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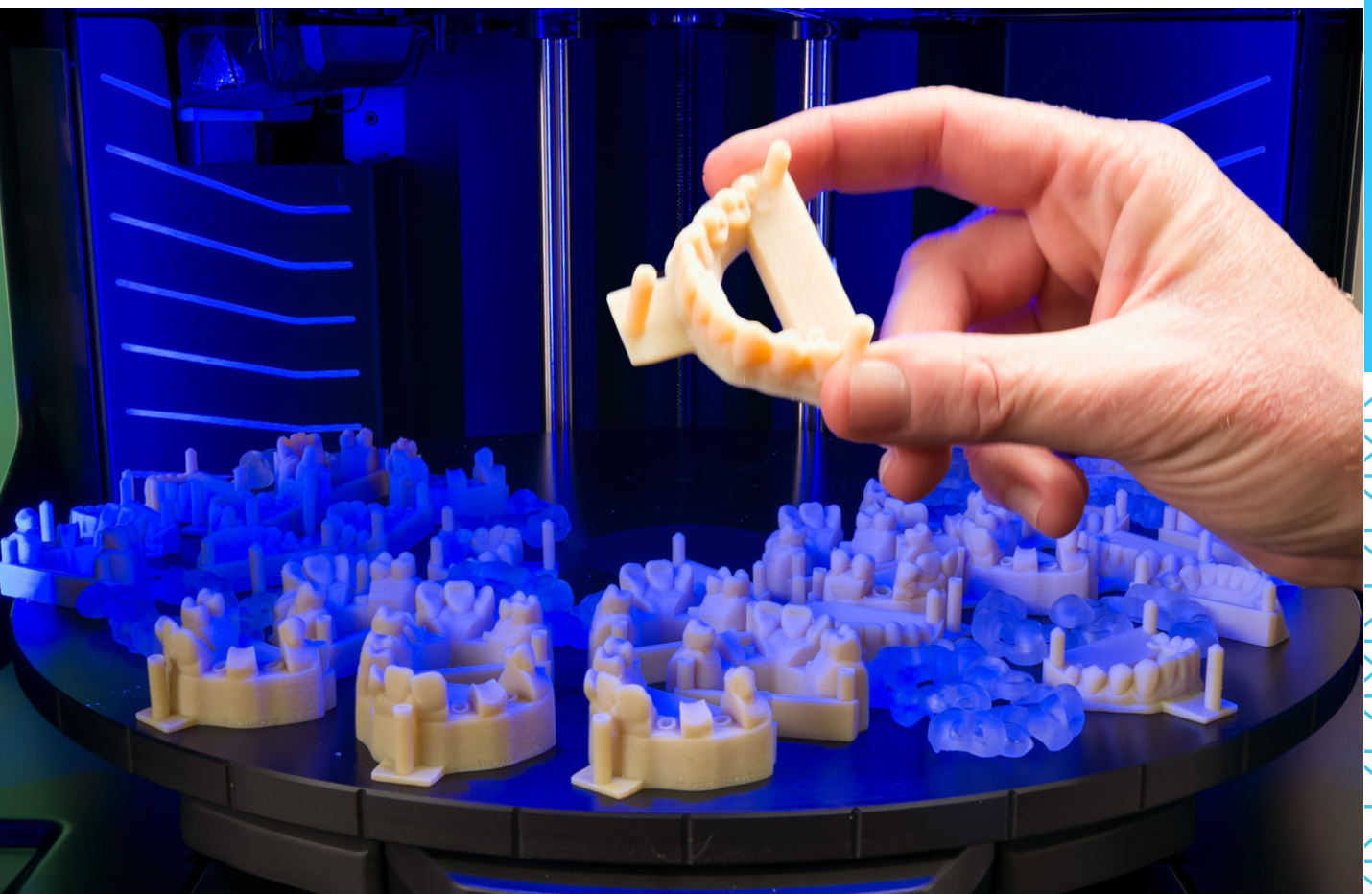
EBOOK
POLYJET

Versatility That Powers Your Lab

Leverage the Value of Mixed-Tray 3D Printing



If you work in a dental lab, you understand the pressures that labs face in today's market. Technology disruption, market consolidation, and a shrinking pool of skilled technicians create a challenging business landscape. This eBook will demonstrate a clear path and opportunities for dental labs to grow, maintain independence, remain competitive, and enhance the quality of the products they offer to their customers.

