Dental Assessment

为什么每一个有远见的牙科实验室都应向数字生产发展
Stratasys 医疗和牙科解决方案负责人 Avi Cohen 以及 Allure 牙科实验室 CEO Larry Stites 详细说明了 3D 打印相比传统铣床在速度、准确性、成本和美感方面的优势。

Why every forward-thinking Dental Lab should progress to digital production?

By: **Avi Cohen** – *Head of Medical Solutions, Objet Geometries Ltd.*
Larry Stites – *CEO and Co-Founder, Allure Dental Labs, USA.*

The assessment is intended for forward-thinking dental labs and dental production centers wishing to discover how the latest 3D Printing technologies which help them stay ahead of the competition, as well as understand the advantages of 3D Printing with compare to traditional milling techniques. This assessment will lay out the industry needs and considerations while thinking about applying the use of 3D printing to their dental production floor.

When hands are not enough:

Dental technicians traditionally rely on steady hands and expert eyes to prepare crowns, bridges, inlays, onlays, veneers and frameworks. Although they often are considered artists, the manual process is time-consuming, imprecise, and requires materials that might not provide the best durability or aesthetic appearance. The known digital workflow is based on few steps which usually are: Scan (using 3D scanner, intra-oral scanner or impression scanner), CAD, where software is being used to design the end product based on the scanning data, and CAM. The CAM is often includes transferred data to CNC systems using traditional milling concept.

3D Printing Digital Solution vs. Traditional Milling

Milling Disadvantages

- Overall reproducibility and accuracy to detail is less than printed. Especially if the object to be milled has an area to be milled smaller than itself. In this case the software will use a milling strategy of creating extra space for the cutting tool. In this scenario the bur cuts away more material than is needed to compensate to make the crown fit. Areas such as this include incisal edges, marginal ridge of tooth preparation. This can takes away much needed room for porcelain when you are limited by the diameter of the cutting tool. In other words a cutting tool cannot mill something smaller than itself. Surface details of anterior teeth and fine grooves such as you would find on posterior teeth are not easily reproduced. In general the fewer the number of tools used the less detail the milling system can produce. Examples of systems with lower detail include Cerec, D4D and Katana.

- The overall quality and ability to mill complex shapes is dependent on the number of axis used. Most dental systems typically use is 2 to 3 axis. There are a few systems that use 5 axis but this will increase the initial cost of the system and its operating and maintenance costs.

- Higher operating and maintenance costs. Burs are very expensive and difficult to optimize how many units can be milled from a set of burs. Sometimes they break long before their estimated capacity or life expectancy. Burs may break during production and unless a technician is there during production to change the broken bur. production will stop. This does not fully support the concept of lights out manufacturing. Burs add additional cost to the coping or crown. Laboratories need to keep burs in stock. Some systems require only 1 bur (Katana) while others such as Dent Mill or Roeters require 4 burs for their system. This really increases material cost per unit. Typical bur cost is $135.00 to $150.00 per bur each.

3D Printing Advantages

- Printing can reproduce complex shapes and do not require special strategies or use of special parameters to compensate for the size of the cutting tool. You can reproduce and print in exact detail the tooth or object as it was designed. You also have the choice of printing in 2 resolutions and in 2 different surface finishes. A glossy finish shows better anatomical detail. This is especially a big advantage with working with anterior teeth.

- 3D Printers are not limited in the traditional sense to milling axis with linear rotary instruments. Curves, holes and more complex shapes are easier and more accurately reproduced with 3D printing.

- Printers do not require burs. The nature of the printing itself gives excellent detail with out the constraints of the size of the smallest bur. There is nothing to break or change. The need to order and keep burs in stock is eliminated. Fully support lights manufacturing without the worry of production stoppage because of bur breakage during overnight production runs.

TORION 泰瑞恩
北京泰瑞恩商贸有限公司
Beijing Torion Trading Co.Ltd.
www.torion.cn
sales@torion.cn
电话：13801253818
传真：010-84067150

OBJET

Milling Disadvantages

- Wasteful in material usage. You use more material than you actually need and throw most of it away. Disposal of material waste may be harmful to the environment. Milling also requires much longer process times because it needs to remove excess material to produce the final object. Milling requires good dust extraction system. The milling waste from dental stone or zirconium may be harmful to the working environment and is destructive to the milling machine. Milling requires extra attention to cleaning and maintaining extraction systems. Filters and expensive extraction systems add additional set up and maintenance costs. It may be harder to comply with OSHA guidelines.

