

AUSTRIA

## Engineered Materials for High-End Applications

Treibacher Industrie AG is a leading Austrian chemical and metallurgical enterprise. It was founded in 1898 by the famous scientist Carl Auer von Welsbach, who discovered four rare-earth elements: neodymium, praseodymium, ytterbium, and lutetium. He also invented the famous gas mantle light in 1885, which brought first streetlight to many cities around the world. Treibacher has its HQ in Althofen, southern Austria, and is a highly diversified developer and manufacturer of advanced materials. Treibacher lives under the banners “innovation is our tradition” and “we engineer materials for a sustainable future”. The company employs around 900 people and has sales, depending on metal prices, in the range of EUR 500 million per year. Key foreign markets such as Japan, China, and the USA are served via local subsidiary offices. One of Treibacher's upcoming divisions is Advanced Ceramic Materials. The focus here is in the development and production of high value-added products for critical performance applications such as biomedical implants, dental restorations, thermal and environmental barrier coatings, and titanium investment casting. The material basis is predominantly rare-earths, yttria, stabilised zirconias, and vacuum carbides and borides. As well as fine powder raw materials, the product portfolio includes ready-to-press, ready-to-spray, and ready-to-print materials. Jon Dodge (JD), Managing Director of Advanced Ceramic Materials, kindly agreed to give us some insights into the company's activities and strategy as it pertains to high performance ceramics.

**CA:** *How is the Advanced Ceramic Materials (ACM) Division positioned in Treibacher?*

**JD:** ACM is one of five strategic business units and is highlighted as a big growth potential. By far the largest business within Treibacher is the production of ferroalloys, where we remain the largest producer of ferrovanadium in Europe. Treibacher also has a longstanding position as one of the largest suppliers of rare-earths and yttria outside of Chi-

na. ACM was established as part of a strategy to diversify more into value-added products whilst leveraging the core strengths of the company e.g. sourcing and production of rare-earths, zirconia, and vacuum carbides and borides. ACM has a dedicated R&D team, dedicated application development team, and several ceramic powder processing plants. All of this, along with the commercial team, is located at HQ.

**CA:** What is the core business of ACM?

**JD:** ACM focuses on three key areas; thermal spray, bio- and technical ceramics, and titanium investment casting. The strategy for each is the same; develop technically superior products that create unique and sustainable value for our customers. This means there is a high focus on next generation materials, which in turn means a high focus on R&D and application know-how. We need to be able to understand our customer's problems and develop solutions.

Within Treibacher we have a vast capability-set including ceramic process, wet chemistry, and metallurgy. Combining this with a diverse range of raw materials gives us many possibilities to solve problems. We also have extremely high expertise in analytics. Currently, 40 experts work here and are creating more than 65 000 analytic results each year. Actually, we are currently investing more than EUR 10 million into a new analytics facility to ensure our continued leadership here.

**CA:** What products and markets does ACM focus on?

**JD:** In the area of titanium investment casting we are the main worldwide supplier of rare-earth "flours" and "stuccos" used in the ceramic shell-building process for reactive alloy investment casting e.g. titanium and titanium aluminides. Our long-standing success here is based on our ability to produce outstanding lot-to-lot consistency and being



Fig. 1  
Dr. Sandra Demel-Eckhart (R&D Team-Leader Dental),  
Karin Scharrer (Göller Verlag) and Managing Director Jon Dodge (f.l.t.r.)

## EXCELLENCE IN CERAMICS

**FCT** Ingenieurkeramik GmbH  
a QSIL company

For more than three decades we develop and produce unique ceramic components especially for applications with extreme hard conditions. To be able to meet your requirements we prepare our materials Silicon Nitride, Silicon Carbide, Zirconia and further Composites according to own formulations. Going this way, we ensure to find a precise and custom-fit product for you! We would be pleased to establish prototypes or special units for testing and qualification for your facility or your process.

