sized business achieves global success, it needs to provide specialized products and services for niche markets. How did you achieve this?
In fact we are really successful when customers approach us with a specific problem.

As a product and component supplier, the automotive, electronics and mechanical engineering sectors make up over two thirds of our business, although we also supply other smaller, innovative industries such as power engineering and lighting technology.

We structure our business into segments, with each segment responsible for a particular market, e.g. products for the lighting industry. As far as possible, we try to reflect this set-up in production too, by building factories that focus on one particular product area. There are real success stories, e.g. our two PMG plants in Spain or our power engineering activities; here we run an extremely successful plant in Switzerland.

Successful focus factory in Spain: PMG Asturias

Does this structure apply to product development as well?
Yes, both in terms of creating new products and further developing existing ones. Projects involving more than one business segment are coordinated centrally.

Are you looking to step up what you offer in terms of finished components, in order to avoid competition with manufacturers of cheaper semi-finished products?

When we manufacture any product, we always ensure we add as much value as the customer appreciates. This strengthens the bond with our customers, as well as differentiating us from cheaper suppliers who only offer semi-finished products. Having said that, we only develop the product as far as our core competencies allow us, and prefer to leave any remaining work to our partners.

Has the Group started supplying products to a wider range of industries over the last few years?
It was always my aim to grow in innovative and promising markets and I was always convinced that the automotive sector offers huge growth potential, irrespective of short-term turbulences. The same is true for the electronics industry: Just look at the sales growth for sputter targets we make for the production of TFT-LCD TVs. But I wouldn't say we'd started serving any really new markets over the last few years.

High-performance heat exchangers for nuclear fusion

The world's biggest fusion reactor, ITER (the International Thermonuclear Experimental Reactor), is currently under construction in France. Plansee has been involved in fusion research since as long ago as 1985, and is developing and producing the high-performance heat exchangers for the pilot scheme, which it is hoped will pave the way for fully functioning nuclear fusion power plants in the future. In connection with Plansee's work in this field, eight of its employees recently traveled to Warsaw, Poland to staff the company's booth at this year's Symposium on Fusion Technology, which was attended by 650 people from 24 different countries.

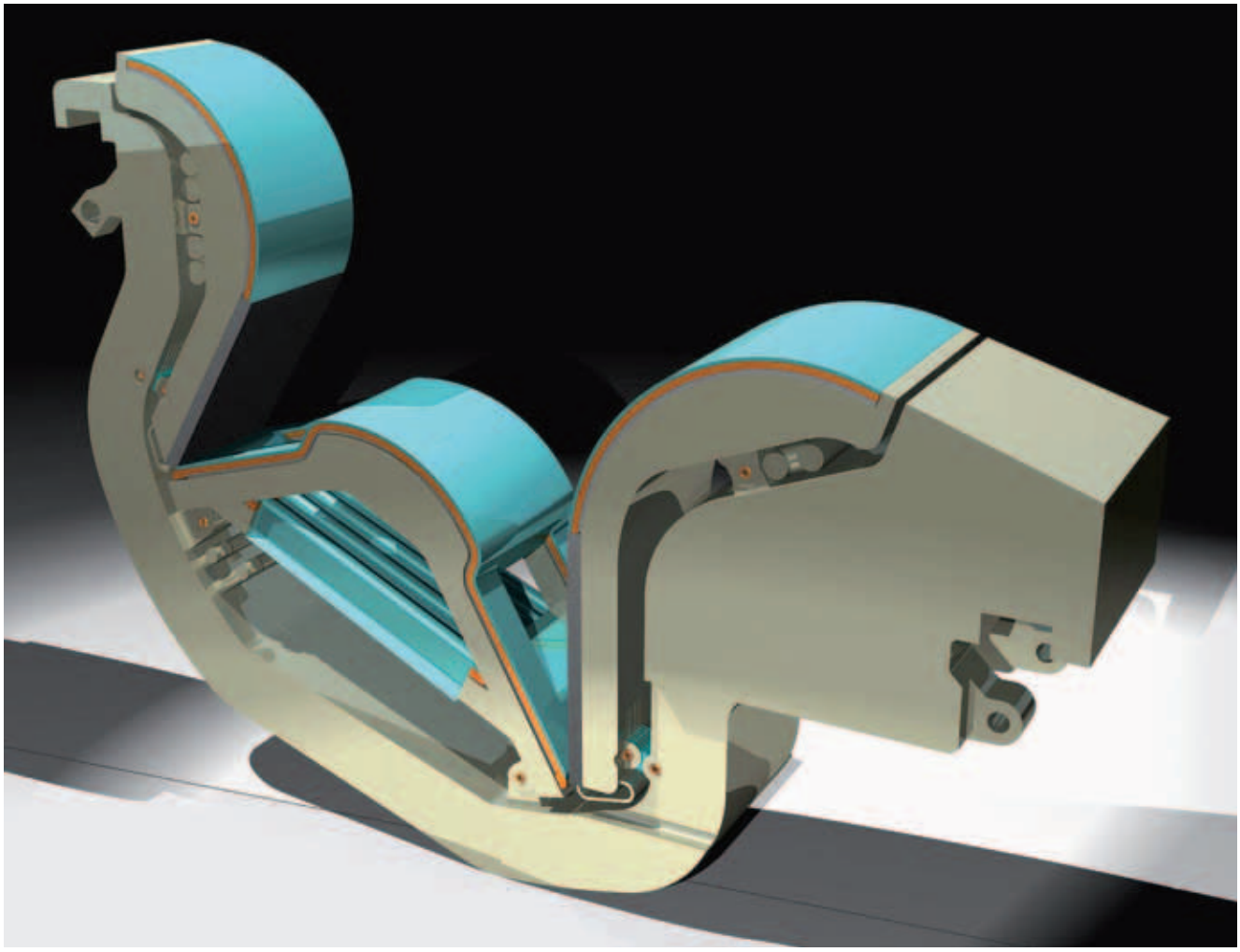
The Symposium on Fusion Technology is held every two years and features discussions, presentations and progress reports on the design and implementation of current nuclear fusion projects. Visitors to the Plansee booth included the French Minister of Research, Francoise d'Aubert, senior ITER's managers, members of the European Commission, and leading scientists in the field of fusion research. The caliber of the guests reflects the increasing status the project has enjoyed since its official launch in May 2006.

