dentallabproducts®

ARTISTRY AND INNOVATION TO INSPIRE DENTAL LAB SUCCESS

AUGUST 2020 | VOLUME 42 | ISSUE 2

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DUCTS

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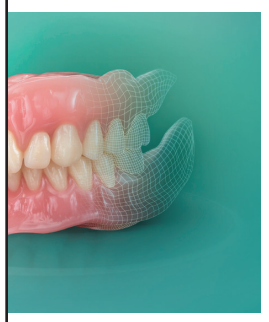

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function.

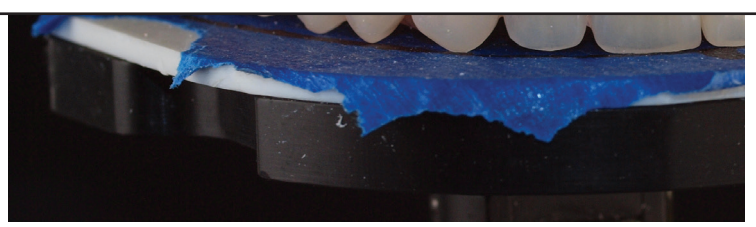
A high-tech prosthesis material that offers strength

One lab technician's experience using TriLor Arch from Harvest Dental to achieve flexibility without compromising on strength.

BUSINESS OPERATIONS

The Top 10 Best Cities to be a Dental Lab Technician

We pinpointed the cities and regions best for lab techs based on a range of financial and demographic metrics.



REMOVABLES

Perfect the plane truth process

Tom Zaleske shares his process for using consistent communication steps to equate to consistent results in the fabrication of removable prosthetics.

SHINNING 3D

AutoScan-DS-MIX

An open scanner with speed and a high degree of accuracy designed to make scanning for a range of case types easier than ever.

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TECHNOLOGY

Where CAD/CAM cannot compete

Dental labs can still succeed with traditional techniques and approaches

NEW PRODUCTS

BEGO

Varseo XS with VarseoSmile Crown plus

A compact and speedy 3D printer designed to work with the industry's first printable material for permanent crowns and other restorations.

VITA NORTH AMERICA

VITA VIONIC VIGO

A line of denture teeth specifically designed for use with digital denture workflows in order to improve efficiency without compromising esthetics and function.

SHINNING 3D

AutoScan-DS-MIX

An open scanner with speed and a high degree of accuracy designed to make scanning for a range of case types easier than ever.

TECHNOLOGY

The digital design evolution

As digital design has advanced, it's become clear the future of the industry lies somewhere between digital design and human artistry.

MATERIAL SCIENCE

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Why Dental Lab Products® matters to me

Relaunching **Dental Lab Products**® is a proud moment, and I hope we can live up to this title's legacy as we return to covering an exciting and evolving industry.

It's often a good idea to keep your personal life and feelings out of your professional life and business decisions. But for me, the relaunch of **Dental Lab Products**® is extremely personal, and something in which I feel a strong sense of pride and accomplishment.

Unlike the many people in the dental industry who follow a career path that is simultaneously a family legacy, I came to the dental world with no experience beyond that of a patient who has never had a cavity and never needed orthodontics. The only dental care I'd ever received beyond my six-month prophy appointments were sealants applied in my youth.

I came to dentistry as a journalist in need of a job and got a crash course in the technologies, material science, and quite simply amazing things dentists can and were doing for their patients. Still, when I first walked into the **Dental Products Report**® newsroom I had no clue what a dental lab was or what they actually did.

My education on the dental industry was a rapid, on-the-job learning spree just like any reporter learning a new beat. I tried to absorb as much information and ask as many questions as I could, but even after working on DPR for more than a year, my only taste of the dental lab industry was copy editing pages for upcoming issues of DLP. It was only after I began directly working on the magazine that my eyes opened to the amazing world of dental labs and the unbelievable work of expert technicians.

The more I worked on DLP content, and the more people from the lab world I got to know, the more I grew to love the privilege of writing about this side of the dental industry. At my core I'm a geek who loves learning how things work and I appreciate the craft of making something as much as I love the finished thing itself. The dental lab world was a hidden place that combined a chance to cover material science, engineering, and cutting edge technology, right along with covering art, photography, and of course the people who do all this amazing work without receiving much of the credit for the potentially life-changing results.

Then a career-changing opportunity presented itself when I was named Managing Editor for DLP. This was my first time fully at the helm of a publication, and it was far more fun and rewarding than I'd expected. I only ran the brand for a bit more than a year, but during that time my esteem for the work done in dental labs grew immeasurably.

When my career path took me in another direction, I watched DLP from afar and continued to work with some of my lab friends on content at my new dental publication. But watching DLP from afar was not much of a pleasure as I saw the new leadership of the magazine just didn't seem to connect to the lab industry and content tended to approach the industry from an outsider's perspective, rather than delving deep into what really mattered at the bench and in the office. To be honest, when the name of the publication was changed to Digital Esthetics, I simply didn't know who it was not supposed to be for.

Now Digital Esthetics is the brand that has been retired and **Dental Lab Products**® is proudly back atop our masthead, and we're entering a new phase with all the excitement of starting something new, and the comfort of it also being something familiar. I hope as we regrow our lab-focused content and continue to explore all of the innovations available to labs today, you enjoy coming right along with us.

Working on **Dental Lab Products**® once again is something that feels right. We plan to focus our efforts on covering the products, services, materials, and technologies of the dental lab world and hope to once again be viewed as a valued resource to help your labs thrive so dental patients always have access to restorations that provide the form and function everyone deserves from their dentition.

Thank you for joining us on this journey. We're glad to be back on this path.

Noah Levine
Editorial Director Dental

dentallabproducts®
AN MJH life sciences® BRAND

editor's choice

Cover Products and other **EDITOR'S CHOICE** products throughout this issue are chosen based on innovation or their perceived impact on improving lab workflows and outcomes.

on the cover

Varseo XS with VarseoSmile Crown plus

Designed to provide a compact, cost-effective 3D printing solution to dental labs and practices, the Varseo XS is a DLP printer said to provide accuracy and speed. The printer is capable of printing up to 20 crowns or up to two seven-span bridges in a single print cycle, and prints at a speed of up to 30 mm per hour. Among the many compatible print materials is VarseoSmile Crown plus, the first tooth-colored, ceramic-filled hybrid material designed for fabrication of 3D printed permanent crowns, inlays, onlays, and veneers. The material is available in 7 VITA classical shades, and the printer features an easily replaceable tank to simplify the process of changing materials or shades. A range of other materials are also compatible with the printer allowing printing of temps, trays, surgical guides, models, and castable parts.

Why this printer and material stand out:

Dental 3D printing continues to grow rapidly because it's an ideal technology for an industry that demands the creation of small, unique parts that require both intricate details and functional properties. However, until the arrival of VarseoSmile Crown plus, none of the printed parts could be considered a definitive, monolithic restoration. Now that barrier no longer stands. This new material offers high dimensional stability and the ability to be customized with composite stains after curing to provide the form and function required of a dental restoration.

BEGO
800-342-2346
bego.com

VITA VIONIC VIGO

A denture tooth line designed specifically for efficient use with digital denture fabrication workflows, VITA VIONIC VIGO teeth are made of an SE polymer and can reportedly be fixed to the denture base without the need for reworking. The teeth are designed to work as a part of the VITA VIONIC SOLUTIONS that includes 8 upper anterior tooth molds, 4 lower anterior tooth molds, 4 upper and lower posterior tooth molds each, 1 bonding system, and material blanks for wax try-ins and plastic bases. The teeth achieve their efficiencies with a reduced tooth dimension, sandblasted tooth neck, an undercut-free basal design, and a conical-oval tooth neck shape with integrated rotation protection which all work to help make positioning and adhesive bonding to the base simple.

How these add to production efficiency:

Designed as a complete system, the teeth are part of a 5-step digital denture fabrication workflow that can be based around either milling or printing the denture base. The process includes scanning, tooth selection and digital design, try-in printing or milling, denture base printing or milling, bonding the teeth, and finishing the dentures. The teeth are said to provide optimal esthetics and translucency to enable efficiency without sacrificing esthetics, and multiple set-up concepts are available via software connections including 3Shape and exocad. The system is compatible with a range of external milling and 3D printing systems.

VITA North America
800-828-3839
vitanorthamerica.com

AutoScan-DS-MIX

Featuring an open design, the AutoScan-DS-MIX is a benchtop scanner with high accuracy as well as high efficiency. With a pair of 5.0 MP cameras, the scanner can capture edge details on abutments and implant scan bodies. Its scan accuracy is as high as ≤ 7 µm. With its high efficiency scan mode, it can capture a full arch in 13 seconds. Its software can automatically detect and add unscanned surfaces to the digital model, making the scanner easy to use. It is suited for scanning cases including crown and bridge, implant abutments and bars, and more.

What makes this scanner worth a look:

Designed with both efficiency and accuracy in mind, the AutoScan-DS-MIX can scan a bite in just 6 seconds, up to 8 dies in 33 seconds, or an impression in 32 seconds. Other efficiency-driving features include a simplified process to seal screw channels in the digital model, and support for dynamic and static articulator scans for most articulators and articulator transfer scans for several popular articulator models.

SHINING 3D
415-259-4787
shining3ddental.com

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To subscribe, email mmhinfo@mmhgroup.com.

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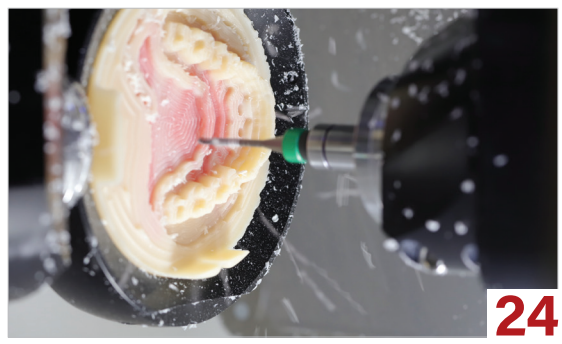
12 Where CAD/CAM Cannot Compete

TECHNOLOGY | Dental labs can still succeed with traditional techniques and approaches.



NEXT ISSUE: Not your grandfather's false teeth –The current state of denture fabrication with a look at technologies, materials, and the pros and cons of both traditional and digital denture workflows.

For more content online...

Visit **dentalproductsreport.com/lab** to find an expanded version of our Top 10 Best Cities for Dental Lab Technicians in 2020, which also includes the 5 worst cities for technicians and expanded details on how we determined our rankings as well as the scores for the individual locales. You'll also find Top 10 Best Cities (and 5 Worst Cities) articles ranking the best and worst places for dentists and dental hygienists.

IT'S YOUR LAB. OWN IT!

PRO 4K large format 3D printers from ASIGA® are here.

The open-material printer for 385nm or 405nm resins features precision pixel placement, renowned Asiga reliability, and super-fast print mode for large batches of virtually all resins.

- Affordable (own it for under $25,000)
- Build plate Volume:
  (176.5 x 99 x 200mm) or
  (217 x 122 x 200mm)
- Two printing modes: Native mode for the defined exposure of pixels for specialty applications, and Standard 4K mode for enhanced resolution and surface finish.
- Standard 4K mode reduces pixel size to increase accuracy and XY resolution without impacting build area or printing time (46µm and 56µm).

Whip Mix®

DENTAL TECHNOLOGY SOLUTIONS

Whip Mix Corporation
361 Farmington Avenue
Louisville, KY USA 40209
502-637-1451
800-626-5651
www.whipmix.com

Questions or comments? nlevine@mmhgroup.com

Staying focused on constantly improving

Whether running a dental lab or a media outlet, producing something tangible and of value requires a refined process and a well-executed workflow.

The work process and especially the end results may look nothing alike, but the spirit that drives media creation and the one driving the fabrication of dental restorations share many common touchpoints. Both are all about creating something completely unique to meet the specific needs of a specific audience (or patient), and both require a mix of specialized training and equipment, along with creative problem solving and a passion for producing something that matters, even if only to a single person.

So whether it's a lab taking a prescription and a physical or digital model and turning it into a lifelike, implant-supported overdenture, or a media outlet taking in key bits of information from a disparate range of sources in order to share vital details and tell a story with impact, both are best done by experts who not only know their craft, but constantly seek ways to improve it.

While the individual projects we all manage come to a conclusion, the refinement of our workflows and the evolution of our processes never stops. Lab owners and technicians are constantly attending courses to learn new techniques and master new technologies. Here in the media world, we never stop looking for new ways to tell stories and new formats in which to present information. What you're reading right now is a part of that constant improvement.

Reviving the *Dental Lab Products*® name and platform was a decision made to better serve our entire audience. This is the publication's first print issue in more than half a decade, and we know this is just a starting point. Our goal remains to help all dental professionals understand their options when it comes to the specialized technology, tools, materials, and services available for their businesses and the patients they help care for. This part of those efforts is aimed squarely at the often-unheralded dental lab professionals.

In this issue and future issues, we'll start with a rundown of some of the newer products in the industry. We'll share techniques, tips, and advice from both well-known technicians and new faces with interesting work to share.

Product-focused content includes our Closer Look interviews with lab professionals and our Solve My Problem product spotlights. Category-focused roundups look at competing options, and our Deep Dive articles will take a technical look at the how technologies and materials function.

Longer articles are also a large part of our plans, with this issue featuring a cover story titled, "Where CAD/CAM Cannot Compete" which looks at how far digital technology has come by focusing on the areas it has yet to disrupt. Each issue will tackle a different trend or subject impacting dental labs, but we'll always have a core of content focused on new products, dental lab technology, the science of dental materials, best practices and techniques for crown and bridge as well as removable cases, and advice on the business of running a lab.

We hope we're setting a good foundation with this issue. Of course, any process can be improved. Efficiency allows room for innovation and excitement, and we hope to be both innovative and exciting. This means we're always open to suggestions on how we can improve what we do.

Is there a product or topic you think we should cover? Do you have a case you want to share, or advice you think could help a colleague? Did we get something wrong or miss something in our reporting? We want to hear from you. Please contact us with ideas, comments, and any feedback you care to share.

And thank you for having us back in your lab.

Mike Hennessy, Sr.
Mike Hennessy, Sr. is chairman and founder of DLP's parent company, MJH Life Sciences™.