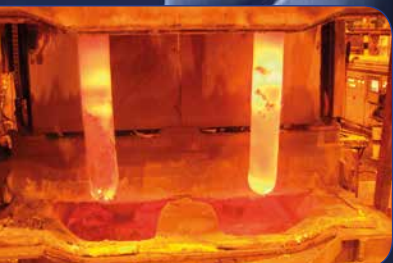
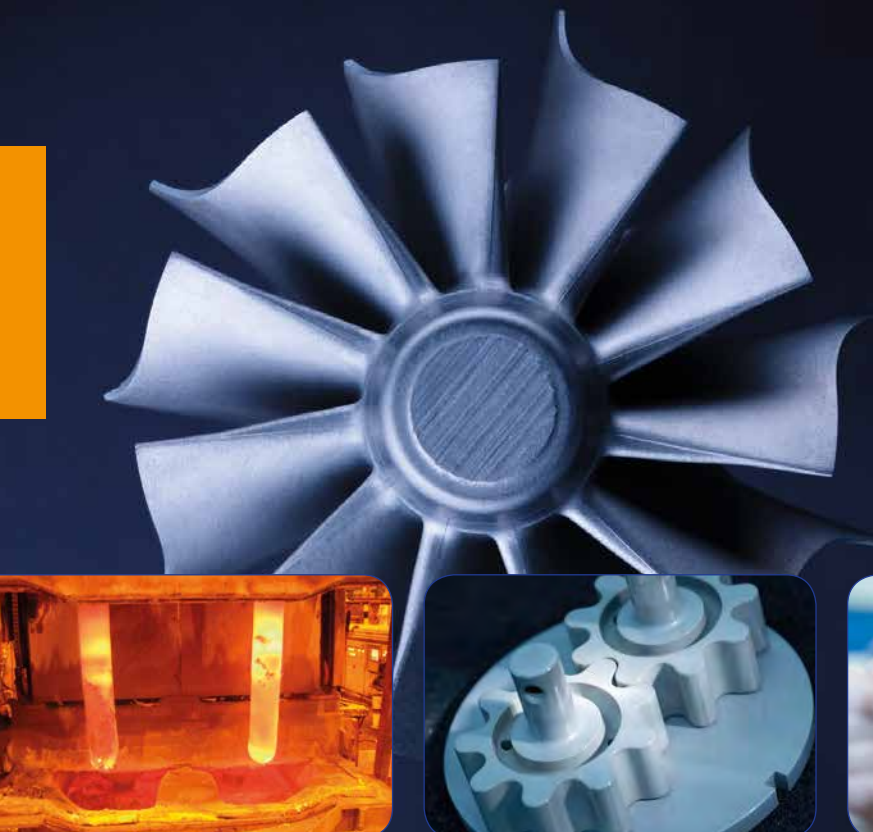




Fig. 2  
Headquarter, production and R&D in Austria

able to supply, despite (often) very unstable supply situations e.g. during China rare-earth crisis.

In the area of thermal spray, a major focus is on developing spray powders to enable higher performing thermal and environmental barrier coatings for aero engines. These materials are marketed under the AuerCoat® brand. Here we have created strong leadership positions and are often the choice for next generation developments. Another main focus is the technical and bioceramics fields. Here we are supplying advanced powders used in the production of bioimplants. Ceramic implants have many advantages over metallic e.g. less wear and no-metal particle creation. Yttria-stabilised-zirconias, in ready to press formats, are a huge strategic focus. Here, under the AuerDent® brand, we are building a strong position as both a development partner and local (EU) manufacturer for the dental CAD-CAM blank industry.