Components to absorb the heat The hydrogen gas in the reactor vessel must reach a temperature of 100 million degrees centigrade – ten times hotter than the sun – before nuclear fusion takes place. A powerful magnetic field then holds the plasma in place, to prevent it coming into contact with the vessel that is protected by components from Plansee.

Afterwards, the massive amounts of energy released must somehow be safely dissipated, and further research is required in this area. However, for several years now, Plansee has been developing and producing components to absorb the heat produced during fusion. The most important of these is called a divertor – a total of 60 divertor casettes, weighing twelve tons each, would be needed in ITER, and these would have to be replaced every three to five years. To tackle this huge task a factory will be planned at Plansee.

WHY FUSION COULD BE SO IMPORTANT

- 2 liters of water and 3 kg of stone contain the raw material to gain the energy from fusion required by a European family.
- World energy consumption is likely to double within the next 50 years even if OECD countries maintain their energy consumption at current levels.
- With conventional energy production technologies, this will mean huge increases in emissions of carbon dioxide and other pollutants.
- This means that the potential market for low-pollution, low-carbon energy sources like fusion is enormous.
- A conventional coal power station burns in one day 9000 tons of coal releasing more than 30000 tons of green house gas. An equivalent fusion power plant requires 400 g of hydrogen and 1.2 kg of Lithium without any emission.
- Fusion has massive benefits in terms of resources, environmental impact, safety and waste materials.
- The challenge is to demonstrate fusion's viability as a power source, leveraging its benefits while keeping costs manageable.
- Currently, the world is not doing enough to develop the new energy sources required. The money spent on energy R&D is equivalent to less than 0.3% of the total value of the energy market.



Plastics prototype of an ITER cassette.

The plasma-facing surfaces of the divertor are made out of tungsten and fiber-reinforced graphite (C/C), as this is the only combination of materials that can resist the extreme temperatures involved. However, even these materials can only withstand such intense heat for a matter of seconds, and so the divertor must be continually cooled. To do this, tungsten and fiber-reinforced graphite (C/C) are bonded to a heat sink made of copper alloy, which then cools the diverter using water. This presents a considerable technical challenge, due to the differences in materials – cone-shaped holes must be bored into the fiber-reinforced graphite by laser before being filled with copper.

