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Lithoz: Manufacturing the Future

Lithoz now employs over 140 people at three sites in Vienna/AT, one in USA and one in China. In January 2022, a new production facility over 2250 m² was inaugurated (see text box). The extension of the company's headquarters in Vienna has enabled further opportunities for trainings and technology demonstrations, as well as research and development, pre-series manufacturing and testing. During a visit there, we were able to view the new production facility and talk to CEO Dr Johannes Homa (JH).



Fig. 1
Lithoz booth at IDS 2023 in Cologne/DE

CA: 2022 was the year with the strongest turnover in your company history. And you more than doubled number of employees in the period from 2019 to 2022 as well as making sizeable investments. What has this boost to your business brought?

JH: Over the last couple of years, we have successfully placed our LCM technology in industry for a wide range of applications (dental, medical, aerospace, electronics and many more). Now is the phase in which these companies are upscaling the new technology step by step to industrial series production. That was reflected in a rapid increase in the sales of our machines over the last year:

that LCM technology has become an industry standard in the ceramics industry. That is shown by the innovative industry partners who have now installed machine parks with several CeraFab 3D printers, and are already manufacturing millions of pieces per year with these machine. Additionally, these companies have already ordered more units.

CA: Besides the already-established LCM process (Lithography-based Ceramic Manufacturing), you added LIS process (Laser-Induced Slip Casting) and LSD technology (Layer-Wise Slurry Deposition) to your portfolio last year. What has been the response from the market?

Series manufacture of 3D printers and materials at a new site



Fig. 2
Dispersing the powders

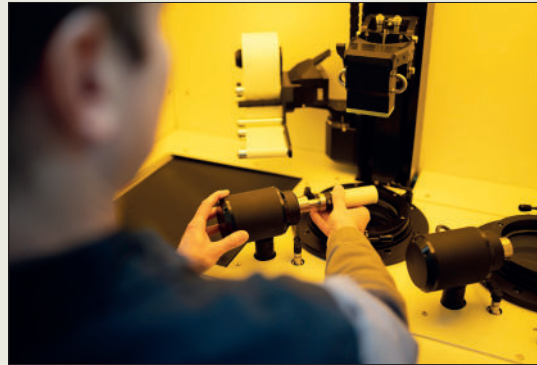


Fig. 3
Preparation of the build platform for 3D printing



Fig. 4
Quality control



Fig. 5
Machine in final assembly before delivery

At the heart of the production facility in Oberlaaer Strasse in Vienna are the ISO class 8 clean rooms. In an exceptionally clean environment, ceramic slips and consumables are fabricated. On account of the sensitivity of the media to be processed, we have to work under yellow light. In addition, rooms are available for final assembly of the series machines, quality assurance as well as warehouse/logistics.

The Medical Solutions team has moved into the offices on the upper floor: in the Lithoz team, they are experts for the highest industry standards. The production of medical products must comply with ISO 13485, which means that the quality management system must meet even higher requirements. A total of 40 employees work at the facility.

Supplying sustainably high quality calls for materials and machines. The demand for both is increasing enormously. The fabrication of the machine builds on the individual adaption of externally prefabricated housings. Particularly important is the adjustment to the individual designs specified by the customer and, naturally, precision tuning and quality control of projector and optics.

JH: As we have already reported in CERAMIC APPLICATIONS, with the acquisition of CerAMing, we have introduced LSD technology into our product portfolio. For specific applications, our customers see advantages in this technology. LSD printing is a cost-efficient process that you can use to manufacture high-quality technical ceramic components. LIS requires with extremely low quantities of binder (comparable with casting) and therefore has the advantage that slurries need only slight adaptation, if at all, to be used

in the LIS printing process. It is possible to manufacture thicker product walls compared to slurry casting. Debinding is comparatively simple. High sintered densities are achieved and the processing of “black” materials, e.g. SSiC, which are not suited to shaping with LCM technology, is no problem.

With the CeraMax Vario V900, which was presented in June 2022, it is possible to apply up to 1000 µm per layer, so relatively big components can be manufactured quickly. LCM is

the preferred technology when it comes to very high precision, complexity and efficiency.

