The story begins with the arrival of the FedEx truck; more than 90 percent of cases arrive in this manner. Upon delivery, the target case is opened and its visit is inaugurated with one serious photo shoot—upward of 70 photos are taken in two seconds by a high-tech camera rig. Nothing escapes the eye of this lens; every detail of what’s included in the case by the doctor—impression, Rx, models, etc.—is captured.
**The journey begins**

From this point, the case transitions from a high-tech environment to something more old-school: It sets off on a journey down a very long, slow-moving conveyor belt (seen at right).

Next, the case arrives at the **logging department**, where technicians review the prescription and impressions for all pertinent information. If any information is unclear or missing—for example, a clinician license number that is required in some states—the case is sent to the call center so the clinician can be contacted and information verified. Within the logging department, it’s also outfitted with a new, color-coded box that identifies to the lab technicians the day of its arrival and the day of its planned departure. On this tour, once you’re made aware of what color is used for that day (this day was purple), you become acutely aware of strategically placed forms and boxes with that color placed throughout the lab.

**Time to get plastered**

Next stop is the **plaster department**. Here, ears are assaulted by a cacophony of grinding, drilling, sanding and more. There’s a lot going on here!

“Glidewell utilizes a premeasured plaster mix, with all ingredients precisely weighed to ensure that it’s always the ‘same sauce,’” our guide explains. All machines are audited on a daily basis to ensure consistency.

Plaster is poured into the impression and allowed to set, and then the resulting model is removed. Here, we discover that for a single posterior, two models are poured: a “working model” that is later sectioned and trimmed, and a “solid model” that allows the technician to verify the fit of the restoration at the very end of the process.

As the Glidewell Laboratories tour continues, we pass by a 10,000-year-old Alaskan woolly mammoth cuspid displayed under glass—an unusual and yet somehow appropriate thing to see in a dental laboratory. Nearby is founder and CEO Jim Glidewell’s first oven from 1971, which he operated from his kitchen table and sold his car to purchase. The case then arrives in **“die trim,”** where technicians grind away the excess plaster, clean all the margins and section out the preparations from the working model.

**The sky’s the limit**

From here, the case heads to the cloud. The now-sectioned working model is attached to a scanning plate via putty and is **scanned**. Every facet of the model is captured at every conceivable angle, as the machine’s swing arm oscillates and projects a futuristic blue grid pattern across the objects. After a series of these vantage points are collected, the computer can stitch together the available data and reconstruct the model in a digital space, while calculating the exact angulation of the object and its dimensions based on the distortions and interruptions of that futuristic grid pattern.

Upon scan completion, the case information is immediately uploaded to online file servers, from where it can be accessed by the design software. An impressive feature of this system is that the software immediately recognizes and labels all
the scanned components, saving precious time as elements of our case are automatically placed in the correct location around the digital jaw model.

After scanning, the case heads to VPX for the virtual plaster experience. All the pertinent information for that case immediately appears on the monitor; the technician doesn’t need to type anything in. The cloud software then calculates the exact dimensions of the preparation and, based on the online anatomy library, proposes a restoration and places it atop the prepared model. For relatively straightforward cases such as posterior crowns, the digital design technicians don’t have to do much else, aside from making minor adjustments and then approving the design. For this case, though, the red on the screen depicts anatomy that was thin, so the tech digitally builds up the restoration until no red remains. (See picture below.) Here, again, there is a standard operating procedure for this task, so everything is kept consistent.

Milling around

The next stop is the milling machines. After the virtual version of a physical case is approved by a technician, the software digitally places the approved virtual crown into the appropriate virtual milling block. The software ensures that the dimensions of the crown are suitable for the requested block and then automatically generates the milling file—essentially a set of directions that informs the mill how to move in order to cut away layers of zirconia and create the finished restoration without destroying the block. This mill file then sits in a queue, waiting for its turn to be used by a mill.

A specialized robot linked to a series of milling machines (pictured below left) takes charge of retrieving the zirconia block and loading it into the next available mill. Each machine produces one crown at a time and downtime between crowns is minimized by automated robotic reloading.

Leaving the mill, the crown (still partially encased in a milling block) is placed on a conveyor belt and brought to a technician who removes the crown and grinds off the sprues. Then, the case
takes on a whole new look as **coloring is added by hand** to the specifications prescribed by the clinician.

It’s remarkable to consider that something that begins looking bulky and unnatural, like the photo below, can transform into something so lifelike after baking.

At this stage of this restoration’s life, it’s still very soft and is fragile. It takes a steady grip to gently handle and painstakingly add coloring to this unit, and for that purpose the lab employs many technicians who were manicurists in past lives. The tooth is colored in this “green” stage for a reason: The color is baked into the restoration; therefore, if the tooth is later adjusted in the mouth, a consistent color will remain. From here, it’s a quick trip under the heat lamp to ensure it’s nice and dry and ready to bake. Drying prevents restorations from cracking when they’re baked.

### Is it hot in here?

A battery of ovens stands at the ready for the next phase, which is the **sintering process**. This will take approximately four hours. In this area of the lab, it’s rather … well, warm. These aren’t your mother’s ovens.

The ovens begin heating with a balmy starting temperature of 77 degrees Fahrenheit. The temperature then rises by 59 degrees per minute until it reaches a whopping 2,192 degrees—and it’s not over yet. After a one-hour holding time, the temperature again begins to rise until it reaches a sintering temperature of 2,876 degrees, which is held for 2½ hours until the ovens begin their cooling descent of 59 degrees per minute. When done, this restoration definitely resembles a tooth, minus the shine. (It’s also a fraction of its former self, having shrunk by 27 percent.)

Once cooled, the restoration is matched to the appropriate solid model to check for fit and then it’s **glazed**. Glaze is preferably applied using a spray, which provides a more consistent end result. Then, it’s back into another oven for the glazing process, taking approximately 25 minutes.

The final step is the **quality control team**. Here, the case is scanned and checked by tenured, experienced technicians whose expertise extends to one task and one material. These people really know their stuff. From here, it heads down a few floors to **shipping**, where it is boxed and sent back to your dental practice.

The end result is a durable, lifelike tooth that will serve the patient well for years to come. And so ends the journey of our case, from its arrival at the lab—as a mere **impression** of what it would eventually be (see what we did there?)—to a final, finished product. Here’s to healthy smiles everywhere. ■