These high-performance heat exchangers are surrounded by a vacuum in the reactor, and have water pumped through them at a pressure of up to 60 bar. Should just one of the welds become leaking, the entire reactor would be inoperational for several months, which is why the testing of the components is governed by extremely strict regulations. Plansee's proprietary testing devices ensure these standards are met at all times. |

PROVEN PROCESSES AND SYSTEMS

Plansee uses a range of proven processes and systems to produce the high-performance heat exchangers. These include:

- Computerized simulations assessing how the component reacts in different conditions.
- Continuous research into different combinations of tungsten, graphite, copper and steel.
- Bonding technologies such as high-temperature brazing, electron beam welding and diffusion welding.
- Coating processes, such as the plasma spraying of tungsten or ceramic materials and chemical vapor deposition. These create special functional coats on graphite or metallic substrates.
- Non-destructive component tests involving ultrasound, X-ray, thermography and helium leak tests.

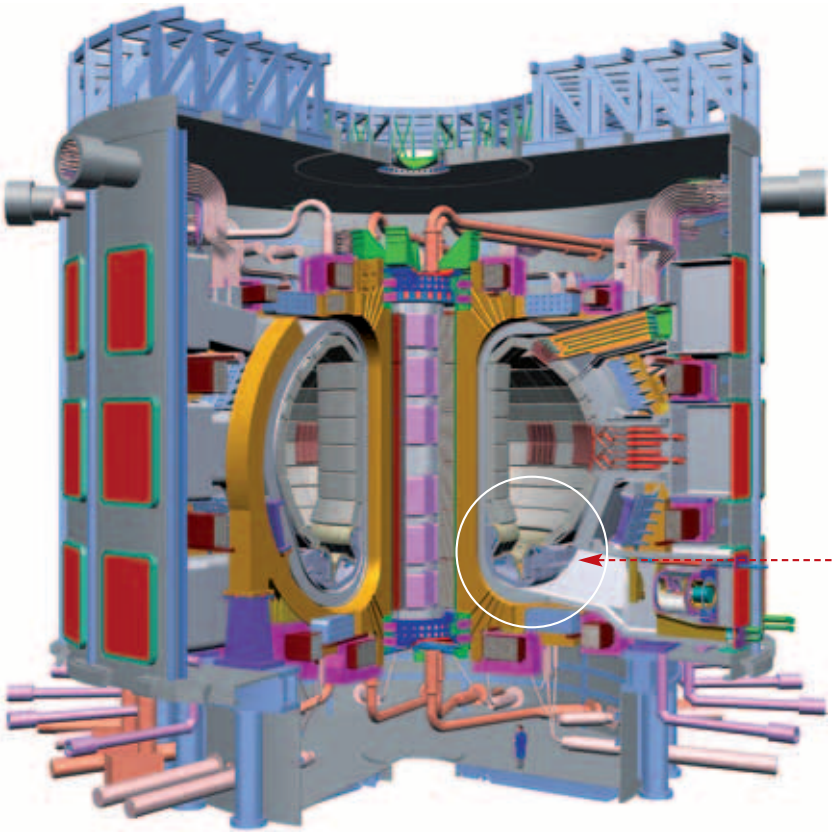
energy

The first fully functioning fusion reactor – the sun

Our nearest working fusion reactor is currently around 90 million miles away – the sun. Each second, it fuses four million tons of mass, giving our planet the heat and light it needs to support life. This process will be replicated on Earth, fusing the nuclei of hydrogen atoms to form helium, and releasing energy for the production of electricity. If the project is a success, the world's energy supply problems could potentially be resolved at a stroke, since there is basically a limitless supply of hydrogen and lithium. The USA, Japan, China, South Korea, India, Russia and the countries of the EU – the world's richest industrial nations – are working together on the project and sharing the construction costs, which currently stand at over 4 billion euros.

However, replicating the fusion reactions that occur in the sun here on Earth is no easy feat. While the sun's intense gravitational field means a temperature of 10 million degrees Celsius is sufficient to achieve fusion there, hydrogen atoms on Earth must be heated to ten times that level to achieve the same effect. At this temperature, the nucleus separates itself from the electrons surrounding it and is transformed into plasma. Plasma conducts electricity, and can be held in place by the right combination of magnetic fields. It thus hangs in the doughnut-shaped vessel without touching the walls of the reactor, which would otherwise cool it immediately, ending the reaction.