Our Mission Statement

Dental Lab Products delivers a complete picture and in-depth coverage of the innovations transforming the U.S. dental lab industry and the technologies and materials making a difference in lab workflows, clinical capabilities and patient outcomes. Dental Lab Products helps dental laboratory technicians, managers and owners understand the available products and services and how to select the best options for their businesses and the practices they work with. We are committed to asking the right questions and delivering unbiased, quality content.

dentallabproducts®

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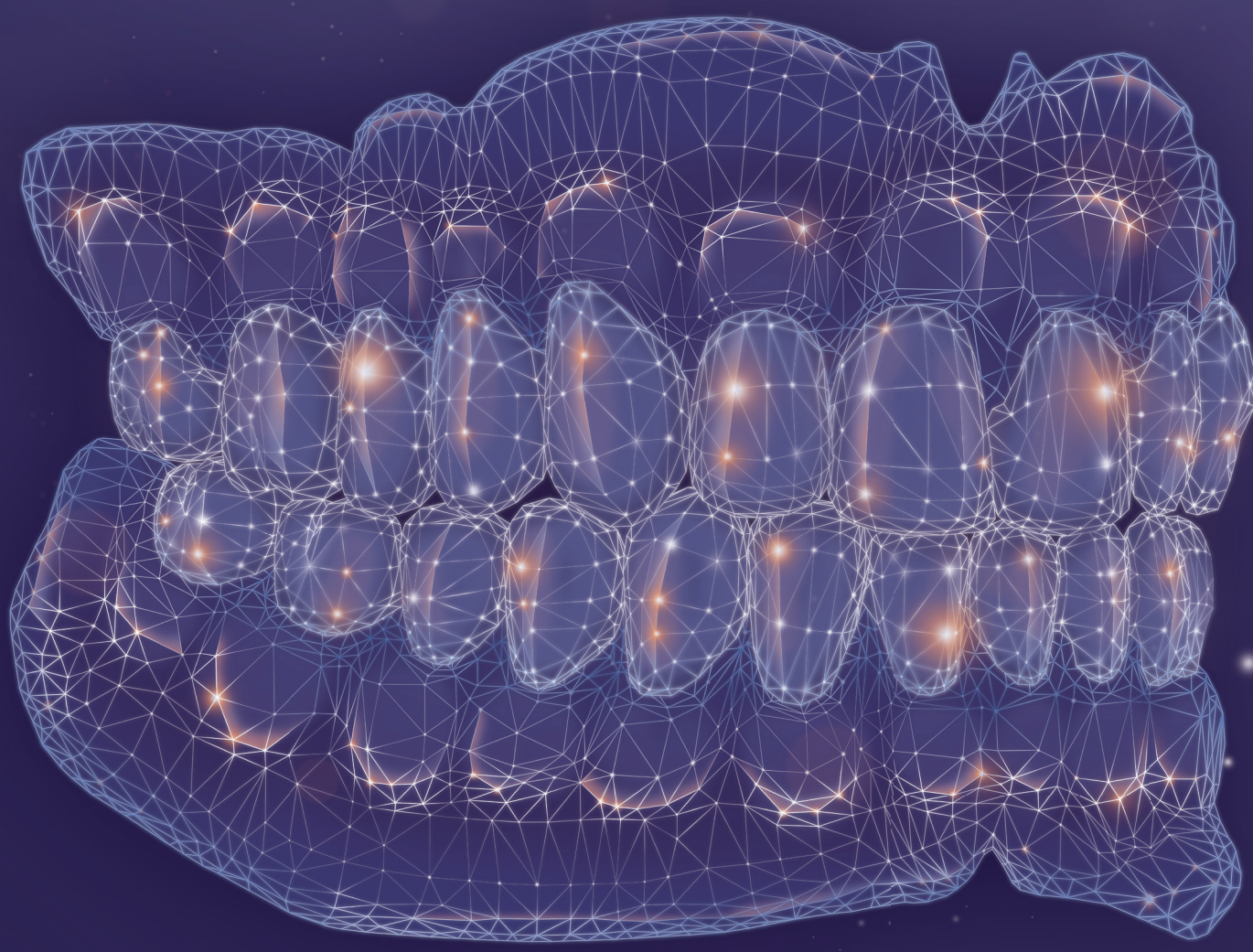
DentalCAD 2.4 Plovdiv

Flexible, fast, full-featured

NEW RELEASE
now available



Enjoy freedom of choice and expanded indications with the new *DentalCAD 2.4 Plovdiv*

Advance your dental lab and facilitate your workflows with the new *Plovdiv* release. Enjoy full flexibility for digital dentures with new capabilities, including single-arch dentures and support of all relevant manufacturing methods. *Smile Creator* enhancements, improved *exoplan* compatibility, new hybrid denture workflows, and the advanced thimble crown bridge workflow highlight many important improvements. Keeping exocad's philosophy of well-tested and well-thought-out workflows and user guidance, all dental technicians can easily achieve higher quality results in less time.

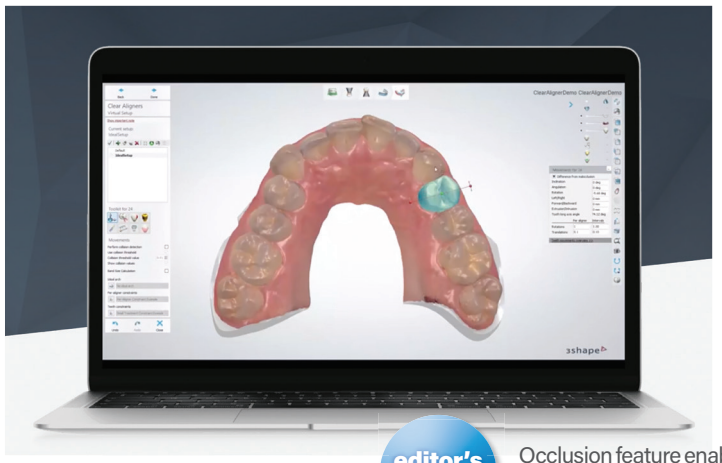
- **New release with 64 new and 45 enhanced functions**
- **Hardware independent, works within your existing environment**
- **Broad range of indications, easy-to-learn workflows for creative freedom**
- **Huge libraries of editable 3rd party teeth, implants, attachments, articulators, etc...**

The new Plovdiv release is now available at no extra charge to all exocad customers with a valid upgrade contract.

Your freedom is our passion

exocad.com/dentalcad

exocad



editor's choice

Occlusion feature enables manual bite arrangement from a quality distance map.

ORTHODONTIC SOFTWARE

3Shape Clear Aligner Studio

3Shape Clear Aligner Studio software gives practices and labs full control over the design and production workflow and the opportunity to produce clear aligners in-house. The new 3Shape Clear Aligner Studio, version 2019.2, adds innovative features to considerably increase treatment control and efficiency. New benefits include: enhanced collision detection—proactive real-time collision detection halts teeth movement when space is already occupied by another tooth; Attachment groups—setup and switch between different groups of attachments for efficiency; Overlay of malocclusion on ideal setup—enables the viewing of both the malocclusion and the ideal setup of teeth at the same time.

3shape
3shape | 3shape.com

CAD MATERIAL BLANK

EASY Blank Wax

Casting and pressing techniques are still being used regularly, so Renfert has extended its range of products for digital manufacturing with the EASY Blank Wax for the hybrid processing techniques CAD/Cast and CAD/Press. The blue blank is available in the usual diameter of 98.5 mm with a 10 mm groove and in sizes 14 and 20 mm in height. In the hybrid workflow, the restoration is first constructed efficiently using the CAD software and then milled from the blank wax. The material—not, in fact, wax, but a modern acrylic material—can be processed flexibly in the usual manner. The coordinated material composition means the material removed during milling forms small chips, which do not stick to the tool; this ensures a high degree of processing reliability.

Renfert USA
630-762-1803 | renfert.com

MILLING MACHINE

N4+

The N4+ is a wet processing machine for milling and grinding glass ceramic, composite and zirconia blocks as well as titanium abutments. This machine combines the high precision and fast processing in an extremely compact housing. With the new mill, users also benefit from plenty of power: The 800-watt spindle with speeds up to 80,000 rpm offers powerful performance for the efficient wet processing of three blocks up to 45 mm in length or three prefabricated abutments. Another highlight of the four-axis machine is its integrated camera for easy remote support. These features make the N4+ the ideal partner for the laboratory and practice-labs.

VHF, Inc.
631-524-5252 | vhf.com

3D PRINTER

FreeShape

The FreeShape professional-grade 3D printer by Ackuretta is now available from Primotec. It is designed with digital dentistry in mind to produce smooth, very accurate, high-resolution models and biocompatible prints. The new printer is based on an open-material platform so it serves a multitude of applications including dentures and temps.

Primotec
203-682-6429 | primotecusa.com

editor's choice

An anti-fog coating provides superior optical clarity.

FACE SHIELD FOR LOUPES

iVisor™ Loupe

Featuring a large breathing room that comfortably fits over optical accessories and extra wide air vents for maximum airflow, the iVisor Loupe is described as the company's most comfortable reusable visor and shield kit. An adjustable cinch cord and thick foam bumper provide exceptional user comfort. Visor and shields can be easily decontaminated by cold sterilization for reuse. It easily fits over glasses, loupes, and lights and is designed to protect against sprays, splashes, and spatter of bodily fluids. Shields can be reused after contamination by simply washing with warm water and soap or cleaning with a disinfectant solution. Available in three sizes with a respective rear opening of 8, 9, and 10 cm.

Pac-Dent, Inc.
909-839-0888 | pac-dent.com

3D PRINTERS

PRO 4K

The new PRO 4K large format 3D printers from Asiga are open-material printers for 385 nm resins and feature custom-engineered optics for precision pixel placement, reliability, and super-fast print mode for large batches of virtually all resins. They utilize Asiga's SPSTM Smart Positioning System Technology that ensures the build platform is in the correct position when forming each layer, providing repeatable accuracy and production continuity. Affordable (under $25,000) large-format DLP printers are available in both 65 µm (176.5 x 99 x 200 mm build volume) and 80 µm (217 x 122 x 200 mm build volume) resolution versions in two printing modes: the Native mode for the defined exposure of pixels for specialty applications, and the Standard 4K mode.

Whip Mix, Inc.
800-626-5651 | whipmix.com

ZIRCONIA DISCS

GenesisZr™

Using the highest quality Tosoh powder, GenesisZr is made in America and sold direct to labs with no middle man. GenesisZr zirconia starter kits include: 1 - 98 x 12 mm Puck (Other Sizes Available); 1 - 50 ml Origin Chroma Coloring Liquid—One color of liquid of your choice will be Free with the first 16 discs purchased (any size disk); 1 - Sorting Bin (Up to 16 bins with your first 16 discs purchased); 1 - AMS Incisal Tone Sample—One sample Incisal of each Tone is free up to 5 Jars with the first 5 discs purchased; 1 – Brush (one free brush with first order). FDA 510K Cleared, benefits include: High Translucent: 47%; Strength: 1,100 MPa; Indicated for anterior, posterior and bridge cases.

AmericaSmiles Network
708-746-5730 | americasmiles.net

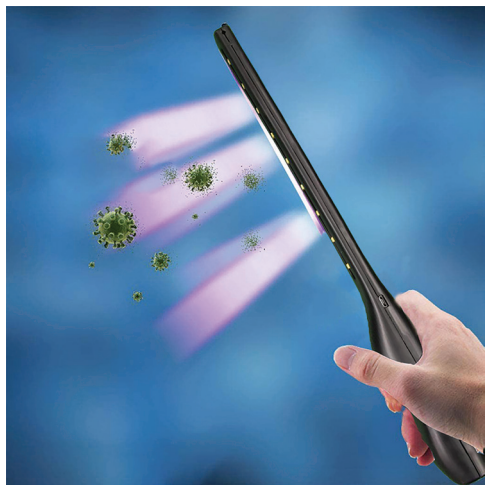
DENTURE RESIN

Lucitone Digital Print 3D Denture Resin

Optimized for 3D printing in Carbon M-Series printers, Lucitone Digital Print 3D Denture Resin is the next generation of the successful, high-impact Lucitone denture base. This denture resin features Body-Activated Material, a smart polymer technology that permits the finished denture to immediately respond to body temperature while being worn, and provides amplified material properties resisting breakage and preventing the worsening of any existing cracks or fractures. This attribute is accomplished by the material's thermally responsive reaction causing a twofold increase in the work-of-fracture material property. This strengthening of the appliance is undetectable by the patient.

Dentsply Sirona
844-848-0137 | dentplsysirona.com

new products



DISINFECTANT DEVICE

UVC LED Disinfectant Wand

The UVC LED Disinfectant Wand is designed to disinfect dental cameras, smart phones, tablets, keyboards, keys, and virtually any item around the office that doesn't lend itself to chemical sterilization. The 265-280 nm range LED wand is designed to eliminate up to 99.9% of the harmful germs, virus and bacteria in any surrounding.

Lester Dine, Inc.
561-624-9100 | dinecorp.com

CLEAR ALIGNERS

ClearCorrect NOW

ClearCorrect's first remote clear aligner treatment solution, ClearCorrect NOW, is a fully clinician-directed teledentistry aligner solution that can help keep patients and clinicians safe in the midst of a pandemic. ClearCorrect NOW gives patients the option of completely virtual treatment, or they can choose to delay in-office procedures. Patients will start with a virtual consultation using the DentToGo™ platform. The clinician will enter a treatment prescription and aligners will be shipped to the patient, with the clinician monitoring progress remotely.

ClearCorrect
888-331-3323 | clearcorrect.com

SHOE SANITIZING STATION

The UVZone Shoe Sanitizing Station

The UVZone Shoe Sanitizing Station is the first and only proactive disinfection solution that uses a patented combination of Ozone + UV-C light for superior disinfection results. This combination is said to be 110x more powerful at eliminating pathogens than using UV light alone. It has been proven to eliminate coronavirus, MRSA, C. diff, E. coli, Candida Auris, Staphylococcus Aureus, Klebsiella Pneumonia, and other similar pathogens in 8 seconds, resulting in cleaner and safer environments. In conjunction with current practices such as using booties, shoe baths, and sticky mats, this is an additional layer of protection for your infection prevention program, particularly in high-risk areas.

PathO3Gen Solutions
727-300-1069 | patho3gen.com

FACE SHIELDS

Great Lakes FACE SHIELDS

Great Lakes FACE SHIELDS are constructed with medical-grade, optically clear PETG thermoplastic and designed to protect against aerosols, sprays, droplets, and mists. Accommodates most dental loupes, safety glasses, and masks.

Great Lakes Dental Technologies
800- 828-7626 | greatlakesdentaltech.com

Form 3B

Complete Package

High quality, high throughput 3D printing for $5,999

INDUSTRY-LEADING PHONE AND EMAIL SUPPORT

10+ EXCLUSIVE DENTAL MATERIALS

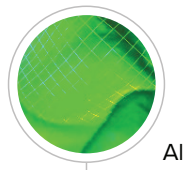
THE BEST DENTAL 3D PRINTER ON THE MARKET

AUTOMATED WASH AND CURE UNITS

Print Volume

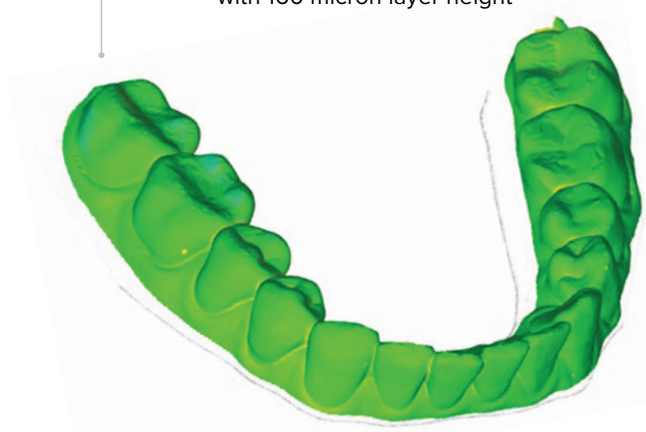
Optimize your most precious resource — your staff's time — by bundling multiple jobs in larger prints.