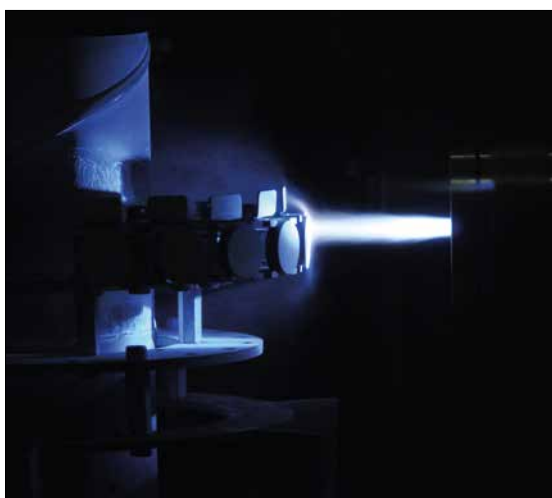


Fig. 3  
Coating process in Treibacher's state-of-the-art Thermal Spray Center

**CA:** One product family within your portfolio is “ready-to-spray” products. Could you give us details about these?

**JD:** We produce thermal spray powders and suspensions mainly for Thermal Barrier Coatings (TBCs) and Environmental Barrier Coatings (EBCs). In order to improve fuel efficiency and reduce emissions, aero engines must run hotter. This requires higher performing TBCs.

To enable this, we are producing zirconia based materials doped with different rare-earths and refractory elements. We are also the leaders in the development and supply of suspensions for Suspension Plasma Spraying (SPS). This is a coating technique that yields affordable coatings with high thermal strain tolerance. Engine producers are also using Ceramic Matrix Composites (CMC) components due to their increased lightness and thermal tolerance compared to alloys. However, CMCs bring another set of problems including intolerance to water vapour. Here we offer a range of rare-earth silicates spray powders to solve this. We are also working on developing new coating powders that result in higher resistance to sand and volcanic ash. As engine temperatures increase this ash and sand (CMAS) no longer just passes through the engine but melts and infiltrates the coating. This is a big problem.

**CA:** You have a lot of business in the aerospace market. What is the current market situation?

**JD:** COVID had a huge impact on air traffic numbers and our sales here suffered heavily in 2020 and the first months of 2021. However, there is currently a recovery of domestic flights, and a general return of confidence by the airframe producers, especially Airbus.

The fundamentals for air travel remain strong and we believe the market will recover. Many of the planes in Europe and North America today are old and need replacing. In China, there is a huge demand for new planes. What is promising for us is that the newer planes and corresponding engines require innovative ceramic coatings. This plays directly into our strategy.



Fig. 4  
YSZ handling in Treibacher's production in Austria (Figs.: Treibacher)

**CA:** What are the highlights in bio- and technical ceramics?

**JD:** One key ceramic powder family for us is Yttria-Stabilised-Zirconia (YSZ), used in both technical/industrial and biological applications. We have developed a portfolio of YSZ powders with different combinations of aesthetic and strength characteristics. We are positioning ourselves as a European based development partner and producer of these materials. These powders are available as ready-to-press and are produced according to near-cleanroom conditions. They are used for the production of dental CAD-CAM blanks, luxury goods, and industrial components.

We recently developed a 2-mol YSZ that has game-changing fracture toughness properties e.g.  $K_{1c} > 12 \text{ MPa} \cdot \sqrt{\text{m}}$ . Our strategy in YSZ is to focus on the higher value materials that many other companies struggle to make.

**CA:** Can you tell us about your geographic presence?

**JD:** We have many customers throughout the world. The largest markets for us are currently Europe and North America. SE Asia and China is a growing and increasingly important market for us. China presents a huge opportunity for aerospace and biomedical. Sales is a "local thing" and therefore in our key markets we have either our own subsidiary companies or representative offices, or specialised agents and distributors.

**CA:** Are you concentrating only on organic growth?

**JD:** So far, organic growth has been the biggest initiative. However, there is a real need and a desire to grow via acquisition so this will gain more attention going forward. As an advanced raw material company, we are particularly interested in "bolt-on" acquisitions that add new value-adding capabilities.

**CA:** Thank you for talking to us.

KS

# Advanced Ceramic Materials

European Zirconia for

Dental Blanks and

Technical Ceramics

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INDUSTRIE AG



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