Prototype of a high-performance heat exchanger.



Plansee's fusion research in the ITER project: Focus on engineering and manufacturing plasma facing components.

Market leadership based on strong customer relationships

The Ceratizit Group, which specializes in the manufacture of hard materials and tools, currently operates in 17 countries, with production facilities at 13 sites in 10 countries. In recent years, the carbide industry has seen extensive consolidation and competition has become increasingly fierce. Living Metals caught up with Ceratitzit board members Jacques Lanners and Thierry Wolter to discuss the Group's plans for the future.

Jacques Lanners

Ceratizit recently celebrated its 75th anniversary. What factors have been the key to its success over the years?
Jacques Lanners: entrepreneurial flair, sound risk management, speed in decision making, trust in our people and a clear vision of where we want to go.

So what is your vision for the future of the Ceratizit Group?
Thierry Wolter: In tools for wood and stone working, we will focus on maintaining our market-leading position by further strengthening the close relationships we enjoy with customers, and building on our outstanding service and technical leadership.

In industrial wear parts, we will continue to impress our customers with our innovative hard-metal solutions.

And in the cutting tools market, we will expand our share by focusing on specific end user niches. In parallel, the successful WNT total tooling service concept will put us in a position to grow in the European cutting tool markets.

What impact has globalization on your company?
TW: Globalization is opening up new opportunities for us, especially in the BRIC markets (Brazil, Russia, India, China) where some of our customers have recently opened new manufacturing plants. Ceratizit will realize this market potential – either by opening new sales offices, or by building local production capacity if this is important to customers.

"We want it all, we want it now, and we want it cheap" seems to be the attitude of many customers these days....
TW: E-commerce increases price transparency and it also enables us to work faster and more efficiently. Our sales offices are all now linked electronically to the production sites, and our logistics center in Kempten, Germany enables us to deliver products anywhere in Europe within 24 hours. We are currently working on a similar project for the US market.

Thierry Wolter

Ceratizit has a reputation for innovation. How do you speed up the innovation process and develop new applications for carbides?

interview

State-of-the-art production equipment in Mamer, Luxembourg.

JL: Thanks to the efforts of our R&D team, we have brought more products to market in the past two years than ever before. We will continue to invest heavily in R&D – in both product and process innovations. Today, products that are less than five years old account for more than a third of our sales, and we aim to increase this proportion in future.

Will the strategy you have described be adequate to meet the challenges of the future?
JL: We must constantly work to develop new products and build partnerships with our customers that add value and give them competitive advantages in their markets. This requires strong working relationships between our people and our customers on the one hand, and highly automated, state-of the-art production equipment on the other.

The trend towards greater consolidation and increased specialization in your industry will continue for the foreseeable future. What will your response be?
TW: We aim to achieve considerable organic growth, but we will also look at acquisitions if they fit with our business model and our corporate values.

Reprocessing hard and soft scrap metals

As of 2007, Ceratizit will help to preserve raw material resources, as the Reutte plant in Austria will begin reprocessing hard and soft scrap metals.

While the company will be using a proven technique to reprocess hard metals (sintered products), it has had to develop an entirely new way of reprocessing soft metals (powder-based scrap, presintered waste, sludge containing tungsten carbide).

As soon as the recycling center is fully operational, Ceratizit will offer its customers an additional service of taking back any hard or soft scrap metal.

Ceratizit's new facility for reprocessing hard and soft scrap metals.

Ceratizit in Reutte, Austria: New office building and Tooling Academy (right).

Major investments at Reutte site

The Plansee Group's Reutte plant is undergoing a wide-range modernization program. Major investments will see capacity increased along the entire value chain, from powder processing and pressing to rolling, sintering and the final dispatching of Plansee High Performance Materials and Ceratizit products.

The investments to be made at Plansee High Performance Materials will introduce fully automated, standardized processes, with the aim of increasing the efficiency of production operations, and ensuring the consistently high quality of all products.

Notable features of the plan include an increase in the production capacities for sputter targets, as well as the construction of a new hot rolling mill for the production of flat parts.

Work to expand the size of facility by a total of 165,000 square feet began in spring of this year, with the construction of new machining halls and a logistics center.