Accuracy Study



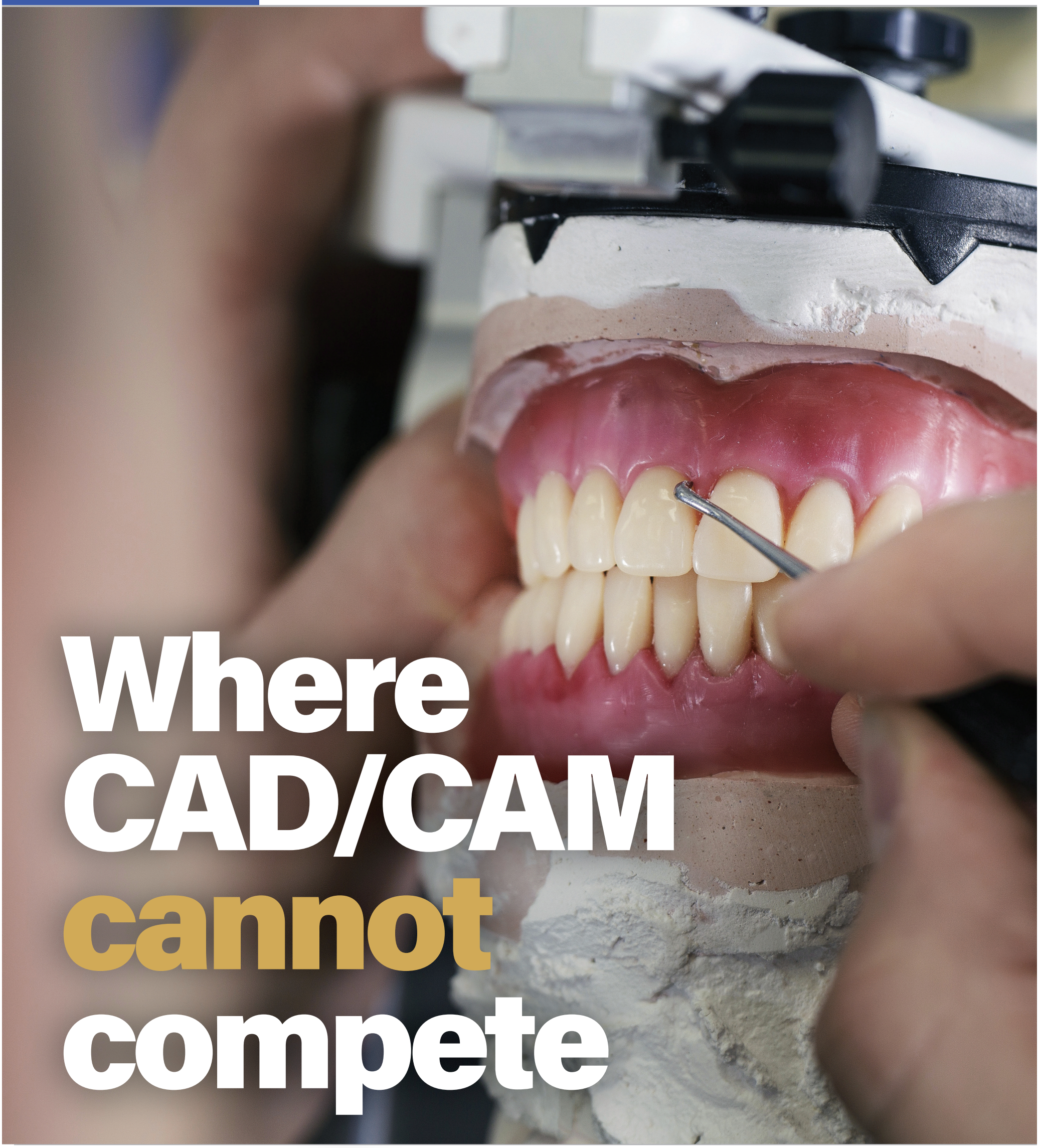
93% ± 6% within 100 µm accuracy or better.

Aligner model printed in Grey Resin with 160 micron layer height

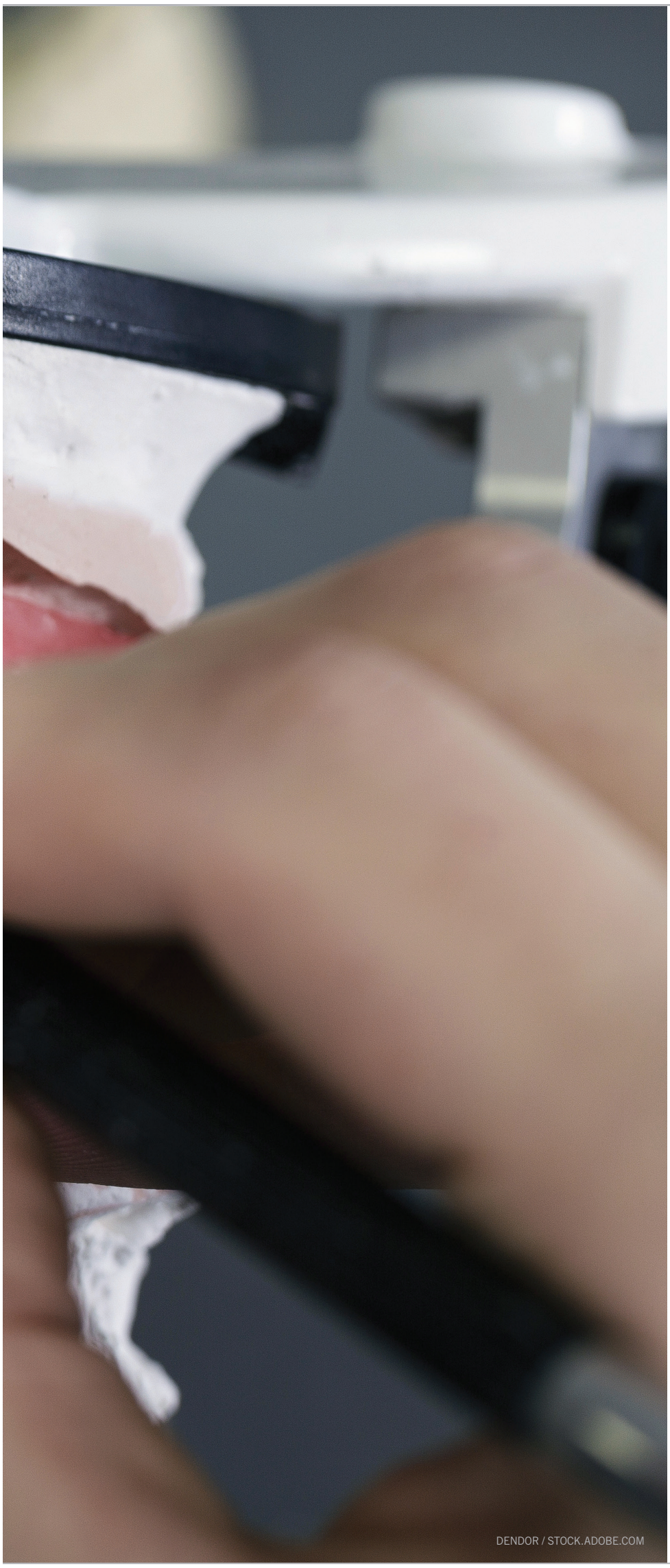


formlabs | dental

dental.formlabs.com



Where CAD/CAM cannot compete


DENDOR / STOCK.ADOBE.COM

Dental labs can still succeed with traditional techniques and approaches

by Robert Elsenpeter

Since the late 18th century, London's Savile Row has been home to the world's most exclusive bespoke tailors. A single custom-fit, hand-stitched suit can cost thousands of dollars, taking up to 12 weeks to deliver. Conversely, an individual can go to a department store and get something off the rack for a couple of hundred dollars. It's a lot of money to spend on a suit, but buying something that's handcrafted rather than mass-produced adds a certain element of attention to detail and élan.

A similar comparison exists between traditional, handmade restorations and CAD/CAM restorations that are gaining in popularity and prevalence. That is not to suggest, however, that one type of restoration is better than the other. Each has its merits and benefits, but for all the attention that CAD/CAM receives, labs shouldn't forget the distinctions of analog restorations.

Attention to Detail

Like Savile Row's suits, analog restorations are delivered thanks to the skilled eyes and hands of craftspeople. "For me it's signature," says Sasha Der Avanessian, founder and CEO of Harvest Dental Products in Berea, California. "People are going to differentiate themselves with their signature and [by spending] more time on esthetics, more time on the things that actually separate you, the things that move you into a different light. I'm a big believer in allowing yourself to spend more time on things that actually separate you in your work."

Analog restorations also give technicians the opportunity to demonstrate their knowledge of form and function, Der Avanessian says. "From a theory standpoint, analog is important because it teaches us the theories of function and occlusion," he notes. "And from a training standpoint, there still needs to be a real focus on analog for that knowledge of form and function."

The human eye, with its attention to detail, can ferret out the subtleties that a computer might miss. "I see a situation, and I can go back to the doctor," says Tom Zaleske, owner of Matrix Dental Laboratory and Consulting in Crown Point, Indiana. "I alert them to that situation. I can help steer the case. In other words, dental technicians with a knowledge base can provide oversight. We're the technical resource for the doctor. What can and can't we do? What do I see once I get the impression poured up? It could be a dozen different questions."

Technicians training with a mouse or a stylus on a CAD/CAM design system, for instance, might not know what to look for, Zaleske says. They're trained to move the mouse to a certain position based on a ridge, whereas hand-skilled technicians see what others miss, he adds.

Because CAD/CAM is so efficient and reproducible, practices expect more output from technicians with the required skill set. As a result,

Dental technicians can provide oversight, and human interaction provides a layer of quality control that a computer can't offer.

CAD/CAM technicians simply don't have the resources to spend with each case. Zaleske observes, "If a guy is sitting at a machine and he's running the mouse or pen and designing stuff, he hasn't got time. He's got to get them out the door. It turns into a widget. It becomes commoditized. So, with commoditization, like the guy at the coat hanger factory, he isn't saying, 'Hey, that loop doesn't look right,' because there are about 10,000 of those cranked out every hour."

Human interaction, however, provides a layer of quality control that the computer can't achieve. The analog technique allows technicians to add a finishing touch to the shape, says Richard Wills, owner of Duece Dental in Wichita Falls, Texas.

"I can sit there and tweak it a little bit," Wills says. "I can look at the computer screen and get shapes figured out, but you've still got to put your hands on it and give it just a little finishing touch…a little bit of tweaking to get the shape that you just couldn't see in that picture."

Not every restoration requires grueling attention to detail. However, those that do, benefit from the human eye, especially when esthetics are critical. A hands-on approach adds a refinement that is hard to achieve digitally, Wills says. "The ones that look really nice, that's where the analog comes in—putting your hands on it to give it that finesse. And I'm sure there are people out there who say they can get that done digitally, but I'm sure they still put their hands on it before they send it out the door," he adds.

One of CAD/CAM's pros is also one of its cons. Its comprehensive tooth design library files, though they provide the tooth shapes that labs need, end up lacking personality. The result is technicians use the same files to print similar-looking crowns, Zaleske says. "It's going to be the same way with dentures. Everybody's going to use the same files; everything's going to start looking the same," he notes.

This also poses a business quandary for the lab: If all patients' restorations look the same, how does the lab differentiate itself?

"How do you stand apart?" Zaleske asks. "Will you stand apart from everybody else because you have to charge less? I've heard all the stories: 'Oh yeah, you've got to service the account.' OK, get past servicing the account, get past everything else. It comes down to price then, because there is no individuality. They all look the same."

Skill

Most of the form and function benefits that the analog workflow afford are, quite simply, due to the training and skill of the lab technician. For instance, training and proficiency pay off when it comes to lighting, according to Dane Barlow, owner of Smiles by Dane in Boise, Idaho.

"I've had designers send me cases, and they couldn't see that the light source was causing a certain shadowing, making them think that it was pointing a certain way," Barlow says. This is similar to a dentist sitting on one side of the patient, with the teeth all facing in one direction, he adds. The teeth are parallel across the mouth and lean toward the side that the dentist is working on.

"As a technician, we have to understand these things," Barlow continues. "And how many years did analog technicians sit in a corner with a light coming through a window on one side and carve their wax incorrectly? I've had technicians do that, and I had to move them to a different part of the room. 'OK, here's your new station. This is where you're going to work from now on because the lighting is directly overhead or directly from the window.' So, they would be able to see an equal shadow on each side. That same problem exists in software. And if they don't know to look for it, if my world has been arches from the beginning and not single tooth, they don't understand the cosmetics and the balance of it."

"For me, it's about signature. People are going to differentiate themselves with their signature…the things that move you into a different light."

—SASHA DER AVANESSIAN, HARVEST DENTAL

Spartan Dental Lab in Lansing, Michigan, has been part of David Turpin's family for four generations, more than 60 years. Digital wasn't an immediate adoption for the lab, but when it was added, it underscored the place of analog workflows. That is, digital works for some things, but analog still delivers, especially when a technician's skilled eye and hand are needed.

"My dad and I, we butted heads for a little while about whether it's more efficient, and it is more efficient because we can cut out steps," Turpin says. "But analog has its benefits because it's a little easier to put the art back into it. Digital kind of commoditizes the industry a bit. People liked my grandfather, who took over from his father, and they came to him because of his artistry. Now it's a little more commoditized. With digital, we're losing that touch a little bit."

A deeper connection exists between technicians in the analog world, who are craftspeople at heart, and their creations, Der Avanessian says. For analog technicians, the digitized process is less intimate and pulls them away from the creativity they bring to a traditional technique, he notes.

"It's self-actualization of the dental technician," Der Avanessian says. "The areas of creativity and esthetics and art—those were the areas that dental technicians really took a lot of pride in. You never really heard a lot about, 'Look at how good this substructure was made.' You need to have the function of a substructure. It needs to be designed with integrity, with minimum thicknesses…But at the end of the day, I think that opportunities to connect dental technicians back to loving what they do [center on] the touch, feel, and, sculpt elements of dental technology."

Regrettably, sometimes that lack of skill or attention to detail is lost on patients and dentists. Patients have never experienced the difference, and dentists with limited educational or practice exposure have preconceived notions about prosthetics, Zaleske says. For him, crafting dental prosthetics is a necessity, and they are not analogous to handmade suits.

"This isn't an elective thing that we do," Zaleske says. "Suits are

an elective thing. If you decide that you want a better suit, something that looks nicer, that fits better, you have to decide whether to buy it off the rack or pay thousands of dollars to have one custom-made. But at its core, we make a custom dental prosthetic for somebody who has lost their teeth to disease or an accident. It's just like somebody who would make a facial prosthetic."

