> “The time required to print a typical removable partial dental frame is reduced by 80 percent, which makes it possible to complete the partial denture framework in a day and a half.”
>
> Scott Udell, President / Udell Dental Laboratory

Udell Dental Laboratory can 3D print models like this in clear bio-compatible material, which costs less than 25 percent of Udell’s previous 3D printing material.

CASE STUDY

Bridging Dental Costs

DENTAL LAB REDUCES MATERIAL COST OF PARTIAL DENTURE FRAMES 75% WITH STRATASYS 3D PRINTER

Udell Dental Laboratory discovered that adding 3D printing to its workflow saved it both time and money – but then it discovered that a Stratasys® 3D Printer saves them even more of both.

Traditional Approach

Udell previously used the traditional manual approach to make its removable partial denture frames (RPD). Using the impression taken by a dentist of the patient's mouth, a skilled technician pours up the stone model and then duplicates it into a refractory model that will become part of the mold used to cast the metal RPD framework. The technician designs a wax pattern to the refractory model that will define the geometry of the RPD and fill in undercuts in the gums to provide a smooth path for putting on and removing the RPDs.

Next, sprues are attached to the wax pattern and refractory model, and the assembly is placed in an investment ring. Silica casting investment is poured into the ring to create a mold for investment casting. Molten metal is cast into the mold through the sprues, replacing the wax pattern. When the metal cools, the refractory and silica investment are removed to reveal the finished frame. The traditional process required 96 minutes of work by the dental technician and was highly dependent on the technician's skill and attentiveness to provide an accurate fit. Turnaround time for the traditional process was two days.

Enter 3D Printing

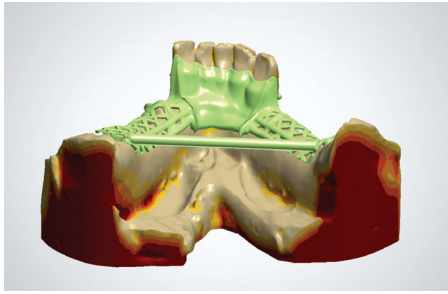
Several years ago, Udell began using digital technology to make RPDs. This approach begins with taking a 3D laser scan of the stone model. The technician works with special software to define the geometry of the frame. The software provides automated tools to ensure an accurate fit, such as automatically calculating the path of insertion for the RPDs and highlighting any interference. This approach reduces the time required for this step from 20 minutes with the traditional approach to one minute. The technician uses a 3D printer to create an RPD pattern for investment casting. The pattern is sprued, invested, cast and finished the same as the traditional method.

This digital method takes only 65 minutes to produce a complete RPD. The new method saves the dentist additional time in fitting the RPD because its accuracy is much higher. If a remake is required, modifications can be quickly made to the digital file and reprinted instead of having to hand wax again from scratch.

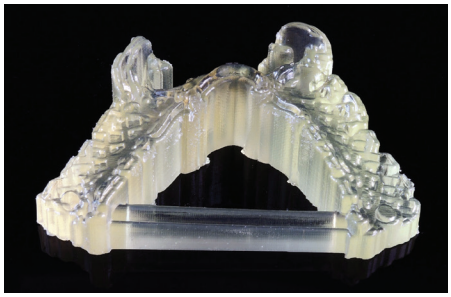
The 3D printer that Udell first used required material that cost averaged $12 for each RPD pattern and took 12 hours to print the pattern. Turnaround time was 3 days. Looking to improve these numbers, Udell decided to compare the Stratasys line of 3D printers against its current system.

Scott Udell, president of Udell Dental Laboratory, said that the Objet Eden260V Dental Advantage™ 3D Printer "offers major advantages over the 3D printer that we used in the past." The bio-compatible material used by the Dental Advantage averages $2.84 per RPD, which is less than 25 percent of the cost per frame from the company's previous 3D printer.

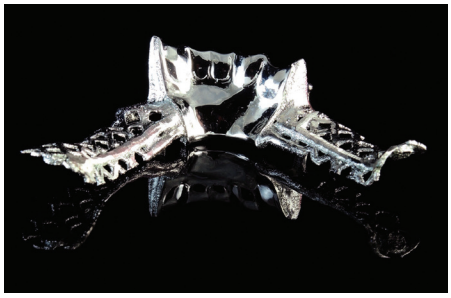
"The time required to print a typical RPD framework is reduced by 80 percent, which makes it possible to complete the RPD frame in a day and a half," continues Udell. "We also use the Objet® 3D Printer for printing denture try-ins and models for night guards. Our total material savings are about $3,500 per month."



This CAD model of a frame designed with 3Shape software took about one minute to complete, compared to the traditional time of 20 minutes.



A complete model, like this frame with the support material intact, takes only 65 minutes via the digital method, compared to two days with traditional methods.



Finished parts, like this polished alloy frame, have higher accuracy using the digital method.

	MATERIAL COST PER MODEL	TIME TO PRODUCE FRAME
Traditional method	$6.18	2 days
Objet Eden260V	$2.84	1.5 days
Savings	$3.34 (vs. traditional) **54%**	0.5 days (vs traditional process) **25%**

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