- Frequent calibration needed which takes time and decreases daily production. Constant adjustments need to be made to keep the milling machine in calibration especially after changing burs when they break. This gets more complicated with systems using multiple burs (2 or more). The more burs used the longer and more frequent calibration is needed.

- Milling systems in general are more complicated to learn and operate.

3D Printing Advantages

- Printing reproduces the object to be printed exactly as designed without waste. Process times and material costs are reduced. No harmful dust or fumes are created to harm the working environment. The recycling program that Objet offers is easy for the laboratory to dispose of spent resin cartridges.

- You can print multiple parts at the same time. Crowns, dies and models can all be printed at the same time. Multiple models can be printed at the same time. Example: one can print 4 quadrant models U/L with crowns and dies in 1 hour and 35 minutes. There are new printing strategies with semi hollow models that greatly reduce material cost by nearly 50% while support material will increase slightly. Average milling time per unit is 8-10 minutes. However one can print 50 to 80 units in 56 minutes in high quality mode.

- Very easy to learn and operate. Requires very little training time.

- The materials used are not esthetic or useable for case presentations such as diagnostic work.This limits the dental solutions and hinders milling systems versatility.

- Most milling systems have various limitations while milling and are intended for crowns and bridge fabrication.

- Both the Verodent and Vero white materials have excellent and life like features lending additional dental solutions for the dental lab.

- Can print all solutions needed for typical laboratory needs with one system.

About Objet Geometries

Objet Geometries Ltd., the innovation leader in 3D printing for rapid prototyping and additive manufacturing, provides 3D printing systems that enable manufacturers and industrial designers to reduce cost of product development and dramatically shorten time-to-market of new products.

Objet's ultra-thin-layer, high-resolution 3D printing systems and materials utilize PolyJet™ polymer jetting technology, to print ultra-thin 16-micron layers. The market-proven Eden™ line of 3D Printing Systems and the Alaris™30 3D desktop printer are based on Objet's patented office-friendly PolyJet™ Technology. The Connex™ family is based on Objet's PolyJet Matrix™ Technology, which jets multiple model materials simultaneously and creates composite Digital Materials™ on the fly. All Objet systems use Objet's FullCure® materials to create accurate, clean, smooth, and highly detailed 3D parts.All Objet systems use Objet's FullCure® materials to create accurate, clean, smooth, and highly detailed 3D parts.

Objet systems are in use by world leaders in many industries, such as Education, Medical / Medical Devices & Dental, Consumer Electronics, Automotive, toys, consumer goods, and footwear industries in North America, Europe, Asia, Australia, and Japan.

Founded in 1998, Objet serves its growing worldwide customer base through offices in USA, Mexico, Europe, Japan, China and Hong Kong, and a global network of distribution partners. Objet owns more than 50 patents and patent pending inventions. For more information, visit us at www.objet.com.

Objet Geometries Ltd.
Headquarters
2 Holtzman st.,
Science Park,
P.O Box 2496,
Rehovot 76124, Israel
T: +972-8-931-4314
F: +972-8-931-4315

Objet Geometries Inc.
North America
5 Fortune Drive
Billerica,
MA 01821
USA
T: +1-877-489-9449
F: +1-866-676-1533

Objet Geometries GmbH
Europe

Airport Boulevard B 210
77836 Rheinmünster
Germany
T: +49-7229-7772-0
F: +49-7229-7772-990

Objet Geometries AP
Asia Pacific
Unit28, 10/f, HITEC
1 Trademart Drive
Kowloon Bay, Kowloon
Hong Kong
T: +852-217-40111
F: +852-217-40555

Objet Geometries AP
Limited China Rep Office
Rm1701, CIMIC Tower,
1090 Century Blvd,
Pudong Shanghai
200120 China
T: +86-21-5836-2468
F: +86-21-5836-2469

info@objet.com www.objet.com

Q3/10