Costs

In any business, costs matter, and whether analog or digital is more expensive depends on the lab and how it works. "Some processes, like the digital dentures, don't cost less," Turpin says. "I think it's more of a wash in the cost of materials, but the machines are very expensive. So, I think that even on the material costs, it's more the amount of labor that you save doing it."

Materials for digital cost less compared with analog, but the equipment that uses the material is not cheap, Wills adds. He spends more on labor for analog than for digital, so his lab is saving on the number of individuals it needs to hire, he says. "With analog, you don't have the equipment expense; you've just got manpower," he observes.

CAD/CAM machines are just that—machines. They can be expensive and eventually become obsolete. Zaleske compares this to the music industry, which has moved from records to 8-tracks to cassettes to CDs and now, digital downloads. Eventually, one technology is phased out in favor of something shiny and new.

"[When] you buy a piece of equipment like that, you have an investment," Zaleske says. "It's a capital equipment investment, and it has a certain shelf life. It's like everything. Well, that equipment has a shelf life. It's only going to manufacture for you for so long before the next latest and greatest thing comes along because that's the *modus operandi* of manufacturing. You trickle it out. You get a bunch of people invested in the technology, and then you milk them along. After 3 years, if the machine hasn't paid for itself, you're looking for a lease on a new machine."

Labs should not base their value entirely on price but also on behaviors that make them more valuable than what they do, Der Avanessian suggests. He recommends innovating behavior to make a lab unique. At the end of the day, competition only exists where a lab's value does not, he says.

"We hear about the race to the bottom a lot," Der Avanessian says. "And to me, the race to the bottom is a territory. And the people who engage in that race are people who have not created a value proposition more valuable than their crown, which then makes price their only differentiator. I believe that you can be a profitable laboratory, whether you are milling your crown or not. The hard truth is that the market does not need another crown; it needs you. Your thumbprint tells you that you have no competitor. Act on that."

Speed

It may seem counterintuitive, but in some cases, doing the work by hand can be faster than following a digital process. That is often the case when using a new design system. Digital tends to be a very slow process when a technician is getting started, Barlow says, and the transition isn't necessarily easy.

Like all new technology, CAD/CAM machines can become obsolete and phased out.

For example, if a lab spends $3,000 on a computer that's well designed for nesting, it would absolutely perform calculations faster. However, if the computer calculates through 80 or 90 percent when trying to set arches and it fails, a redesign may be necessary, Barlow says. And it can fail multiple times before the technician understands whether the issue lies with the nesting software or the design software.

"When you buy new equipment, it has a certain shelf life. It's only going to manufacture for so long before the next latest and greatest thing comes along."

—THOMAS ZALESKE, MATRIX DENTAL LAB

"On the back end, once you start to understand what it's doing wrong, you avoid that early on in your design completely," Barlow says. "That's something not every designer understands either. You have [one] person [doing] the nesting and [another] doing design. And if they're not in great communication, the designer doesn't know what he's supposed to do to help the nesting software, and the guy who is providing the nesting has a hand in getting those designs to work. So, it does take a lot of communication and active learning to actually get the results that you want, which is efficiency and how things move correctly."

Labs can regularly update CAD systems' software with new functions and features, which is a plus. However, this can also become an unexpected obstacle for designers as options are changed out and don't function as planned, Barlow says. Even if the technician and lab are producing digital products, they need a foundation in the functionality of the analog world.

"Everything we do digitally, if you have not done analog, you have no business doing it digitally," Barlow says. "I just added a technician, walked up, and looked at the screen and said, 'OK, well, how did you determine your orientation on a screen?' 'Well, I just said OK to that.' 'So that means you looked at the model work that's on-screen and just arbitrarily determined that the face looks a certain way?' 'If you were doing this analog and had articulated it in the articulator, what would you do?' [The tech said] 'I would print out the photo of the patient with a grid or a retracted view. I would then orient what I'm looking at in the articulator.' I said, 'Great, so why haven't you done that digitally, set a new custom view? Why did you just arbitrarily make it look like the stone arch is perfect?'"

Quality control for digital cases necessitates a need for a knowledge of function, the kind of knowledge that comes from having worked in the analog world. Even if a technician does send out a wrong case, the ceramist would ideally catch the mistake, usually by using analog and verifying with a photograph to make sure it's articulated correctly, Barlow says.

"It really does require that people are following analog procedures, even in a digital space. There are lot of fun things to look at in software, but if they're not working correctly yet, then it's best to avoid them and not suffer the consequences or additional loss. It takes great technicians who understand analog to still teach and do their job in a digital workspace," Barlow says.

Materials for digital cost less compared to analog materials, but the equipment that uses the material is often expensive.

Education

Although the appeal of digital includes speed, efficiency, and consistency, some would argue that an understanding of anatomy and of function gets lost in the workflow. It's the sort of foundation learned in a formal setting. However, dental labs are struggling to find new technicians, according to Turpin.

"I know from talking to a lot of other labs that the problem with not going digital is the lack of technicians out there," Turpin says. "It takes quite a bit of time to train them. Either you can find a great analog technician who is not very good with computers, or you can find someone who's really great with computers, but they're not a technician. There are only 13 schools in the country and, according to the NADL [National Association of Dental Laboratories] at a meeting I was at a few months ago, there were about 300 graduates in 2018. There are just shy of 6,000 dental labs in the United States, so not a lot are finding technicians. It's harder to scale from a business aspect."

As cases get more complex, the need for that education becomes even more apparent. There is a lack of formal education in the field, Zaleske says. Compounding that problem are individuals outsourcing and using offshore products from countries such as China, he explains.

"Because of that reason, labs had to find a way to compete. First off, owners, if you have a larger laboratory, you've got to find technicians," Zaleske says. "Well, if there are no technicians around, you have to either create them in-house or look outside for another source to do that. It's very distasteful for many people to use outsourcing. They'd like to keep it domestic. Labs have to look at how we can compete with China basically. What happened was that some of our larger laboratory groups and independent laboratories looked around and said, 'Well, we don't have enough people. We're competing against China. We've got to bring in some sort of automation. We've got to find a way to fill those positions that would ordinarily be filled with human beings.'"

But that doesn't mean that labs need to pick sides; a place exists for both analog and digital workflows. No lab can survive in a digital-only space or an analog-only space; labs need both to get by, and Der Avanessian believes the industry needs to define a middle ground.

"I think there's really an opportunity for growth in both areas," Der Avanessian says. "But I think we've kind of drawn a line right down the middle of our industry, and we've pushed digital to the left and analog to the right. My question is: What do we call the middle? Because the middle is actually where we live."

As for form and function, digital allows technicians to automate the areas that they don't compete on, so they can spend more time on the things that make them unique, Der Avanessian says. "It comes back to that idea of signature—your signature esthetic and, most of all, the exclusive behavior you possess and deploy at every human touch point where your dentist interacts with your lab. This is ultimately what's going to separate you," he explains.

"It requires that people are following analog procedures, even in a digital space. It takes great technicians who understand analog to teach and do their job in a digital space."

—DANE BARLOW, SMILES BY DANE

That signature is a source of pride for the analog craftsperson, Wills adds, because technicians put a lot of pride into their work. This is the biggest difference between analog and digital, he notes.

"I'm sure there are lots of people out there who will argue against me on that. But if you put your heart and soul into working with your hands and making something look beautiful, that goes a long way," Wills says. "I think that the digital method is just out there. [It's] the cash cow because you can crank out a lot of work and make a lot of money without really knowing more than how a crown should look on the computer and stain and glaze it."

From a functional standpoint, the suits fashioned in Savile Row are, by and large, no different from the ones found on a department store rack. The same can be said of restorations crafted by hand or created digitally. However, each method has its own advantages. Handmade restorations offer an element of personalization, the same element of care and craftsmanship that goes into those bespoke suits.

Images courtesy of Matrix Dental Laboratory and Consulting.

Precision and reliability are the keys to a dental furnace

compiled by Noah Levine

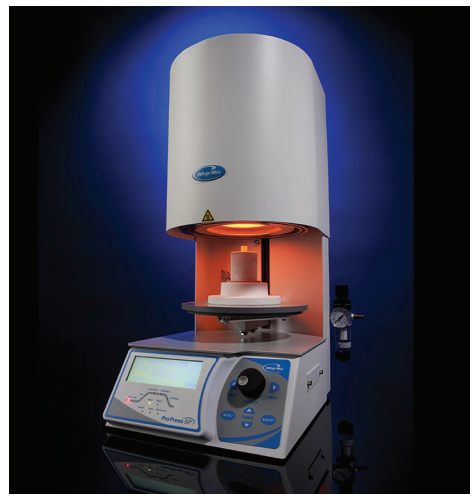
ANY DENTAL LAB WORKING with ceramic materials is familiar with the stress that ensues once a furnace starts its cycle. Whether firing ceramics, sintering zirconia or pressing glass ceramics, dental lab furnaces are a closed system that is relied on to perform to precise specifications in order to achieve optimal results. If something goes wrong within the furnace, it might not be recognized until it is too late to save the restoration. The good news is modern furnaces are designed for reliability and reproducibility, and many of the latest systems feature a range of automatic processes, sensors and indicators to produce quality results in less time, every time. Furnaces are designed for regular use and firing cycles can be easily customized to achieve designed results with any material. Here are some of the furnaces available to dental labs. ●

RH2010 / STOCK.ADOBE.COM

Programat P710

- Features infrared technology capable of speeding up the firing process by up to 20 percent
- Thermal imaging camera measures the surface temperature of object being fired to customize and automate pre-drying and closing processes
- Provides consistent, high-quality firing results and reduces cracks in ceramics
- Integrated digital shade assistant
- Multimedia screen functions as PDF reader

Ivoclar Vivadent
716-691-0010 | ivoclarvivadent.us



ProPress SP

- Provides optimal pressing control with automatic monitoring of the flow of glass and movement of the ceramic into the ring to increase the likelihood of a complete press
- Provides fast pressing with more successful units per ring
- Minimizes or eliminates the reaction layer
- Capable of successfully pressing, even with cracked molds

Whip Mix
800-626-5651 | whipmix.com

Master Plus

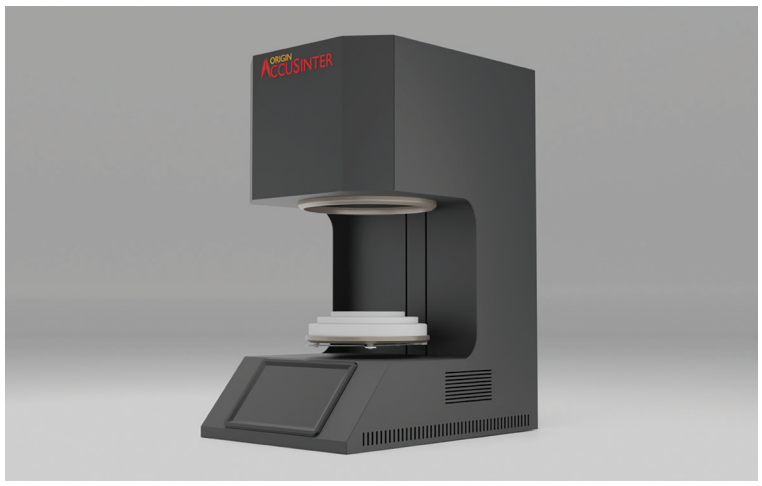
- Designed to be compact and easy to use, it is programmable with up to 500 custom courses available
- Comes with 160 preprogrammed courses which can be customized
- 2-step firing processes can be saved to 30 courses
- Manual mode allows setting changes during firing

KDF U.S.
310-320-6633 | kdfus.com

VITA VACUMAT® 6000 M

- A microprocessor-controlled firing furnace for all dental ceramics, it is ergonomic in design and features two cooling trays for safe storage of fired restorations
- Automated features include prevention of firing chamber condensation, automatic temperature adjustment, and automatic cleaning
- Operated by a VITA vPad control unit that can be shared with up to four furnaces
- Easy to use with intuitive menu navigation

VITA North America
800-828-3839 | vitanorthamerica.com



Origin AccuSinter

- Designed to be user friendly with optimal performance
- The smaller chamber size offers enhanced heat distribution control
- Compact size saves counter space, and stainless steel construction and internal fan and ventilation system keeps external temperature low
- High resolution touchscreen LCD monitor
- Programmable with custom cycles available for different materials
- Can fit up to 3 sintering trays and an average of 75 units per cycle

B&D Dental Technologies
800-255-2839 | bnddental.com

Ceramill Therm 3

- Provides consistent temperature control and even temperature distribution in the firing chamber
- Can store up to 250 firing programs with 3 pre-programmed for validated firing protocols
- Features three stackable sintering bowls
- Simple operation
- USB interface for documentation and program updates

Amann Girrbach
800-851-3719 | amanngirrbach.us

Multimat Cube

- A universal furnace designed for use with all dental ceramics, it provides mutli-stage heating and two-stage cooling and automation features for process reliability
- The mobile furnace chamber balances out vibrations
- Operated via an intuitive touchscreen display which keeps technicians informed of the status of ongoing firing processes
- Minimalistic design fits into any lab

Dentsply Sirona
844-848-0137 | dentsplysirona.com

Zirkonofen 700

- Features four $MoSi_2$ heating elements
- Comes with 12 preset programs with special sintering programs available on request
- Features a large combustion chamber and controlled cooling
- Upgradeable to the Zirkonofen 700 Ultra-Vakuum sintering furnace

Zirkonzahn
678-441-9419 | zirkonzahn.com

LHT 02/17 LB Speed

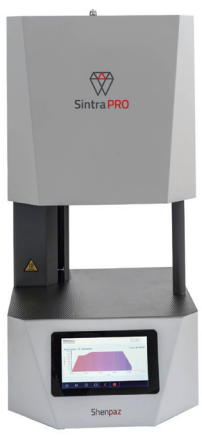
- Featuring a maximum temperature of 1,650° C and a large chamber, the furnace is designed for sintering zirconia
- Includes both drying and forced cooling functions and it is designed to stay open with a gap during initial heating to allow reliable moisture removal
- Up to 50 custom programs for use with any commercial zirconia
- Total cycle times can be as short as two and a half hours
- All around furnace chamber heating helps keep temperatures uniform

Nabertherm
302-322-3665 | nabertherm.com

Vario Press 300.eZr

- Features an Advanced Press process that ensures uniform temperature distribution so pressing takes place at ideal temperature within the ring to reduce reaction layer generation and increase pressing speed
- TTC Mode takes advantage of software and the firing chamber design to enable linear cooling, which can prevent chips and microfractures in zirconia restorations
- A tripod insert beneath the firing ring helps create uniform heat
- Automated drying adjusts the lift position for ideal dry cycles

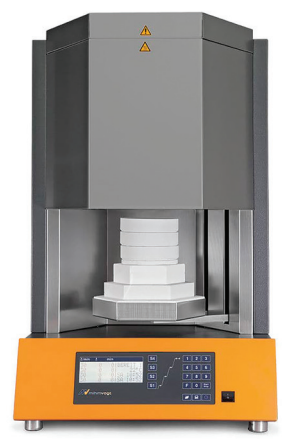
Zubler USA
770-921-2131 | zublerusa.com



Sintra Pro

- Intuitive touchscreen display makes programming simple and multi-stage programs are illustrated on a graph with elapsed time indicated by color change
- Completely customizable cycles make the furnace compatible with a wide range of zirconias
- Remote connection allows the furnace to be operated and monitored from a PC, smartphone, or tablet
- Fast cycles are available for specific zirconia materials
- Unique degassing design helps extend the life of the muffle

Shenpaz
info@shenpaz.com | shenpaz.com



HT-2/M/Zircon-120

- Features high-quality molybdenum-disilicide heating elements and can reach a maximum temperature of 1,650° C
- Capable of 4-steps and up to 30 programs
- Designed to process 75 to 90 crowns in a single cycle

Axsys Dental
248-926-8810 | axsysdental.com

A benchtop printer ready for a range of tasks

With SHINING 3D's AccuFab-D1 Dental 3D Printer available via Aurident, dental labs can quickly and easily add a range of additive workflows.

compiled by Noah Levine | information provided by Aurident

Aurident
800-422-7373 | aurident.com

THE PROBLEM

It can be difficult to figure out where to begin with 3D printing

With so many systems available, finding an easy-to-use system that offers a wide range of options in materials and applications is challenging.

