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Long-term safety: choosing the right dental manufacturing technology today for tomorrow

Many dental practices and laboratories that plan new investments face an important question: should they invest in subtractive milling technology or in additive 3D printing? Both paths lead to digital, efficient workflows – but they have different strengths and fields of application.

3D printers excel when many models, splints, or temporary restorations need to be produced in a short time. However, for restorations intended for permanent placement, other factors are decisive: precision, durability, and biocompatibility. In these indications, milling technology still clearly outperforms 3D printing. Anyone who decides to invest should therefore consider how their practice or laboratory balances short-term provisionals and long-lasting restorations.

Milling technology: proven in long-term clinical studies

Milled dental ceramics such as glass-ceramics and zirconia have been clinically validated for decades and documented in numerous studies¹ with survival rates of more than 90 percent after ten years. By contrast, 3D-printed restorative materials are still relatively new, and comparable long-term data is largely lacking. Those who choose milled ceramics are therefore not only opting for state-of-the-art technology, but also for a treatment option with proven safety.

Strengths you cannot see – but you can feel

The flexural strength of a material largely determines the service life of a restoration. While 3D printed resin materials typically reach only about 80-150 MPa, lithium disilicate ceramics milled from blocks achieve around 500 MPa and zirconia can reach up to 1,200 MPa. A well-milled, esthetic ceramic crown therefore not only looks good, but also offers mechanical reserves that reliably withstand daily functional loads.

¹ Example: IPS e.max Scientific Report – clinical validation.
Online: <https://www.zm-online.de/markt/marktanzeigen/detail/scientific-report-zu-ips-emax>

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Biocompatibility: trust begins with the material

For patients, biocompatibility is crucial – and it begins long before the restoration is placed in the mouth. 3D-printing resins often contain reactive monomers and require precisely controlled post-curing, as insufficiently cured resin is considered a potential health risk. Ceramic and metal milling blanks, on the other hand, are chemically almost inert and provide a level of safety based on many years of clinical experience.

Milling technology for high-quality products – and 3D printing as a supporting technology

Ceramic restorations combine excellent biocompatibility with superior surface quality and natural esthetics – properties that 3D-printed materials do not yet fully achieve. “When it comes to permanent restorations, milling technology using ceramic materials remains the undisputed first choice,” says Tim Zinser, Product Manager Dental at vhf camufacture AG. “Building on decades of expertise, we continuously advance our milling technology so that our users can always rely on maximum precision and reliability. 3D printing, as a flexible partner for models, splints, and provisional restorations, complements digital dentistry in a meaningful way.” Those who intelligently combine both technologies lay the foundation today for sustainable, future-proof treatment concepts.

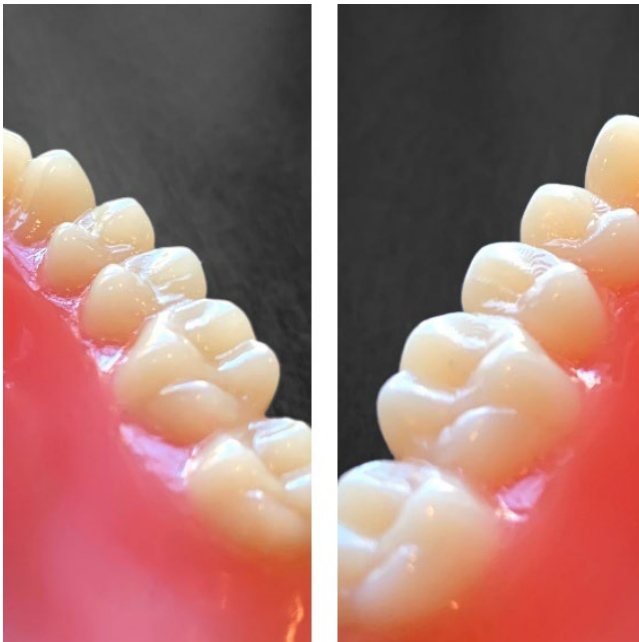
More information: [Milling and 3D printing in dental technology | vhf camufacture AG](#)

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Images



The milled restoration demonstrates the natural translucency of zirconia-reinforced glass-ceramic. Even in its crystallized and fully cured state, the tooth stumps remain visible when backlit.



Milled prosthetic teeth (left) and printed prosthetic teeth (right). The layer lines typical of 3D printing are clearly visible. These steps must be manually smoothed to prevent increased plaque accumulation.

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A crown immediately after milling (left) and after 3D printing (right). Milling leaves a small support bar placed inconspicuously on the side of the workpiece which can easily be removed by hand.

3D printing uses thin support structures that are often located directly on the occlusal surface, making removal significantly more difficult. Residual printing resin can be seen as a white film.



Wet grinding of glass-ceramics: micrometer-level repeatability ensures excellent fit accuracy.

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Tim Zinser, Product Manager Dental, vhf camfacture AG

About vhf camfacture AG

vhf camfacture AG is one of the leading manufacturers of dental and portal milling machines, high-quality tools, and compatible CAM software. Founded in 1988, the company offers an open, perfectly matched system for processing all common materials in the dental, manufacturing, and sign making industry.

Thanks to highest quality standards, the company's customers can rely on best-in-class manufacturing solutions, ensured by around 350 dedicated employees and proven by ISO 9001:2015 certification.

Development and production take place exclusively in Germany – at the headquarters in Ammerbuch (Baden-Württemberg) and in Fürth (Bavaria).

Internationally, vhf is represented with locations in Hauppauge near New York and in Shanghai.

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