So, from one source, we are now offering three processes that complement each other. In 3D printing, we have now reached a level that has always applied in ceramics production: manufacturers can select their optimum shaping process to produce high-quality and cost-efficient ceramic components in series. The other advantages of 3D printing, in respect of the complexity of components and working without moulds, are already well-known.

CA: *Is the market focus therefore now on industrial applications?*

JH: What's clear is that when Lithoz was set up 11 years ago, the 3D printing of ceramics was seen first and foremost as a technology for R&D and prototyping. At Lithoz, we have a good academic background based on the many research projects we have conducted in cooperation with universities and institutes. Naturally, we are continuing these activities, as they form an important basis for our innovation. In addition, we are supplying numerous printers to universities and institutes, but in terms of unit numbers, customers in industry now dominate by far. On the back of development partnerships with institutes, multi-material printing, which is now unexpectedly gaining momentum, was developed.

With these new partnerships come more and more new applications. One such application has come from a very interesting cooperation with ZENIT Smart Polycrystals (spin-off of CNR ISTECC – Consiglio Nazionale delle Ricerche in Italy). ZENIT holds a patent for the 3D printing of transparent polycrystalline components with different chemical composition, which are used in solid-state lasers.

The successful 3D printing of transparent ceramics clearly demonstrates its high quality in respect of homogeneity and high sintered densities. Laser technology is an extremely fast-growing market, so it's important for us that we have positioned ourselves in this market.

CA: *In the dental sector, you have exhibited the further development of 3D printing at the IDS in Cologne. How did IDS 2023 turn out for you?*

JH: In this sector, we have been working for years in a development partnership with Ivoclar Vivadent in Liechtenstein. The flawless precision and impressive material efficiency of LCM technology guarantee a perfect finish and performance both for dental restoration and dental implants. We have included high-strength zirconia-based materials (zirconia/TZP-A or alumina-toughened zirconia/ATZ) and bioresorbable hydroxyapatite for bone regeneration in our assortment for a long time now.

The CeraFab System S65 Medical is a specially adapted machine for these applications and can fabricate up to 108 implants in one print job in 2 min (per implant). This year, with our showcasing of 3D-printed dental restorations made of lithium disilicate, the Lithoz booth was a real hit. It also showed how vital our solid foundation in R&D remains to this day, enabling us to offer modified materials for top 3D printing applications.

Today, ceramic products for dental applications can be produced with complex geometries and ultra-filigree structures manufactured in series via 3D printing, which can never be matched using conventional processes.

CA: *What course have you set on the international market?*

JH: At the top of our list was the founding of Lithoz America, to get a foothold in the USA. 50 % of the machines we export now head there. So CERAMICS EXPO in the USA remains a very important trade fair for us.

With CERAMIC APPLICATIONS, we enjoyed a very successful show at CERAMICS JAPAN and will continue there with a systematic approach, supported by ASOne as our Japanese representative.

In India, since the start of 2023, we have been supported by a highly renowned partner in Wendt (India) Ltd. Founded in 1983, Wendt (India) Ltd. was established as a joint venture between the Germany-based company Wendt GmbH and Carborundum Universal Ltd. (CUMI) and rated by the IGCC as one of the most successful German-Indian joint ventures.

CA: *Lithoz has to "cope" with enormous growth. What have you had to adapt?*

JH: Besides extensive investments and the expansion of national and international networks, we have also had to change our organizational structure and establish services that industry customers expect.

It was important to set up series production at a separate facility with capacity for further increases because there we need to comply with strict rules to meet the highest quality requirements. Such capacity cannot be reconciled with a facility where applied development and testing or customer training take place.

In respect of services, industry customers rightly expect fast response times as well as individual support. Here, we not only had to increase our personnel, but also prepare for these requirements. Considering everything that had to be done, the new organization was certainly the central task for Johannes Benedikt and me. It is also exciting that more and more OEMs are now asking us directly about solutions with ceramic 3D printing. That proves that this technology has truly arrived in industry and is here to stay.

CA: *Thank you for talking to us.*

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