THE SOLUTION

AccuFab-D1 Dental 3D Printer

- Provides high resolution output across multiple applications and material options
- Ideal for those new and experienced with 3D printing
- Easy-to-use software with automatic support creations simplifies print set up as well as post processing
- A large print volume and print speeds of up to 40 mm/hour allow it to produce up to 120 wax-up crowns in 45 minutes or 4 arch models in an hour
- Applications include dental models, wax-ups, surgical guides, custom impression trays, bracket transfer trays, and more
- Supports both SHINING 3D print resins and compatible 3rd party print resins
- No annual software fees—software updates are included with the purchase of the unit

HOW TO

Balance digital and analog design

As digital design has advanced, it's become clear that the future of the industry lies somewhere between digital design and human artistry. by Conrad Rensburg, N.D & N.H.D in tech.

Most technicians, trained in the 1990s and before, fully understand the design freedom that a wax-knife, a Bunsen burner, and a block of wax offered. This was a world where a talented artist—with a firm understanding of function, anatomy, esthetics, and a willingness to work long hours—easily ruled the universe.

Unfortunately, this "analog freedom" of creating almost anything imaginable was rather short lived and was quickly replaced by a digital mouse and a computer screen. This digital evolution was ultimately for the better, and through this process, a new breed of super efficient technicians was spawned. This 21st century technician can create amazing prosthetics with this technology while preserving the most valuable asset off all—artistic hands.

Over the last decade we have seen the creation, and subsequent development of many digital design programs, such as 3Shape dental system (3Shape.com), exocad (exocad.com), CEREC inLab (dentsplysirona.com), etc.

At first, most of these softwares focused on fixed restorative processes required to support the multitude of new milling systems and innovative zirconia products on the market. With the introduction of printable and millable denture bases, these software companies quickly stepped up to also supply the industry with a workable denture and partial design module.

3Shape, under the leadership of visionaries such as Rune Fisker, offered a denture module for laboratories as early as 2010. This was long before the industry had the analog ability to produce a functional and esthetic digitally processed denture that was comparable with a hand processed prosthesis.

STL Flexibility

As laboratory owners and technicians wanting to compete in this ever changing digital landscape, it is crucial to not only stay abreast of these technologies, but more importantly understand what mastering its capabilities offers.

In the past, layering glass ceramics, casting alloy substructures, and grasping other hand processes defined a laboratory. Going forward, the ability to manipulate and control the STL file will be the differentiator.

Artistry will never be replaced by machines, but hand processes remain the biggest potential enemy of consistency. A marriage between digital design and human artistry is ultimately the future of this industry.

Up to this point in our evolution, labs have had no choice but to be prosthetic producers guided by manufacturers. A technician's responsibility in the past was mastering the processing of materials driven by suppliers. STL is now allowing technicians to be leaders and innovators, using these materials to support their innovations and through this, differentiate their laboratories from the competition.

The Merging of Fixed and Removable

Many dental laboratories established in the 1990s and before were founded as specialized businesses focusing on either fixed or removable prosthetics. With the introduction of the all-on-four™ concept by Nobel Biocare, the once clearly defined lines differentiating fixed from removable laboratories became blurred. As this concept grew in popularity, many fixed labs found themselves in a situation where a traditional denture wax set-up was required to initiate the process of restoring a fixed hybrid prosthesis.

Absolute Dental Lab faced this same conundrum. Ultimately, the decision, albeit hesitantly, was made to morph into a full services lab.

For almost a decade the Absolute removable division was seen purely as a support department for the fixed aspect, and therefore was never promoted, advertised, or ever considered as a profitable business opportunity.

All the above drastically changed when Dentsply Sirona, in partnership with Carbon 3D printing, launched the new Lucitone 3D Print™ material. This material/technology combination greatly increased production efficiency and yielded high-end esthetics combined with material strength never achievable in a printable prosthesis (**Fig. 1**). This material advancement greatly improved profitability and breathed a breath of fresh air into this once almost forgotten department.

Unfortunately, the corporate Lucitone message was that the technology could only be used for full dentures and offered no initial application for removable partials. As more clinicians became aware of the incomparable strength of this material, the lab received calls on a constant basis requesting a Lucitone 3D printed partial.

The Challenge

Create a partial in a full digital workflow (**Fig. 2**), print the base with Lucitone 3D Print on a Carbon M2 printer and lute/fuse the IPN 3D™ Portrait teeth using Dentsply Sirona's proprietary Lucitone Digital Fuse. Creating this partial, with a custom milled tooth structure in the design software, is as simple as point and click. The goal with this project was to process only with available Dentsply approved components found inside the Lucitone 3D print family. Unfortunately, using the proprietary prefabricated IPN 3D teeth posed a real digital challenge.

The STL Problem

No proprietary Dentsply Sirona supported partial design workflow exists in the 3Shape RPD design module. At the time of this publication the 3Shape RPD module did not have premanufactured tooth libraries available. Even though the IPN 3D DME library exists in the 3Shape denture module the RPD design module relies on traditional custom crown and bridge tooth designs that can be exported for milling of the tooth overlays.

The Solution

The 3Shape RPD module offers a customizable tooth library option through the "scan it library" function. This allows a laboratory the ability to create their own custom tooth library in lieu of using the 3Shape default libraries for their crown design.

This option gave the Absolute team the ability to create an RPD workaround by physically scanning the IPN 3D teeth on a 3Shape E2 benchtop scanner (**Fig. 3**). This effectively created an IPN 3D DME library (**Fig. 4**).

Although initially necessary to scan every mold in the IPN 3D range to build the library, this arduous task is only required once. Furthermore, it is only necessary to scan one quadrant of each tooth card. The "scan it" function has a "mirror current tooth" option which offers the ability to automatically set the contralateral tooth from the DME file.

It is important to note that if interproximal or clearance adjustments are needed, the value of using prefabricated teeth in lieu of a custom designed and milled option becomes questionable.

Because of the aforementioned, 3Shape had no practical reason to offer prefabricated tooth libraries in the RPD module and this should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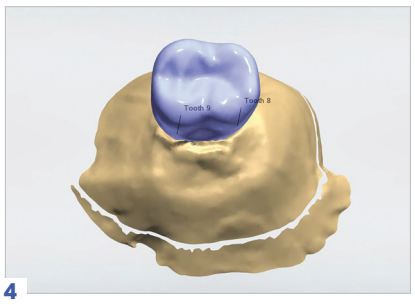

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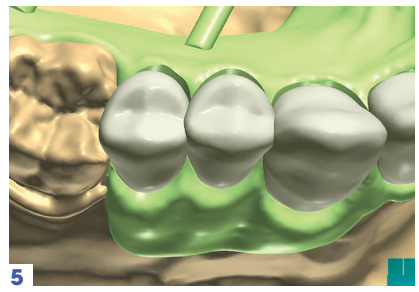
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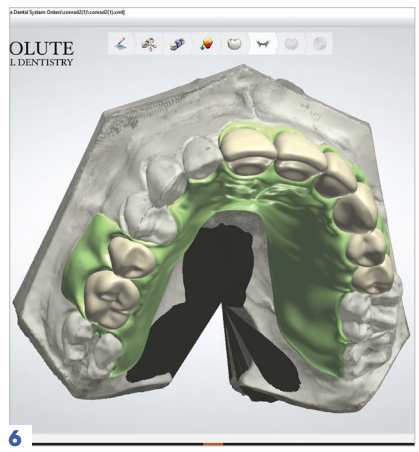

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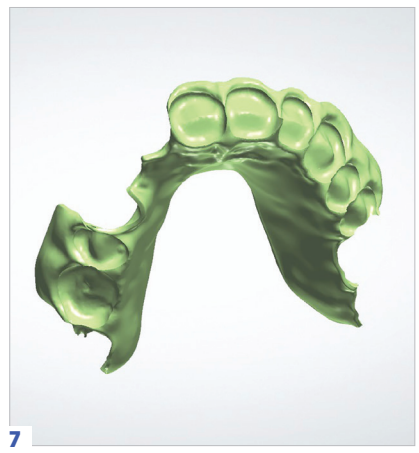
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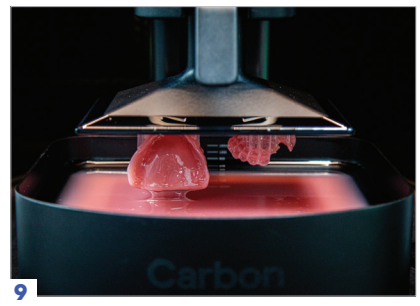

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[at a glance]

1. Lucitone Digital Print denture

2. TRIOS digital impression

3. Creating a DME library

4. DME file ready for design

5. 3Shape RPD design flexibility

6. Proposed partial design

7. Partial base separated and ready for print

8. Lucitone product line

9. Carbon printing

10. Completed partial

11. Lucitone 3D printed partial

12. Absolute Dental Lab ART team

therefore not be seen as a deficiency in the software.

The flexibility of the RPD design module does, however, allow the designer to infringe in the interproximal contact areas if an optimal DME tooth is not available (**Fig. 5**). In this case, those infringements caused over-designed contact areas which had to be adjusted in analog on the printed model.

The advantage that milling a tooth structure offers over printing a base, for luting prefabricated teeth, is the fact that the tooth structures can be customized in the digital design. Those custom designs are milled on spec in the analog fabrication process. The flip side is that milling a tooth structure and denture base, even utilizing the most advanced milling equipment compared to printing the denture base, is simply not efficient or cost-effective in a modern-day production laboratory setting.

To complete an encompassing workflow available for use in all clinical scenarios, the Lucitone Digital print product family requires the addition of millable tooth puck. This addition would also allow the use of this superb product when a custom designed tooth is a requirement.

In Summary

Even though a Lucitone printed partial base is 3 times stronger (3000+ J/m^2) than the minimum required ISO impact standard (900 J/m^2) and more than twice as strong as the well-proven traditional Lucitone 199 (1380 J/m^2), the demand for permanent acrylic partials have all but disappeared.

This digital revolution in the dental industry is only now starting to gather steam, and over the next decade these technologies will grow exponentially in both functionality as well as demand.

The rationale behind this article was not to revitalize interest in acrylic flippers.

Laboratory owners and technicians need to realize that times have already changed. Digital design is the future. Understanding the hidden ability of this new "wax knife" will lead to innovation and innovation will ultimately lead to relevancy.

Acknowledgments: The author would like to recognize Dries van Aarde, Kate Johnson, and Steve Lombardi for their thorough understanding and ability to manipulate the 3Shape design software. Also, ART team members Jack Marrano and Chris Love for their amazing artistry. ●

ABOUT THE AUTHOR

Conrad J. Rensburg is CEO and head of the dental implant division at Absolute Dental Services in North Carolina. He graduated with a 4-year Baccalaureate degree from Pretoria Tech in 1992. He is certified with an ND in technology and specialized with an NHD in fixed prosthetics.

He is a member of the prestigious PEERS association, the Academy of Osseointegration, the American College of Prosthodontists, and registered with the NADL, NCDLA, and certified by the SADTC. He has specialized in fixed and removable dental prosthetics with an emphasis on dental implants since the early 1990s. As a CE-accredited speaker since 2002, he has presented at hundreds of events across the U.S., including the Academy of Osseointegration, Global and U.S. symposiums, World Summit Tours, and a multitude of study club events. Conrad's emphasis as a speaker, is keeping today's clinicians abreast with the latest advancements in restorative protocols and digital workflows related to removable as well as fixed prosthetics. Conrad can be contacted at absolutedentallab.com or conrad@absolutedentalservices.com

HOW TO

Perfect a complete digital manufacturing process to create top-quality removable dentures

Ivoclar Vivadent's Ivotion Digital Denture Innovation works with 3Shape to allow patient-specific customization and great results. by Eric D. Kukucka DD, Canada

FEATURED PRODUCT

Ivotion Denture System

- Comprises a complete digital manufacturing process which allows you to create high-quality removable dentures
- Seamlessly combines materials and processes from Ivoclar Vivadent with scanning and software solutions from 3Shape
- An exclusively developed design software together with coordinated and proven materials, including special manufacturing strategies and state-of-the art milling machines (PrograMill) promise exceptional reliability and consistent, predictable results

Ivoclar Vivadent
716-691-0010
ivoclarvivadent.com

WHAT IS AN INNOVATION?
Innovation is defined as the introduction of something new, a new idea, method, or device. For Ivoclar Vivadent, to further qualify a product as innovative, it must also be easy and very efficient, require fewer clinical appointments, fewer manual working steps, appealing esthetics, individual and functional dentures, ability to shape and morph the teeth, highly efficient manufacturing, and high-quality optimal results for the patient.

"Disruption" is a word you tend to hear quite a lot these days, especially in the digital economy. Contrary to the word's negative connotations, when disruption leads to improvement, it's actually a positive.

Disruption is a process in which existing ways of doing business (products, technologies, services) are replaced and sometimes driven out of use by new technologies. Two examples of disruptive innovations are Uber, which changed the conventional taxi industry, and Netflix, which has rendered traditional video stores virtually obsolete.

Digital Dentures

The Digital Denture Process is an excellent example of disruptive innovation to digital dentistry and as a whole has evolved over the past five years with more than 1,000,000 cases designed in 3Shape Dental Systems. This is no longer a concept, but a ground breaking reality.

Conversely, only 1% of the removable prosthetics manufactured globally are digital. In 2019, 3Shape saw a 250% growth in the number of digital dentures designed. That statistic bears repeating: 250%!

What does all this mean? Earlier I spoke about morphing: so what happens when a company like Ivoclar Vivadent meets innovation? The result: Ivotion. One disc. One milling process. One denture.

Combining proven high-quality tooth and denture base materials in a single bi-color disc, Ivotion provides digital dental laboratories with an efficient, predictable, monolithic milling solution that offers change in the world of digital dentistry, the kind of change that will most certainly be noted in the history books of prosthetics as a pivotal turning point.