Along with new offices for the sales team, a Tooling Academy test center for cutting tools has been built at Ceratizit (see page 4). Over the course of the next year, the extrusion press and the pressing line for turning tools will also be expanded.

Power train components: increased density in critical areas

Studies of stress distribution in power train components suggest that the best way to improve performance is not necessarily to increase density uniformly, but rather do so in specific areas – primarily the working surface of the component.

Long-term power train reliability can only be guaranteed if the individual components offer excellent static and dynamic mechanical performance. However, that is only part of the story; most fatigue failures originate at stress concentrators on component surfaces, but if stress distributions in typical mechanical components are examined, you'll find that while the working surfaces are subjected to extremely high stresses, the level of stress decreases rapidly towards the interior of the part.

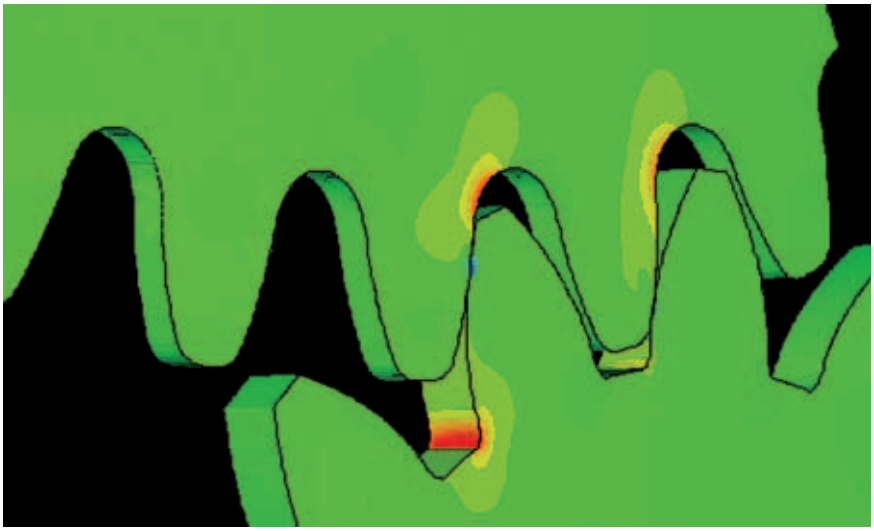
DensiForm® is PMG's new patented material and process technology to produce sintered steel components with a full-density layer on the critical working surfaces. The mechanical performance of heat-treated sintered components produced with DensiForm® matches, and in some cases even surpasses, that of heat-treated wrought steel products.

The DensiForm® densification process results in a full-density layer with a depth of up to one millimeter on critical surfaces, and an overall component density that is over 90% of the theoretical density. The combination of full density in critical areas, high core density, and the flexibility of powder metal alloys, facilitates the production of P/M components which can match the performance of wrought steel in high-stress applications.

In early 2006 PMG received the prestigious "MPIF Design Excellence Award in Automatic Transmission" for this product. Late in 2006, production of new DensiForm® one-way clutch races for use in torque converters has started at PMG Ohio.

PMG is also planning to expand the range of DensiForm® products available in its European and Asian markets. In Europe, the company has developed DensiForm® helical gears for manual transmissions, and DensiForm® timing sprockets for gasoline direct injection engines, and is now marketing these products. Meanwhile, at PMG Asia, preparations for the Japanese launch of the one-way clutch races and sprockets are at an advanced stage.

One-way clutch inner race and Cam for a torque converter one-way clutch. The clutch is installed in the aluminium stator.



Stress field which results from the meshing of gears. High stress areas in the contact region and at the tooth root.

Ceratizit Mamer celebrates its 75th birthday

October 13 saw a number of dignitaries, including HRH Grand Duke Henri of Luxembourg, Luxembourg's Finance Minister Jeannot Krecké and Mayor of Mamer Gilles Roth gather to mark the 75th anniversary of Ceratizit's operations in Mamer, Luxembourg.

Spokesman for the Ceratizit board Jacques Lanners commented, "The celebrations follow a particularly exciting few months for Ceratizit, with the opening of sales offices in Brazil, Hungary, the Czech Republic and Poland, a comprehensive reorganization of internal structures, and record investments made across the Group."

The Cerametal Group was founded in 1931, when Nicolas Lanners built a factory for the production of light bulb filaments. In the early 1970s, the company began supplying markets around the world, before merging with Plansee Tizit in 2002 to form the Ceratizit Group.