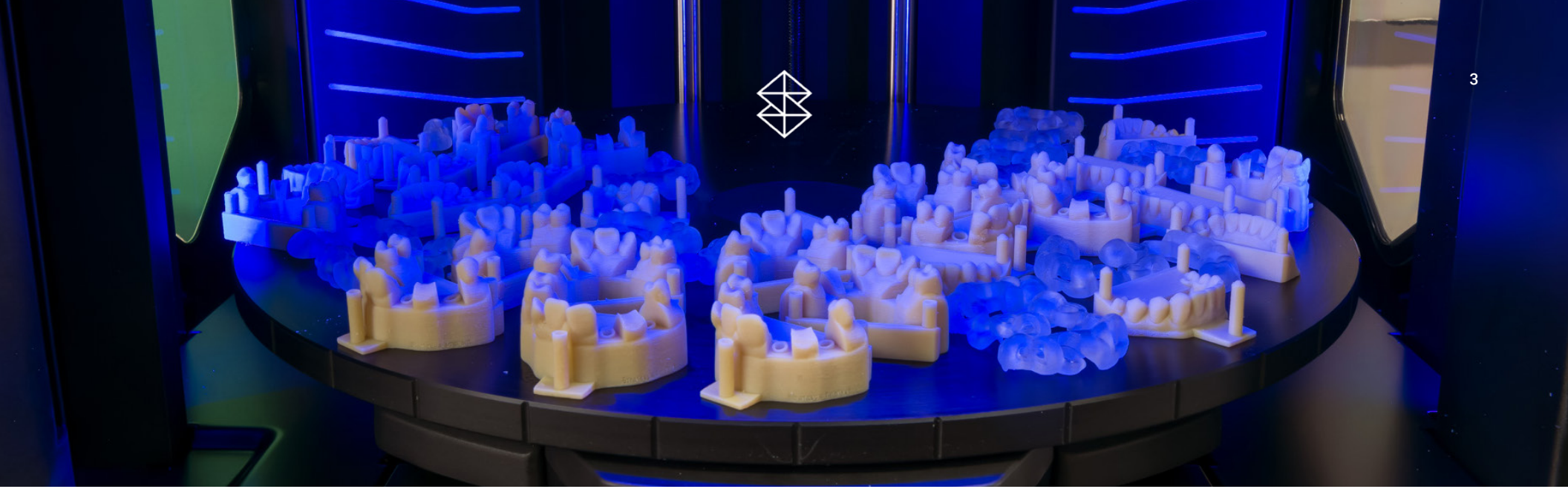
3D Printing: Both a Solution and a Challenge

The current landscape of dental laboratories presents an intriguing paradox. On one hand, the growing needs for lab services, driven by an aging population and increasing demand for oral care and advanced cosmetic procedures, are evident. On the other hand, labor shortages and the high costs associated with keeping pace in an industry rapidly embracing digitalization make it challenging for labs to maintain profitability.

3D printing and digital workflows have been widely adopted across the dental industry enhancing production scalability and automating labor-intensive processes that were once the exclusive domain of highly skilled technicians. Labs have diversified their service offerings accommodating a range of applications, a growing number of which originate from a digital record.

Single-material printers, with their small footprint and lower acquisition cost, have facilitated the transition of numerous laboratories into the realm of digital dentistry. The aim has been to increase production without compromising quality, all while avoiding the need for workforce expansion. However, while 3D printing has streamlined certain aspects of the workflows in the lab, it has also presented challenges such as continual switching between materials or the acquisition of additional printers to support new applications, and in some cases, both.

Managing print queues for a large variety of cases in which each component requires a different material leads to suboptimal printer utilization, increased labor requirements and growing inventory. Without sufficient cases to print a full tray with a particular material, existing cases are frequently delayed until there are enough parts to maximize printer utilization which may cause turnaround delays. In addition, frequent build changeover and inherent variability in quality also contribute to a loss of productivity. Furthermore, most single-material printers demand continuous attention, diverting skilled technical labor from other value-added tasks.