The driving factor behind this innovation was to make the production of digital dentures as efficient as possible for a laboratory. And what could be easier than to get a finished denture out of one single disc?

The Ivotion monolithic milling disc features unique Shell Geometry, a data-based three-dimensional tooth and dental arch structure suitable for the rapid digital fabrication of removable upper and lower dentures. It is based on the data of time-tested complete dentures to create this geometry. Shell Geometry defines the transition between the tooth and the denture base sections of the disc.

Integrated exclusively into 3Shape Dental System 2020 CAD software, the digital denture system allows patient-specific customization with the Ivotion tooth library and the coordinated Shell Geometry. Efficient design strategies offer the freedom to customize and morph the shape of individual teeth for optimal retention, stability, function, phonetics, and esthetics.

What makes this process a true innovation is the elimination of the denture tooth bonding process. Dentures are milled in the PrograMill milling unit in one uninterrupted milling process and only need application of surface texture, separation, and polishing prior to delivery—true to the motto that Ivoclar Vivadent has declared: Design. Mill. Finish. Ivotion is the answer to optimal efficiency, as customized monolithic complete dentures are fabricated in a seamless workflow with fewer manual working steps.

Regardless of your clinical record process, the Ivotion Digital Denture Process is designed to provide you with exceptional quality, and a clean, esthetic result that can be digitally preserved indefinitely. Throughout this article I will demonstrate a unique 3-appointment clinical process as well as the laboratory design, mill, and finish process.

Clinical Procedure

Clinical Record options for centric relation records can include occlusal rims, existing denture impressions (reference dentures), Gothic arch tracing with functional final impressions, as well as a unique workflow, that includes two impressions and a centric tray which will be shown in greater detail in the article below (**Figs. 1-3**).

Preliminary Records utilizing Accudent XD, UTS CAD Fixated to Centric Tray to determine Bi-Pupillary Line & Campers Plane (**Figs. 4-5**).


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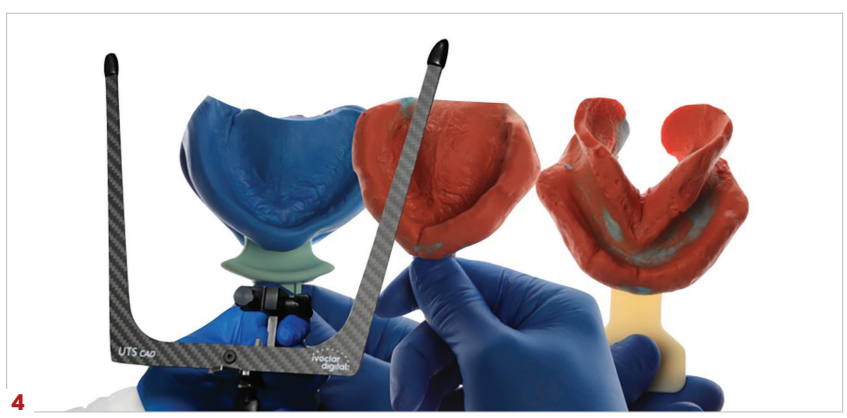

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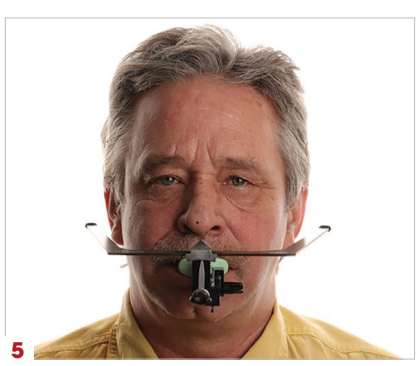
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[at a glance]

1. Options for centric relation records can include occlusal rims.

2. A unique workflow which includes closed mouth functional impressions and Gothic arch pin tracing [Gnathometer CAD].

3. Existing denture with final impressions.

4. Preliminary Records utilizing Accudent XD, Centric Tray and UTS CAD.

5. UTS CAD Fixated to Centric Tray.

6. The scanning of the Centric Tray with the 3shape Impression Fixture.

7. Scanning of the Centric Tray.

8. The Centric Tray Scan maxillary & mandibular side aligned to the maxillary and mandibular impression scans.

9. The maxillary & mandibular impressions as virtually articulated casts with the UTS CAD.

10. Software features a soft (Ivotion S) and bold (Ivotion B) tooth morphology.

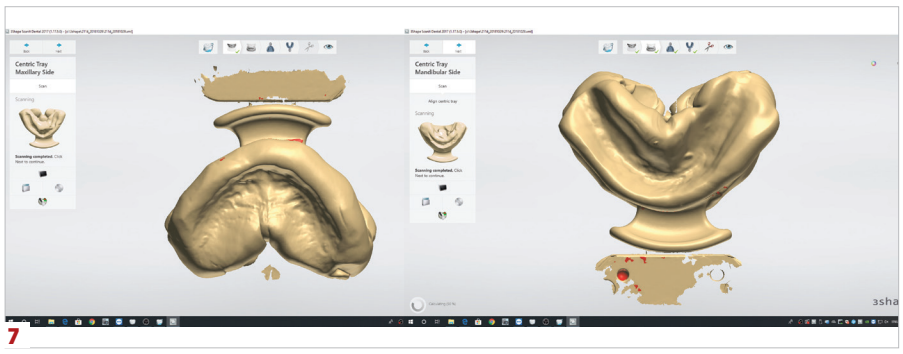
11-12. Evaluation of the Shell Geometry and final Gingiva proposal upper (11) and lower (12).

13. The milling of the Try-in Pro Art CAD Try-in.

14. The intraoral assessment of the Pro Art CAD Try-in.

15. The polymerization process of the tooth and base material occurs while the material is still in its "wet swelling state, creating a true monolithic disc".

16. The PrograMill PM7 performs the first milling steps of milling pink with 5 mm flattening tool.



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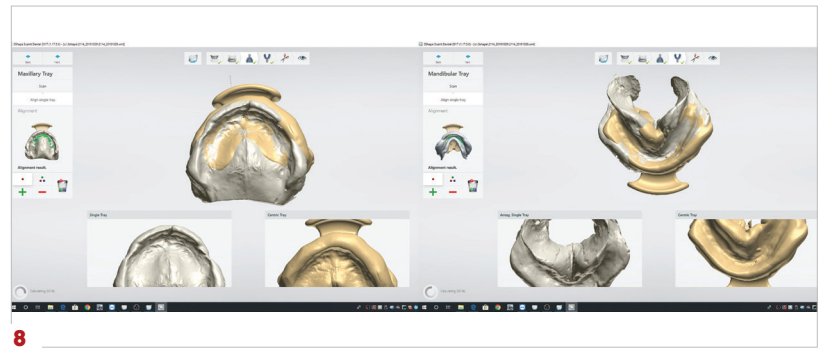

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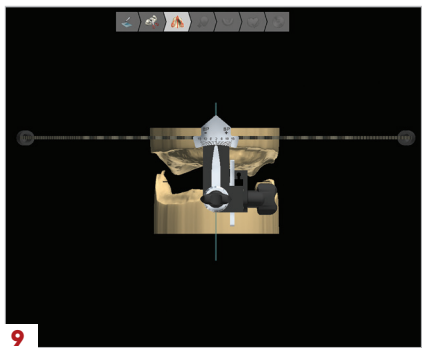
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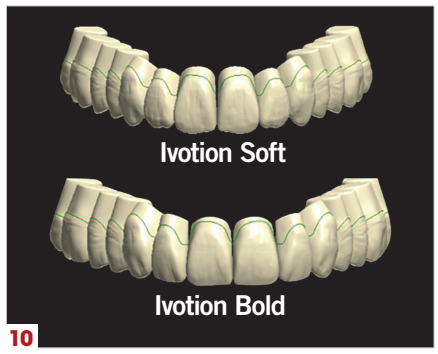

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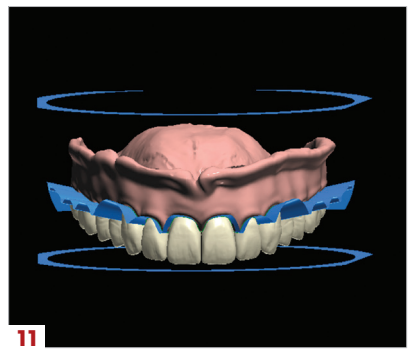
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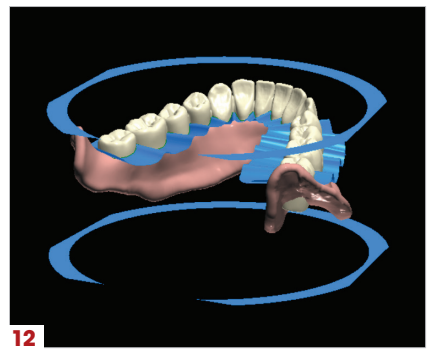
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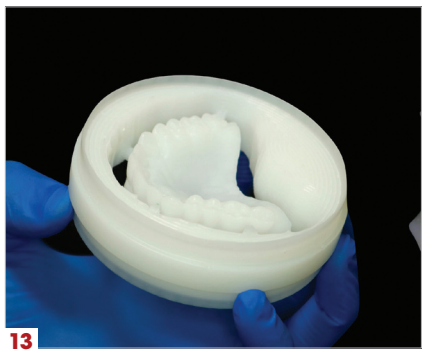
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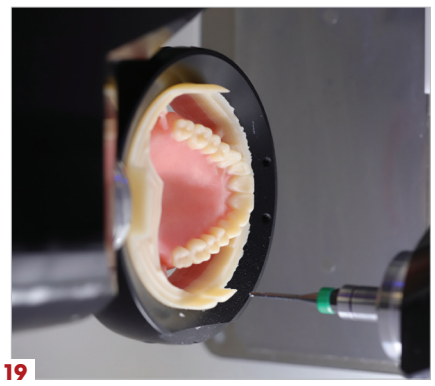
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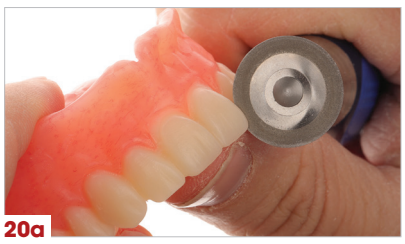
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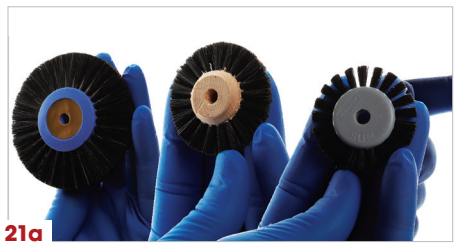
21a


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20b


21b


23


20c

21c

[at a glance]

17. The second milling steps milling white with a 5 mm flattening tool.

18. The monolithic disc being milled where the tooth arch begins to be defined.

19. Final results directly after milling.

20. The finalization includes separation, individualization, vertical, and horizontal surface textures.

21. Polish the denture base with Resilience Pumice and these 3 brushes for optimal smooth and polished surfaces.

22. A clean esthetic final result that can be digitally preserved indefinitely.

23. A look at the patient with the clean esthetic final result.

Laboratory Procedure

The scanning of the Centric Tray with the 3shape Impression Fixture is shown in **Figure 6**. Scanning of the Centric Tray and Maxillary and Mandibular Impressions are illustrated in **Figure 7**. Maxillary and Mandibular impression scans are then aligned to the Centric Tray Scans (**Fig. 8**).

Maxillary and Mandibular mounted casts with Centric Tray Registration and the UTS CAD in the 3Shape software (**Fig. 9**).

Model Analysis, denture base outline, and Initial Proposal of Ivotion (Ivoclar Vivadent) follows, and the arch proposes based on the occlusal plane established by the UTS CAD. The Arches can be arranged with either a Soft or Bold Tooth Mould Utilizing the Phonares II Moulds B and S 70 Series from Ivoclar Vivadent. This mould features slightly abraded incisal edges and a reduced facial curvature but can be morphed and individualized to meet esthetic specifications (**Fig. 10**).

The laboratory does an evaluation of the Ivotion Full arch arrangement proposal, an evaluation of Shell Geometry and final Gingiva proposal (**Figs. 11-12**). **Figure 13** shows the milling of the Try-in Pro Art CAD Try-in. The intraoral assessment of the Pro Art CAD Try-in (**Fig. 14.**) The Shell Geometry is demonstrated.

Note that the polymerization process occurs while the material is still in its "wet swelling state creating a true monolithic disc due to the unique polymerization process" (**Fig. 15a-b**).

The Ivotion Disc demonstrates one monolithic Disc, while the CAM V.4.1 illustrates seamless integration of the CAM5 Ivotion file into the CAM software. This nests the Ivotion Denture directly into the Ivotion disc aligned with the Shell Geometry.

The PrograMill PM7 performs the first milling steps of milling pink and white with 5 mm flattening tool (**Figs. 16-17**). **Figure 18** demonstrates the monolithic disc being milled where the tooth arch begins to be defined, leading to the final results directly after milling (**Fig. 19**).

Final Results After Milling

Ivotion Digital Denture Innovation helps you produce optimal results. The finalization steps include separation, individualization vertical and horizontal surface textures (**Fig. 20a-c**).

Next, polish surface texture and interproximals with Universal polishing base. Polish the denture base with Resilience Pumice and 3 brushes for optimal smooth and polished surfaces, and finalize with Universal Polishing Paste leading to the desired appealing esthetics, individual and functional dentures and high-quality optimal results for the patient (**Fig. 21a-c**).

With Ivotion, customized monolithic complete dentures are fabricated in a seamless workflow with fewer manual working steps. The workflow makes it easy for clinicians to implement and to get great results.

Regardless of your clinical record process, the Ivotion Digital Denture Process is designed to provide you with exceptional quality, and a clean esthetic result that can be digitally preserved indefinitely (**Figs. 22-23**). ●

ABOUT THE AUTHOR

Eric D. Kukucka DD is a denturist from Windsor, Ontario Canada. He is recognized as an important consultant and key opinion leader by Ivoclar Vivadent, 3shape and Nobel Biocare, and has quickly become a respected authority and international lecturer in digital denture technology. In 2014, collaborating with Ivoclar Vivadent, he became the first denturist in North America to beta test digital dentures while the concept was still in its infancy. He continues to work directly with the 3shape and Ivoclar Vivadent R&D teams.

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HOW TO

Perfect the plane truth process

How one laboratory technician uses consistent communication steps to equate to consistent results in the fabrication of removable prosthetics. by Thomas Zaleske

ONE OF THE MOST IMPORTANT laboratory steps in the fabrication of removable prosthetics is the transference of clinical information to the laboratory so they can provide an accurate, translatable form to an articulator for setting clinically prescribed tooth positions. As we know, this information is supplied with an occlusal rim.

A clinical checklist taught in dental and technical schools consists of basic information which enables the laboratory to accurately articulate and set the teeth based on specified markings and trimmed dimensions of the rim. This article will address how my laboratory uses and maintains an easy, tractable, guided way to stay within the parameters of the trimmed rim during set-up and how I illustrate to my clinical partners the importance of taking time to rim trim.