Ceratizit's spokesman Jacques Lanners and his guests: HRH Grand Duke Henri of Luxembourg and Mayor of Mamer Gilles Roth (from left to right).

Today, Ceratizit is one of the world's leading suppliers of hard metal wear parts and tools. It is one of three divisions that make up the Plansee Group. |

Global service for semiconductor industry

Plansee High Performance Materials strengthened its position as supplier to the semiconductor industry. Organically through the expansion of the production capacity at the Japanese affiliate Vacs Precision by almost 50 percent and strategically through the acquisition of US-based Electro-Graph.

A memorandum of understanding was signed in the end of November and the acquisition of Electro-Graph is due to be completed in the first quarter of 2007. Electro-Graph enjoys an excellent position in the US market and has strong relationships with its customers.

The company is well-known for its considerable expertise in the design, engineering and production of replacement parts and components for the semiconductor industry, specifically for use in processes such as ion implantation, sputtering and CVD coating.

Electro-Graph employs 65 people. Projected sales for the current fiscal year amount to 20 million dollars. The company's headquarters are in Carlsbad, around 30 miles north of San Diego, and it also operates a production site in Guaymas, Mexico, some 400 miles south of San Diego.

After a construction period of slightly more than four months the new facility at Vacs Precision was opened late in September. The Vacs Precision plant in the Japanese city of Oshu produces ion implanter components and lamp electrodes. Its largest customers are mostly Japanese-based, but sales to countries such as Taiwan and Korea are increasing steadily.

Opening ceremony with Noriaka Nakayama, a Shinto priest, Bernhard Schretter and Karlheinz Wex.

Capacity increased: New production facilities at Vacs Precision in Japan.

Japan

Code of Conduct implemented Group-wide

Plansee Group has recently published a Code of Conduct. This defines standards of behavior that must be adhered to by employees of all affiliated companies.

global

The Code of Conduct should give employees a clear understanding of what is expected of them, summarizing the commitments of Plansee Group and providing a framework for fulfilling them. It is structured around five guiding principles of business conduct.

"Managing a fast-growing international Group requires not only shared targets, but also shared standards of business conduct," says Michael Schwarzkopf, Chairman of the Executive Board of the Plansee Group.The Code of Conduct can be viewed online at www.plansee-group.com.

Filling key positions internally

Achieving the Plansee Group's ambitious growth targets and overseeing its international expansion represent a considerable challenge for senior managers. However, it is our stated aim to continue filling key positions with internal candidates wherever possible.

In order to achieve this goal, a systematic global development program is needed, to help talented managers at every level realize their potential and improve their skills – and that is exactly what the Global Management Development Program has been created to do.

It is the Plansee Group's stated aim to fill key positions with internal candidates.