Efficiency Challenge: One case – 3 different print jobs

Consider an implant case example. Implants require three parts made of different materials: an opaque rigid model, a soft gingival mask, and a clear surgical guide. All three parts need to be shipped together, but a single-material printer can only produce them sequentially.

To print the rigid models and maximize build capacity, you must consolidate models from other unrelated cases. Next, you must change materials to print the clear guide. However, if there are no other implant cases, you must either wait for more cases to fill the printer tray capacity or print the single implant case on its own. The same scenario applies to the gingival mask. Coordinating the print schedule to produce a single implant case by the end of the day adds time that a technician could spend on more productive tasks.

One solution is to buy several smaller printers to minimize material swapping. This requires coordination among lab staff to ensure that the work is done in the right order and with the right materials. Safety is also a concern because exposure to uncured resin is a health hazard.

From a workday productivity perspective, while smaller resin printers may print quickly, total output often falls short. Most labs load up a print queue at day's end so that new models are ready the next morning. However, these smaller printers are only capable of building a few models at a time. The printer may complete the job quickly, but that benefit is negated when there is no one available to load the next job. Increasing overnight production means either adding a technician during night hours to reload the printer or using a printer with more capacity.

Labs looking to level up their capabilities would like to 3D print different types of cases on one build, for example, the parts for implants, orthodontics, crown and bridge, and removable partial dentures. In this scenario, one could print the surgical guide, all the models, the castable patterns, gingiva mask, and a custom tray all at the same time, in the same print job on the same tray.

Maximize Productivity with One Printer

One of the most effective ways to maximize your lab's productivity is with multi-material 3D printing. It gives labs the versatility of producing multiple applications at the same time on a mixed-tray. This means that labs can print models in different materials during the same print job on the same build tray. There's no need to wait for sufficient parts to print in one material and then change to another material for other parts. You can print the parts as you need them, whether they're crown and bridge models, cast partial patterns, clear aligner arches, or implant models and guides, regardless of material requirements. This offers significant workflow efficiency.

For orthodontic labs, mixed-tray printing provides the ability to produce mixed trays of clear aligner arches, study models, and flexible indirect bonding trays with biocompatible materials. This radically streamlines your workflow and gives you the flexibility to print what you need when you need to without having to wait for the printer to finish a run and change out the resins.

Simpler case workflow management is another benefit of a mixed-tray printer. You can print the entire implant set—model, gingival mask, and surgical guide—together. This saves time and avoids errors when matching all the parts for the right case, which often happens when they can't be printed together.

Multi-Material vs. Single-Material Printer Productivity Comparison

To validate the capability of multi-material printing, Stratasys compared the J3 DentaJet® printer to several competing single-material dental printers. A surprising result involved the total number of "touch points" needed to produce parts, a factor not readily apparent when comparing printers. "Touch points" reflect the number of times a technician is involved in the printing process. That includes emptying and reloading the printer, changing materials, and post-processing the parts. Counterintuitively, the faster smaller printers produce parts, the more labor, or "touch points," are needed to manage the printer, effectively minimizing or negating productivity benefits.

The scenario described below summarizes the findings of these comparison tests, using a "16 Case" implantology print load scenario. This scenario was chosen because it represents a full build tray on the J3 DentaJet, using three different materials for the models, gingival mask, and surgical guides.

Load One Tray and Walk Away

Multi-material printing streamlines labor and enhances production scalability, reducing the manual intervention required to produce a wider range of applications simultaneously. In contrast, smaller, single-material printers shift the labor from hands-on operations, such as constructing models and appliances, to the management of the 3D print queue. Instead of operating the 3D printer, it's the printer that directs your actions. This critical aspect is often overlooked when comparing different 3D printers.

16 Case Scenario:

Case Turnaround Time: A single overnight print job for the J3 DentaJet vs. 2 days and multiple prints for a single material DLP printer.

Total touch points: 3 touch points for the J3 DentaJet vs. 108 touchpoints for single DLP printer.