Construction of fixed platforms for most non-adjustable articulators with a mounting system.

- Painters' tape
- Miniature bubble level

- Interlocking construction toy parts
- Plastermin
- Mounting plate of choice for tracing

- Polystyrene sheet (vacuum form material)
- Komet vacuum form cutter H219

In order to maintain and translate the rim dimensions to a repeatable position, this author has relied heavily on fixed occlusal platforms (**Fig. 1**) in conjunction with several articulator systems. These articulators offer the fixed platform as a purchasable feature. Over the years I have realized this feature allows me to: 1) use a rim tracing to keep tooth positions within the horizontal width boundaries, 2) maintain a parallel plane anteriorly and posteriorly established by clinical rim trim to the Campers line as a baseline for tooth arranging (**Fig. 2**), and 3) A documentation tool to communicate prescription fulfillment.

Because many clients rely on laboratories to use non-adjustable articulators which don't have the platform feature or can be expensive, I had to establish a way to accessorize my non-adjustable articulators with an interchangeable fixed platform feature which I will illustrate (**Fig. 3**).

Consistent with either manufacturer supplied or handmade platform is the need to center, mount, and rim trace the maxillary arch. I cover the platform with painters' tape for easy tracing and removal at case conclusion. I have recently found the yellow version works even better (**Fig. 4**). I also use landmark extension lines to allow for centering on platform.

Once the maxillary arch is mounted the mandibular arch is affixed and mounted, you have a photo documentable depiction of the rim mounted on the platform and an outline of the rim that guides the set up. Because the platform is fixed, a baseline to begin a Curve of Spee or lengthen anterior teeth, you never lose angle orientation of the plane (**Fig. 5**).

"When it comes to the fabrication of removable prosthetics, it's very important to take the necessary steps in the transference of clinical information to the laboratory so they can provide an accurate, translatable form to an articulator..."

The Steps

STEP 01 Take a polystyrene sheet, trace a mounting platform shape of your choice, and cut out using a Komet H219 cutter. Finish edges with preferred smooth cut carbide (**Fig. 6**).

STEP 02 Select the mounting plate for the articulator system you prefer. Box the base with painters' tape to contain plaster within the plate boundary. Fill base to a level that coincides nearly with the vertical sweet spot on the articulator (**Fig. 7**).

STEP 03 While it's setting up, place an interlocking construction toy piece modified with a ball of pattern resin on top along with a small bubble level to establish a plane parallel to the floor during the setting of plaster. It helps to use a stiff mix of plaster to avoid pieces from sinking (**Fig. 8**).

STEP 04 Once set, interlock a secondary piece and apply hot glue on top. Immediately center and place occlusal plate along with small bubble level on top of cooling glue. Use the level to adjust plate with a centered bubble. Glue is pliable while cooling so move quickly. Once cool remove plate and inspect (**Fig. 9**).

STEP 05 You now have a removable plate with a base that has been constructed for that particular articulator. You can work on several cases on the same articulator if desired by making several plates as described using the same base (**Figs. 10 and 11**).

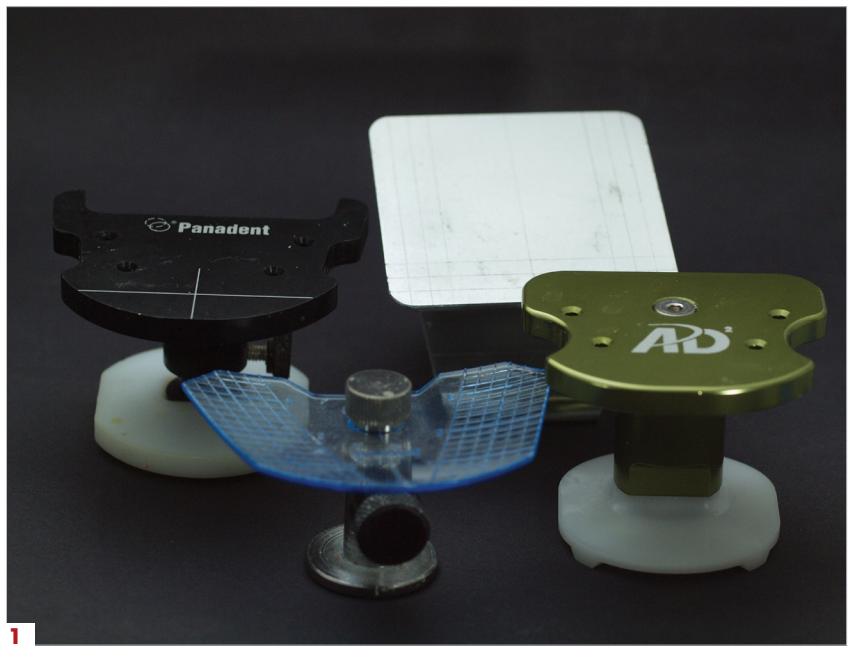
Conclusion

Again, when it comes to the fabrication of removable prosthetics, it's very important for the laboratory to take the necessary steps in the transference of clinical information to the laboratory so they can provide an accurate, translatable form to an articulator for setting clinically prescribed tooth positions.

Here, the author addresses how his laboratory uses and maintains an easy, tractable, guided way to stay within the parameters of the trimmed rim during set-up, as well as how he illustrates to clinical partners the importance of taking time to rim trim. ●

ABOUT THE AUTHOR

Thomas Zaleske is the owner of Matrix Dental Laboratory in Crown Point, Ind., and has more than 34 years of experience in removable prosthodontics. He regularly lectures on providing high-quality service to dentists and, most importantly, to their patients. He can be reached at matrixdental@comcast.net and at zaleske.com.



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[at a glance]

1. Ancillary Fixed platforms for semi and fully adjustable articulators.

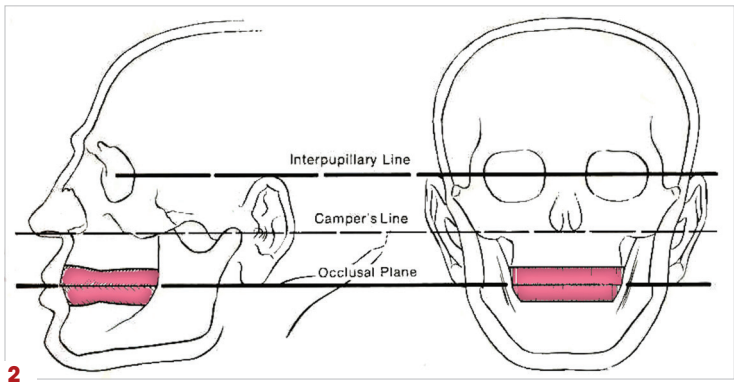
2. Planes and lines which must be communicated, translated, and maintained throughout fabrication of removable prosthetics.

3. Example iterations of handmade occlusal platforms. Before the realization that once the base is made a level mounted below platform is worthless.

4. Centered and ready to mount on AD2 fixed occlusal plate.

5. Occlusal baseline established by the rim and maintained by the rim trace and platform mounting. Serves as an ideal way to photo document case conditions, illustrate prescription fulfillment, and can also provide a great teaching tool.

6. Trace and cut out preferred occlusal plate shape. This is the AD2 plate shape. I use vacuum form polystyrene because its available for other things in my laboratory, but any rigid sheet material will work. Using Komet H219 cutter to facilitate cutting polystyrene.



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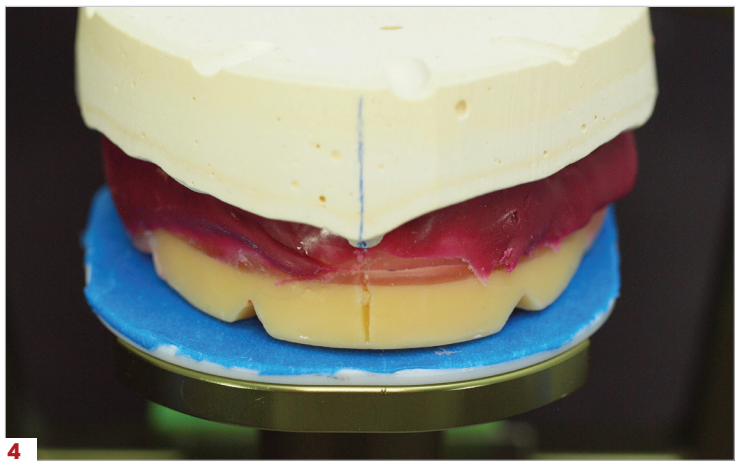
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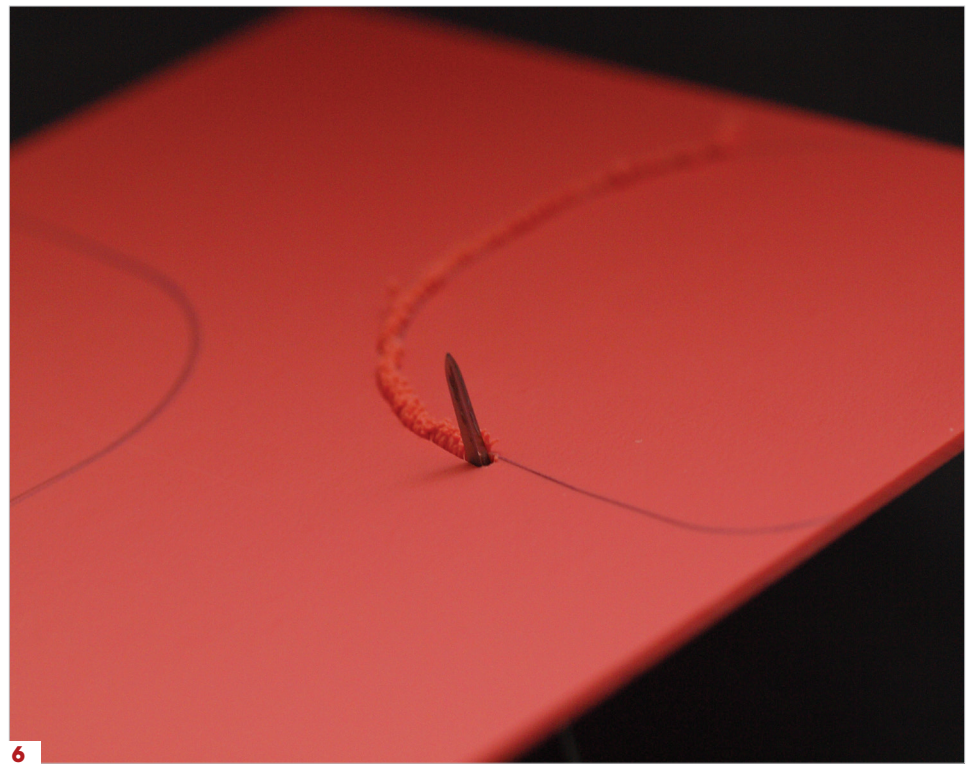
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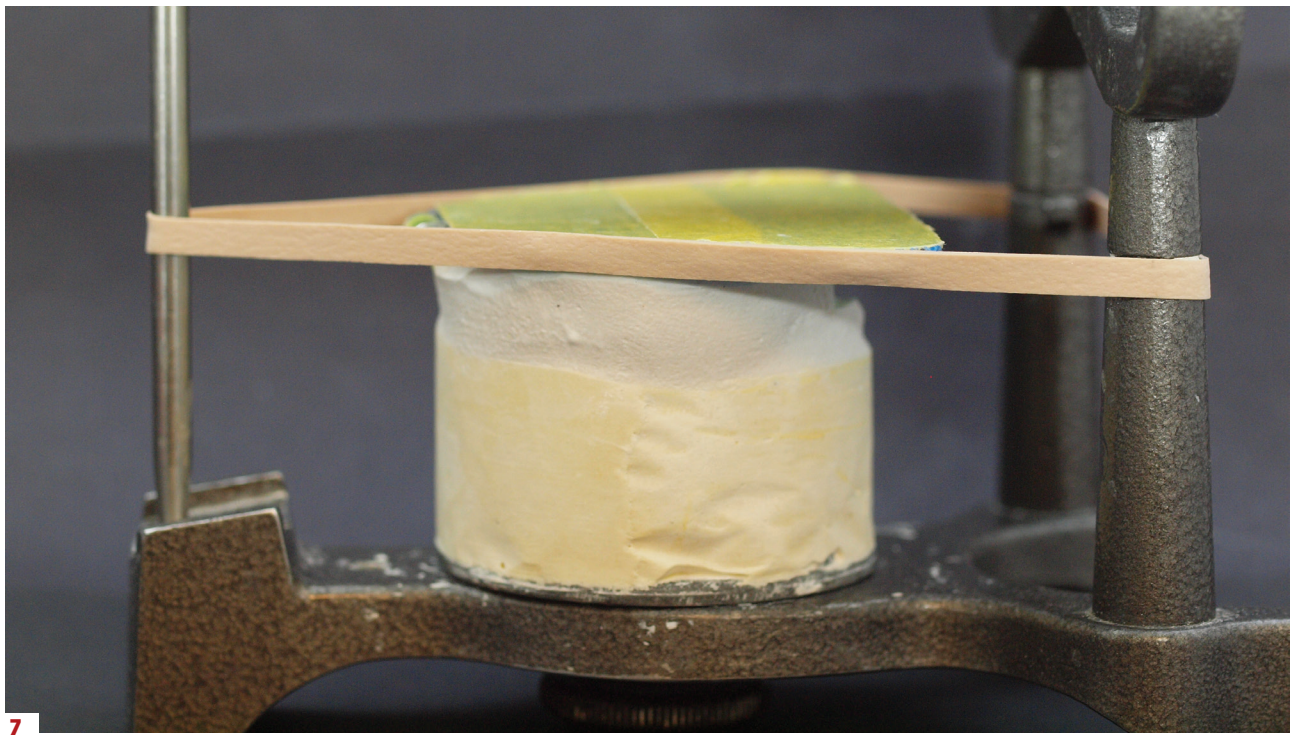
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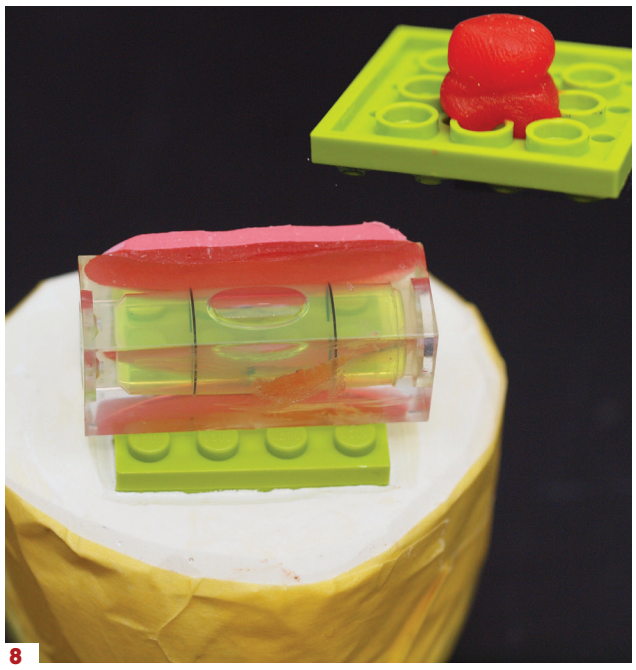
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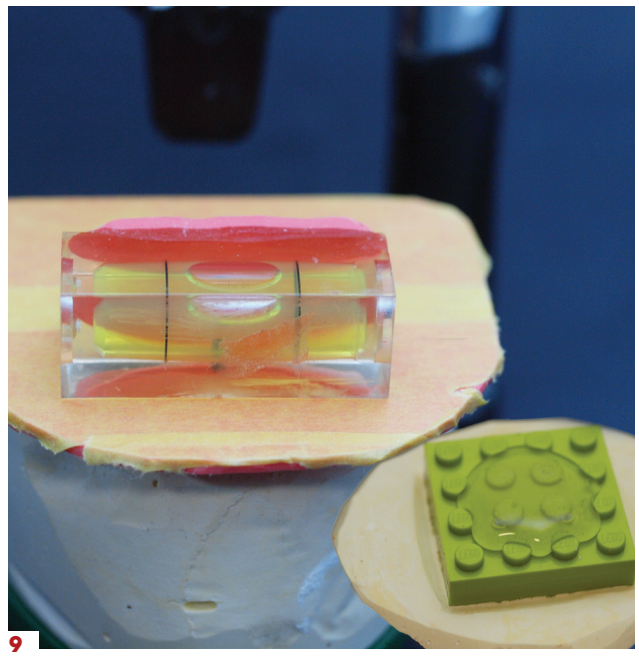
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11

[at a glance]

7. Most articulators have what I call a "sweet spot". A vertical marking on the posts which serves as an occlusal plane mounting orientation point. I stretch a rubber band to guide the process in making the custom platforms.