Integration award for Plansee

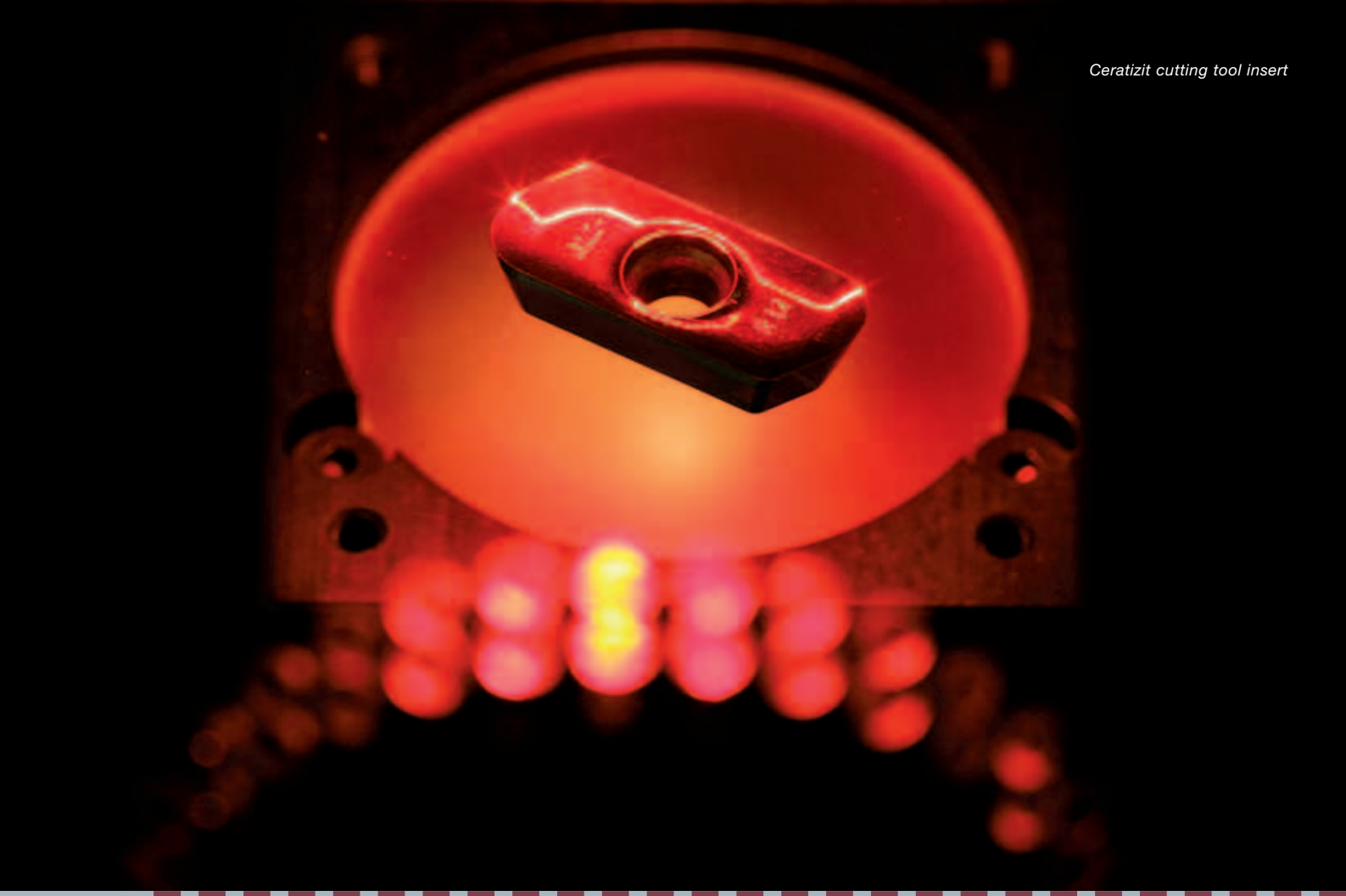
The Plansee Group recently received the Tyrol Integration Award from the Federal Social Office, an Austrian government agency, in recognition of its efforts to promote the integration of disabled people in the workplace. The award was presented at a ceremony in Innsbruck in mid-November.

In the award citation, the jury said: "We are proud that one of Tyrol's leading companies – a company that has to compete in global markets every day – takes its social responsibilities so seriously, and has been working for decades to aid the integration of people with disabilities."

Of a total workforce of over 2,100 at the Group's Reutte site, 29 have some form of disability.

Says Detlef Bartsch, Head of HR: "We are pleased that our work for the disabled has been recognized. It is not our approach to create jobs for them artificially, but rather to adapt existing positions to their needs."

The Integration Award was accepted on behalf of the company by Production Line Manager Bernd Junginger, HR manager Günter Koch, Head of HR Detlef Bartsch (standing) and Stefan Posch (right).



Ceratizit cutting tool insert

PLANSEE CERATIZIT PMG

Three divisions - one aim: excellence in powder metallurgy

To address the highly specialized requirements of our customers in future industries, we have concentrated our material competence into three independent divisions: Plansee High Performance Materials, Ceratizit Hard materials & Tools and PMG PM-Products. In this way, we guarantee selective marketing, a targeted customer approach and individually-tailored product solutions.

As a private company, our thoughts and actions are focused on the long term, and our present investment is aimed at securing our leading position in powder metallurgy for the future. With the support of a unique corporate and innovation culture embracing our entire workforce, all our efforts are directed towards the achievement of one aim: **Excellence in powder metallurgy.**

Electronics

Lighting technology

Medical technology

Power engineering

Mechanical engineering

Automotive industry

Construction industry

Plansee Holding AG, 6600 Reutte, Austria, Tel. +43 5672 600-0, Fax +43 5672 600-500

www.plansee-group.com

plansee GROUP