J3 DentaJet – printing 3 resins simultaneously

- Print setup and job initiation (automated nesting and support generation)
- Print (a single print job)
- Support Removal with waterjet. (No recontouring, smoothing, IPA bath, or post curing)

DLP Printer – printing a single material at a time

- Nesting builds: 8 model plates, 2 gingiva mask, 2 surgical guide
- Replace build head, remove parts, clean build head, stir/prep resin, start job (5 x 12 = 60 touchpoints)
- IPA clean each build immediately (2 touch points per build) Dry, Post cure (12 x 3 = 36 touchpoints)

Full-Time Equivalent (FTE) burden:
The J3 DentaJet requires up to 2 partial resources (headcount) to complete the 16 cases (print set-up and support removal) whereas competing printers required a full-time dedicated resource or multiple resources to manage all the touch points.

Beyond mixed trays, multi-material printing enables printing in color. This capability can be used to print either realistic dental models or multi-shaded dental appliances such as permanent dentures.

Color Dental Models

Color lets you differentiate your products in an otherwise competitive space. Some labs use different colors on models to highlight the treatment area and outcome for the patient[1], enabling more constructive dialogue between patient and clinician. Other labs use the color model as a reference producing a more accurate restoration based on the actual color data.

TrueDent™ Dentures

TrueDent Dentures are monolithic, full-color, 3D printed dentures produced with either TrueDent™ FDA cleared (Class II) or TrueDent-D™, CE Marked (Class I) resin on the J5 DentaJet platform. The TrueDent solution enables scaled production of highly aesthetic, monolithic, multicolor dental appliances on a single mixed-part, high-capacity tray.

[1] https://onlinelibrary.wiley.com/doi/10.1111/jerd.12873

[2] https://www.aegisdentalnetwork.com/idt/2023/02/polyjet-monolithic-high-fidelity-polychromatic-printed-prosthetics

Multi-Material Printing:
A Solution for All Dental Labs

3D printing a single material at a time has its limitations. It may print quickly, but at the cost of increased labor. Multi-material printing increases a lab's productivity and efficiency, optimizing resources. Mixed-tray capability has been the go-to tool for large dental labs but has been out of reach for smaller and mid-size labs, mainly due to cost. The Stratasys DentaJet Series offers a solution for any lab that is interested in expanding their service offering and growing their business.

Benefits of Multi-Material Printing for Specific Dental Applications

Orthodontics: Produce high volumes of aligner arches, orthodontic models, and indirect bonding trays unattended. DentaJet also eliminates the need for applying a separator that is necessary in many orthodontic appliances. Optimize resources by managing both printing technologies through the GrabCAD Print™ software platform.

Implant Workflows: Simplify the complexity of 3d printing implant components and maximize production and repeatability. Print high precision opaque and rigid implant models, biocompatible and transparent surgical guides, and soft gingiva masks — all on one tray — in a single, unattended print job.

Removables: Make the difference with highly aesthetics, precision printed, customized monolithic polychromatic dentures. The TrueDent solution enables scaled production of multi-shade prosthetics in a single mixed-part, high-capacity tray.

Crown & Bridge: increase capacity, improve efficiency, and reduce cost per model. To improve color matching restorations and reduce remakes implement utilize color printing capabilities. With TrueDent resin, long term temporary crowns and bridges as well as highly aesthetic diagnostic models can be printed.

In the ever-evolving landscape digital dentistry, the challenges are undeniable. Yet, solutions that empower growth and elevate your practice are within reach. FMulti-material 3D printing is more than a technological advancement; it's a game-changer for dental labs of all sizes.

By streamlining workflows, reducing manual intervention, and offering the versatility to produce a diverse range of applications on the same tray, multi-material 3D printing is your key to enhanced productivity and efficiency.

So, whether you're a seasoned lab with ambitious growth goals or a smaller practice aiming to level up, consider the profound impact that multi-material 3D printing can have on your journey toward success.

If you're ready to unlock the full potential of your dental lab, don't hesitate to take the next step.

Contact us for a personalized consultation and discover how multi-material 3D printing can scale your operations, improve your efficiency, and expand your service offerings.

Together, we can help your lab thrive in an increasingly digital and competitive landscape. Your future starts now.

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