8. Boxed and poured mounting plate with primary interlocking piece embedded in base. Use a small level to orientate piece to floor while still wet. An important step as it established a floor level plane with the secondary interlocking piece and an affixed occlusal plate.

9. Secondary piece placed and hot glue applied. Place plate on top of glue along with a bubble level and if needed, adjust plate to establish floor parallelism.

10. Once the base is made, it is possible to fabricate and interchange plates and work multiple cases on the same articulator.

11. Consistent communication equates to consistent results.

There's something special about these teeth

One dental laboratory has stopped looking for denture teeth options after going with Primotec's REF-LINE. **by Stan Goff**

JEREMIAH NAAS

TECHNICIAN TEAM MEMBER INDUSTRY

There seems to be something special about those who get really excited about producing great dentures. Not everyone can deliver truly great dentures and not everyone seems to even have the desire to do so.

But for those who really do want the best and have the passion, the end results can be outstanding, both in terms of esthetics as well as function.

Jeremiah Naas from Inverness Dental Arts in Maine runs a high end removable laboratory with his wife, and he is one of those who just so happens to want the dentures he produces to be the very best. Naas has been in the dental laboratory business for over 20 years, but moved from Florida to Waterville, Maine last year to become a denturist.

"If you have passion for esthetics, it's exciting times [to work with dentures]," he says. "I feel that a lot of other people just find it to be frustrating, but it's not really if you really stick to your protocols and you do some education."

With this in mind, Inverness Dental Arts has been exclusively using the REF-LINE denture teeth from Primotec. These teeth are made from a new composite acrylic material that is composed of pre-cross-linked polymer and the matrix is reinforced by inorganic nano- and micro-fillers.

According to Primotec, when compared to conventional acrylic, the REF-LINE material offers improved resistance to the mechanical wear, good resistance to plaque adhesion, color stability, higher hardness, excellent polishing properties, and good adhesion to denture base materials.

Having worked with his father's high-production laboratory before starting his own business, Naas has seen and worked with many denture teeth lines. But the more cases he worked on, the more passion he had for making great dentures, not just good ones.

"I started to really scrutinize my denture teeth to the point where I would hold them up to the light and really try to see into the tooth," he says. "I found by doing that, by really paying attention, that some companies would have manufacturing errors in their teeth.

"A lot of people don't recognize it, take the time to see it, or they simply accept it being there. But I was always one of those people that just never was willing to accept that."

Then a friend and respected lab technician, Arian Deutsch, CDT, told Naas about the great esthetics he was getting from REF-LINE.

"That's how I first got introduced to the teeth, through photos and talking about cases with Arian, and I tried them out," he says. "I quickly just fell in love with them. They're very strong teeth, and they have a unique, very natural look to them."

Naas has continued using the REF-LINE moulds simply because he likes what he sees in his patients' mouths.

"Because my patients and prosthodontists are very heavily sharing photos, we get to see it even on a laboratory side, and we get to see our end result quite often," he says. "I have yet to find any complaints from people at all."

He loves to hear doctors tell him how happy they are with the end result and wonder how long it took his lab to create and deliver such great dentures.

"I've actually had a couple doctors tell me, 'Wow you did it. You did an amazing job with this and you must have been working on it forever'," says Naas, who adds that using REF-LINE is helping set his laboratory apart from others.

REF-LINE is designed to provide great anatomy for restorations, and both patients and dentists have noticed. The teeth are well-suited for both implant cases and traditional dentures and are said to deliver esthetics similar to porcelain crowns.

"They're definitely not the only high-quality line of teeth out there so I don't want to make that claim," Naas says."But I do find that, as a laboratory that is trying to set themselves apart from other labs, that these teeth were not as commonly used. And when clients start seeing these teeth…there's something different about them. It's been a great thing just to have a little bit more of a unique tooth to use."

Naas also likes the way the mould guide has been set up by Primotec, making it easy to use and understand.

"It's the little details at the end of the day," he says. "There are so many small things that are above and beyond." ●

REF-LINE

Primotec's REF-LINE premium denture teeth are formulated from a new composite acrylic material that maximizes strength while providing optimal esthetic qualities. Features include a warm intensive cervical, light enamel color and diverse surface structure to give the teeth a lifelike appearance. The incisal portion of the tooth consists of small irregularities and details similar to natural teeth.

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A high-tech prosthesis material that offers strength

This lab technician finds the TriLor® Arch from Harvest Dental to offer flexibility without compromising on strength. **by Kristin Hohman**

JASON DUNBAR

TECHNICIAN TEAM MEMBER INDUSTRY

A dental technician at Guided Dental Ceramics, LLC in Naples, Florida, Jason Dunbar specializes in Chrome Guided Surgery for all-on-4 treatment. When working on a surgical prosthesis for intraoral conversions, Dunbar's material of choice is the TriLor Arch from Harvest Dental. The material is 3.5 mm and is already in an arch form, which are just two of the features that drew Dunbar to the TriLor, he says.

"The nice thing about is it comes in a 3.5 mm thickness. And you cannot get a puck for a mill that thin, that's not a possibility. So, the fact that it's an arch-form shape already and it's already as thin as 3.5 mm, that's attractive because then you can go in and manually add it to your prosthetics," Dunbar says. "Something like that would be hard to integrate into the digital workflow. It's actually one step that takes me out of a digital workflow because it is a manual task. That's attractive because it's easy to implement."

What he usually does is mill a nano-ceramic surgical provisional 2 to 3 mm short on the intaglio surface of the provisional, then he can replace that 2 to 3 mm void with the TriLor Arch. The outcome is a surgical provisional that has 2 to 3 mm of cradle support on the provisional, something that he believes would be difficult within a digital workflow and be cost-effective, Dunbar explains.

"I make a prosthesis that's a few millimeters short, and I basically slide in 3 mm of TriLor under it. And I don't see how that would ever work in a digital world. I mean, you can get a digital workflow, but it wouldn't be as far as actual milling because there's no such thing as a 3.5 mm puck. Whereas, as far as the TriLor Arch form, that's been a 3.5 mm," he says. "And what I mean by cradle, is that it's supporting the whole underside of the prosthetic."

The size of the material is an advantage, but the real benefit lies in TriLor's strength, he says.

"The real value is the end-product. I attach TriLor to an already very strong milled nano-ceramic provisional," Dunbar says. "By the time that I'm adding those two together, what we end up with is a very long-term provisional that's almost as strong as the final prosthetic."

The TriLor Arch is so strong, Dunbar believes it lasts about 5 times longer than traditional metal bars.

"Instead of using TriLor, some [techs] will use a metal bar, and you integrate that into the provisional and that is the support for your long-term provisional. But, I would still limit that to a year, year and a half. Whereas this one here, I almost feel comfortable saying and it will last five years," he says.

Dunbar actually has a dentist client who is offering a five-year guarantee with the provisional due to the TriLor support, he says.

"That's kind of a standout right there because if there's a [dentist] that will put his practice and his career on the line and say, 'I get a five-year guarantee on this,' that speaks volumes because there's nobody doing that," Dunbar says. "With the TriLor support, there's no doubt in my mind it's a good five-year provisional. I would say that this is a long-term provisional that is the closest you can get to an actual final prosthetic strength."

In addition to its strength, Dunbar finds the TriLor to be very easy to work with, something he was skeptical about in the beginning.

"From a laboratory standpoint, the material is just extremely strong," Dunbar says. "But, it's not that hard to work with. It's kind of user-friendly at the bench. So, despite its strength, it still grinds nicely with our typical standard carbide burs and diamond burs. The first time I started looking into it, I had no idea what the material would grind like. The one thing I found nice is that it's very strong, but it's still pretty easy to grind on."

Another aspect of the TriLor Arch that Dunbar enjoys is its cost-effectiveness, he says.

"It's very cost-effective, and you can turn around and charge a good premium for adding it to your provisionals. So, for under $100 an arch, we can add the TriLor. And we can easily get an upgrade of, say, another $400. That's a good markup, and it doesn't take that long—it probably takes an hour and a half to do," Dunbar says. "I think, the advantages of the TriLors are one, cost-effective to integrate it into the workflow, and two, you end up with a very strong long-term provisional." ●

You can follow Dunbar's work on Instagram @Chromeguidedsurgery.

TriLor® Arch

TriLor Arch is a high-performance techno-polymer matrix with multi-directional glass fiber reinforcement. Designed to be lightweight and resilient, it is indicated for copings and substructures and utilized for permanent implant supported frameworks and clasp supported removable partial dentures. TriLor is an ideal replacement for labor-intensive metal and zirconia frameworks as it exhibits a natural flex and load parameters. It has a flexural strength of 540 MPa and is available in 3.5, 5.5, and 7.5 mm.

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Smoothing out hybrid CAD workflows

With a highly homogenous formulation, Renfert's EASY Blank Wax is designed to produce accurate CAD/Cast and CAD/Press restorations.

compiled by Noah Levine | information provided by Renfert

Renfert
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THE PROBLEM

Pressing and casting workflows require smooth and precise waxups, and some millable wax pucks don't produce smooth surface or sharp margins

Additionally, millable waxes can produce residue which can build up and clog burs, slowing production and adding to the time it takes to clean the mill.

THE SOLUTION

EASY Blank Wax

- Formulated from a highly homogenous material to mill with optimal precision, smooth surfaces, and well-defined margins
- Technically an acrylic material rather than a wax, it burns out without leaving a residue, making the material ideal for all-ceramic restorations
- During milling the wax is shaved off in small chips that do not stick to the bur or the wax puck
- Specifically designed for use with CAD/Cast and CAD/Press workflows
- Distinct blue color for increased visibility
- Available in 14 mm and 20 mm thicknesses

NEXT ISSUE: Ways to improve communication about cases

by Robert Elsenpeter

America, it is said, is the land of opportunity. If one wants to seek their fortunes in a different place, all they need do is pack up and move. In 2020, and for the foreseeable future, that seems to be the case for dental lab technicians. The U.S. Bureau of Labor Statistics (BLS) forecasts an 11 percent growth in the field over the next eight years, so there should be plenty of opportunity from sea to shining sea. But, before anyone packs up and hits the road, let's take a look at which communities are most appealing.

BLS reported data for 378 cities and areas in the fourth quarter of 2019 and found that laboratory technicians earned an average of $61,828 last year. Then, we looked at other quality of life indicators based on data from personal finance website Wallethub.com, U.S. News & World Report's Healthiest Communities study, and state-by-state life expectancy from Worldpopulationreview.com.

10 Midland, Texas

The 24th most populous city in the Lone Star State, Midland earned last place scores for life expectancy, education, and oral health. But it's above-average annual salary for lab techs, at $81,127, keeps Midland in the top 10.

09 New York Metropolitan Area

The largest metropolitan area in the U.S., with 6% of the country's population, this metro area covers New York City, and Newark and Jersey City, New Jersey. Lab technicians earn an annual wage of $83,356, but bottom-of-the-list rankings for public safety and education keep it at number 9, despite coming in 4th in total life expectancy.

08 Washington D.C. Metropolitan Area

This metro area includes the nation's capital, as well as Arlington and Alexandria, Virginia, and is one of the most well-educated metro areas in the U.S. But that isn't enough to move this region any closer to the top of the list. Lab techs earn an above-average salary of $78,676, however other low scores including economy and life expectancy keep D.C. firmly towards the bottom.

06 (Tied) San Francisco Metropolitan Area

Lab technicians in this area, covering San Francisco, Oakland, and Berkeley, California, earn over twice the average annual salary, $151,476, tied for first, overall. But low rankings in public safety, stress, and oral health pulled the Bay area further down the list.

06 (Tied) Trenton, New Jersey

Lab techs in Trenton earn the least of anyone in the top 10, an average of $74, 672, and their overall community health was near the bottom, too. But higher rankings in stress and oral health seemed to offset the lower scores.

05 San Jose Metropolitan Area

The San Jose metro area includes Sunnyvale and Santa Clara, California, and is tied for 1st overall in annual wage, an average of $151,476. But while the region does enjoy high scores for community health and life expectancy, that is canceled out by low scores for stress, public safety, and oral health.

04 Boulder, Colorado

Earning an average of $75,400 per year puts lab technicians in Boulder towards the bottom of the top 10 for earnings. However, Boulder is, overall, a healthy community with a number of first-place rankings for community health and stress. But a surprisingly low oral health score keeps the city out of the top 3.

03 Seattle Metropolitan Area

Lab techs working in the greater Seattle area, which includes Tacoma and Bellevue, Washington as well, earn slightly less than their colleagues in the top spots, with an annual salary of $85,696. The region ranked number 1 in total economy and pulled in solid rankings for education and public safety, but low overall life expectancy was enough to keep the area out of the top spots.

02 Bridgeport, Connecticut Metropolitan Area

With an average salary of $93,860 per year and mostly high rankings for other metrics, the greater Bridgeport area, which includes Stamford and Norwalk, is a great region for dental lab technicians. However, it's lower scores in community health and stress offset high scores in oral health and life expectancy.

01 Boston Metropolitan Area

The greater Boston area, including Cambridge and Newton, Massachusetts and New Hampshire, earns the number 1 place on our list thanks to its top rankings in education and public safety. These scores are enough to negate low community health rankings and an average wage of $86,788. ●

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